Possibilities of plurality: exploring the disciplinary, institutional and system level features of research culture in Indian higher education

Minto Felix

Wolfson College
University of Oxford
Hilary 2025

Supervised by
Professor Alis Oancea
Professor Simon Marginson

A thesis submitted in fulfilment of the requirement for the degree of DPhil in Education in the Social Science Division of the University of Oxford

For my grandfather, Raju. Your life and love have profoundly animated this work.

ACKNOWLEDGMENTS

This project is forged out of the wisdom and support of many. I am filled with the utmost gratitude to my supervisors, Professor Alis Oancea and Professor Simon Marginson. Professor Marginson has expanded my understandings of the world and the possibilities for positive impact through this project and Professor Oancea has been unwavering and critically engaged in helping guide what I hope is considered an important contribution of new knowledge. They have been so supportive in helping me manage the demands of work and the multiple relocations that were necessary to complete the thesis. Crucially, they have helped me grow as a person as well as a scholar. I will miss our supervision meetings.

I would like to thank the participants of the study and the institutions I was able to visit during fieldwork. Their generosity, time and clarity of insight underpin this study. I hope that I have done justice to their aspirations and realities. The opportunity to be in India to conduct interviews added significantly to this project and I am appreciative to Wolfson College for their financial support.

The fruition of this work would not be possible without the involvement of a critical friend, Professor Allie Clemans. Professor Clemans has been an enduring, encouraging force in my life. I am thankful for our friendship as well as her incisive reflections on the project, always delivered with wit and kindness. I am also immensely appreciative to Nic Dillon in being a meticulous reviewer of chapters and helping me prepare for various milestone assessments. Your brilliant mind and attention to detail has sharpened the final work. I am also thankful to the examiners who have reviewed this work at the various stages of its development including Professor Akshay Mangla, Professor Arathi Sriprakash, Professor Fazal Rizvi, Professor James Robson, Dr. Xin Xu, and to Her Excellency Professor the Honourable Margaret Gardner for encouraging me to pursue doctoral studies in the first instance. I owe much to our formative time thinking and learning together

My interest in the power of higher education and research to transform lives and societies has been greatly shaped by my time at Monash University and, throughout the life of this project, at the Centre for Global Higher Education at Oxford and with Nous Group. They have been vibrant and intellectually enriching communities where I have been able to learn much, and I am particularly thankful for the financial support and flexibility provided by Nous while I have undertaken my doctoral studies.

My friends and chosen family across the UK and Melbourne have been instrumental to my joy and happiness over the past five years. There have been some challenging, daunting times along the way. And those nearest to me have been right there in the trenches with me. To Grace, Georgia, Jess and Al in particular, thank you for the fun, candour and for being my daily anchors. To my brother, Terence, I share this with you, and I am so proud of your hard work and determination.

And most importantly, to the two people who have made all my dreams possible: my Mum and Dad. Over the course of this project, we have learned so much about our many cultures and grown immeasurably as a family. This period has been a shifting experience for us. I am forever inspired by you both.

TABLE OF CONTENTS

ABSTRACT

As the third largest higher education system in the world, India is ambitious about improving its research performance and impact. However, achieving this vision is hindered by several challenges, including inadequate funding, challenges in governance and crucially, the need to foster a productive research culture. Both domestically and internationally, India's research culture has been largely described as mediocre and disjointed.

However, culture as a concept has different orientations and tensions, ranging from the view that culture is everything, through to seeing culture in specific ecological and aesthetic terms. However, literature specific to research culture conceives of this concept through at least three distinct lenses. First, disciplinary research culture explores the norms of researchers within shared epistemological communities. Disciplinary research culture overlaps with, but is distinct from the second lens, that of research culture at the level of higher education institutions (HEI). HEI research culture emphasises values, attitudes, and behaviours towards research itself and is positioned as a lever through which to drive changes in research performance. Finally, research culture is also explored at the level of national and regional higher education systems. Here, research culture is expected to fulfil a broad range of ideals, including contributing to national economic and social development. Discourse in relation to research culture at the system level is closely linked with research ethics, regulation, policy, funding and values. It also considers the important role of regional and national identity as well as languages. This qualitative study seeks to identify the specific features of research culture within Indian higher education and considers the interaction between these features.

This study primarily uses semi-structured interviews with research-active staff, early career researchers, and research leaders across a range of Indian HEIs including public comprehensive universities, private higher education institutions and publicly funded national institutes of significance, across two regions in Maharashtra and Tamil Nadu. The study has traced the experiences of researchers working in biomedicine, computer science and historical studies, complementing these perspectives with fieldwork and interviews with expert informants at various levels of government and in policymaking contexts. Data analysis and interpretation has involved reflexive thematic analysis, drawing on participant insight to address the aims of the study.

The major findings of the study explore the similarities and differences in motivation, values and perspectives at the level of disciplines, HEIs, and regions. It considers practices including the flow of resources and the role of performance incentives, the relationship dynamics between the Indigenous and the global and the crucial role of languages in the shaping of research culture. Moreover, the study conceptualises research culture as a model that integrates the disciplinary, HEI and system lenses that is nested within India's social relations. The study goes beyond comparative labels of culture as weak, strong, less or more and reflects a fuller diversity of values and practices.

In turn, a plurality of research culture imaginaries emerge that allow researchers to work towards parallel visions of success, institutions to nurture different types of research capability and systems to harness the diversity of research practices in the country. Drawing on participant data, the study asserts four such imaginaries: Technology Titans, Conflicted Comprehensives, Indigeneising India and Entrepreneurial Elites. Each has their distinct features and dynamics. The imagining of research culture as multiple is vital to India, where the diversity of traditions and knowledges means that research cultures are contending with many ambitions, all at once. This study will be of value to scholars and policymakers alike who wish to develop a rigorous and comprehensive understanding of research culture within Indian higher education.

LIST OF TABLES AND FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

This is a list of acronyms that are used throughout the thesis. The terms listed here are referred to via their acronym because they reflect the language use of participants, are typical in popular use, or are used frequently throughout the thesis. Unless specified in text, these terms are used in singular form.

AISHE	All India Survey on Higher Education
AMS	Academy of Medical Sciences
API	Academic Performance Indicator
BERA	British Educational Research Association
CSIR	Council of Scientific and Industrial Research
DST	Department of Science and Technology
EAC	Economic Advisory Council to the Prime Minister of India
HEI	Higher education institution
GoI	Government of India
HASS	Humanities, arts and social sciences
ICHR	Indian Council of Historical Research
ICSSR	Indian Council of Social Science Research
IIT	Indian Institutes of Technology
IoE	Institution of Eminence
iTNT	Innovation and Technology for Next-Gen Technologies
MHRD	Ministry of Human Resource Development (now Ministry of Education)
MoU	Memorandum of Understanding
NITI	National Institution for Transforming India Aayog
NSB	National Science Board (an agency of the United States of America)
NTM	National Translation Mission
NUEPA	National University of Education and Planning Administration
OECD	The Organization for Economic Co-operation and Development
PCU	Public comprehensive university
PHEI	Private higher education institution
PNIS	Public national institute of significance

PRS	Parliamentary Research Services
R&D	Research and Development
RUSA	Rastriya Uchchatar Shiksha Abhiyan
SRM	Sri Ramaswamy Memorial Institute of Science and Technology
STEM	Science, technology, engineering and mathematics
SWOT	Strengths, weaknesses, opportunities and threats appraisal
TNSCST	Tamil Nadu State Council for Science and Technology
UGC	University Grants Commission
WCU	World Class University

1 INTRODUCTION

1.1 Introduction

There is significant energy and ambition within India to transform its research culture (Department of Science and Technology, 2020). The purpose of this research culture is to fulfil the country's wider economic and social aspirations. Policy manifestos assert that research culture can simultaneously unlock new capabilities across the vast terrains of the country and enable researchers and the overall ecosystem to be influential globally. Yet despite these lofty ambitions, the path towards this ideal state is resolutely unclear and full of contradiction (Srivastava, 2017). As conceived of here, research culture is reduced to a singular, positive notion whereas the reality is much more complex. These agendas are also unfurling at a time of significant renewal in policy setting, funding and regulation concerning the working of India's formal research apparatus (Government of India, 2024). It is within this landscape that the origins of this doctoral thesis come to life. This is a qualitative study of ideas and perspectives in Indian higher education about the features of research culture across disciplines, higher education institutions (HEIs) and systems. It also considers the interrelationships between discipline, HEI and system features of research culture.

The aims of the research were to understand the values and lived experience of researchers. This includes their everyday practices and relationships from the perspective of different disciplines including biomedicine, computer science and historical studies. It also examines practices and norms within the context of different HEIs including public comprehensive universities (PCU), private higher education institutions (PHEI) and public national institutes of significance (PNIS). Crucially, this thesis explores wider system-level factors in shaping research culture, both at the level of regional systems in Maharashtra and Tamil Nadu and at that of the national system overall. In turn, the study considers similarities, areas of differentiation and points of tension which emerge because of the interaction between various features. Through this study, research culture in Indian higher education is reconceptualised as a series of imaginaries with many possibilities and scenarios for research. The study aims to contribute to fields such as Higher Education Studies, International Relations and Cultural Studies. It provides meaningful new insight to understanding Indian higher education and research, which has received limited attention. It is hoped the knowledge generated will also have broader relevance to policymakers and practitioners alike by providing them with a comprehensive framework through which to investigate research culture in India and beyond. Given the increasing significance of research culture in higher education globally, this is a noteworthy contribution of the study.

The study addresses two major gaps in literature. First, there is a lack of empirical research that simultaneously triangulates and synthesises research culture, at the level of disciplines, institutions and systems at the regional and national level. Second, previous studies have neither defined nor identified the enabling elements of research culture within the Indian context, in addition to the extensive scholarship about the negative aspects. In response to the research aims and informed by theoretical and methodological approaches from both higher education and cultural sociology, this research project is guided by two research questions:

Research questions

1. What are the key features of research culture at the level of disciplines, institutions and regional and national systems in Indian HEIs?
2. What are the interactions between disciplinary research cultures, HEI research cultures and the culture of the wider research system, including the implications of those interactions?

The research design was underpinned by a social constructionist epistemology in the interpretivist tradition. The primary source of data was semi-structured interviews with 52 researchers, research leaders and expert informants, typically research funders or policymakers within Indian research ecosystem. The interview data was substantially drawn from the five participating universities who were selected as cases for the study. In addition, the study involved brief fieldwork to expand on the ideas provided through the interviews which was helpful in validating and challenging participant narratives. Data analysis and interpretation drew upon reflexive thematic analysis with a significant focus on iterating and theming ideas.

1.2 Research context

The need for a bottom-up culture, a culture of excellence, and indigeneity are just some of the ideas discussed in relation to India's research culture, though most of these framings are concentrated in national system-level terms (Shah, 2005; Ahmad, 2020, Urvashi, 2020). Limited attention is devoted to understanding either the specific disciplinary level interactions in relation to research culture, institutional differences in research culture, or the relationship between disciplines, HEIs and the regional contexts in which HEIs are located. Of the limited literature available about disciplinary research culture in India, Urvashi (2020) contrasts the *dual-culture* of Indian higher education between the working-class students who tend to pursue liberal-arts subjects with the middle and upper-classes who go into the sciences, and the implications of this dualism for research. Elsewhere, Agarwal (2009) suggests that universities should be reorganised such that they foster the formation of inter-disciplinary teams, cultures and ways of working.

Most literature, including grey literature such as government publications and policy documents, is focused on national system-level ideas of research culture. For instance, there is a repeated emphasis on building India's national research culture. A recent UGC (2019a, p. 6) policy document describes the absence of "inter, multi, and trans-disciplinary cultures" in universities and highlights the aspiration of the central government to "introduce a culture of research" (p. 6) through activities such as seed grants for new faculty, sabbatical leave, postdoctoral fellowships and travel grants for faculty and students. This document grounds research culture in the material conception, as a set of activities and practices that are to be carried out by all higher education institutions. It identifies that:

> Research culture in Indian higher education requires multi-pronged activities beginning with a bottom-up rather than a top-down approach…designed to arouse intellectual curiosity and its appropriate channelisation and imparting of research tools and techniques (UGC, 2019a, p. 5).

Ahmad (2020) echoes these sentiments, stating that by incorporating research skills into undergraduate curriculum, India's higher education sector can begin to develop a research culture that prepares students for research careers. Elsewhere, Sengupta (2019) focuses on fostering activities and a culture of research specifically at the undergraduate level, stressing the need for students to be "inducted in the culture of research as early as is pedagogically possible" (Sengupta, 2019, p. 3).

Shah (2005, p. 2235) focuses more about the quality and effectiveness of research culture and less on the framing of research culture as consisting of a specific set of activities, attitudes, and practices. He characterises India's research culture as "mediocre," and goes as far to highlight the appointment of "substandard professors" as one of many reasons for a culture that lacks "merit" (p. 2236). For Shah (2005), fostering research culture is about to redressing the "bug that has crept into premier universities" (p. 2237). Similarly, Patel (2012) offers a harsh assessment that there has been little effort to shape a culture that supports research excellence, arguing there is little "pursuit of originality and creativity"

(Patel, 2012, p. 14). Patel (2012) goes further to identify elements which have yielded this incompatible culture. They include the erosion of academic standards, overemphasis on professional education rather than basic sciences and constrained university autonomy. Patel (2012) also draws links between India's research culture and the wider "social milieu", calling for academicians to develop formal codes to guard against encroachment on university autonomy. In a more recent work, Patel (2016, p. 251) identifies aspects of Indian research culture that are problematic including the "fragile existence" of the peer review process, cases of plagiarism and poor-quality output, and an overall "ritualistic" attitude towards research. Elsewhere, Ravi, Gupta, and Nagaraj (2019) and Srivastava (2017, p. 107) argue that research in India must "rise beyond the step of instrumentality" and describe the need for academics to make the pursuit of research a primary purpose, rather than as an added-on activity. Misra & Singh (2015) talk of research culture as being lost three decades ago and that leadership is needed to turn this around, by instituting quality faculty, PhD programmes and improving research funding with industry.

Literature also concentrates on tensions between the global and the indigenous elements of India's research culture. Comparing the research cultures of Chinese and Indian universities, Rong (2016) argues that India lags China in relation to its knowledge creation capacity on the global stage. David and Motala (2017) make similar assertions, while also highlighting that India's research culture must support its universities to provide answers for their own societies. Chakraborty (2017) argues that a culture of research is missing in Indian institutions, where "instead of doing research to serve society, faculty are concerned with research to get published". In Chakraborty's (2017) conception of India's research culture, it ought to be concerned with addressing India's needs in a collective fashion. Resources in India are comparatively scarce; in turn, there is the view that Indian universities should pursue an agenda that focuses on meeting local challenges (Marks, 2018). India's research culture is seen to be stuck between the global and local.

A final, and perhaps most critical set of ideas in relation to research culture in the Indian context relates to inequalities in research culture within and across both HEIs and regions. Agarwal (2012) observes the concentration of resources within a select few institutions and considers the implications for the research culture of the system at large. Altbach and Mathews (2019) make the case that, with the partial exception of the Indian Institutes of Technology (IIT), Indian institutions have been unsuccessful in attracting large numbers of reputable international scholars, leading to a disjointed research culture. Bhargava (2016) remarks that research culture is not just the domain of higher education institutions but also requires the cooperation of research laboratories, government and the private sector. Tierney (2016) puts forward the notion that it is essential to protect academic freedom in all of Indian's universities and this is critical to the research endeavour but also notes that academic freedom is lacking at some HEIs.

Emerging research agenda and the case for the present study

The elements of research culture that are productive within the Indian context are examined in neither scholarly nor grey literature in a substantial and systematic way. The explanation for how certain elements of Indian research culture have come to be developed is not properly understood, including at the level of disciplines, within HEIs, and in wider the regional contexts. While there is robust evidence to support the conceptualisation of three distinct yet interrelated lenses of research culture: disciplines, HEIs, and regional and national systems, there is not an adequate theorisation of research culture across these domains in the Indian context.

Beyond increasing remuneration, little is said about the conditions which may enable Indian HEIs to retain and develop home-grown talent. Similarly, while Altbach and Mathews (2019) make clear the case that Indian institutions have been unsuccessful in attracting large numbers of reputable international scholars, less is known about the characteristics, if any, which would make it desirable and attractive to conduct research in Indian universities. While many studies of research culture in India discuss these issues at an aggregate level, they do not adequately deal with the heterogeneity of the country and its complex regional diversity. There is already much evidence to suggest that these factors have significant implications for the governance and effectiveness of higher education, while the implications for research culture are a lot less known. Therefore, there is a need to conduct an exploratory study which looks at the disciplinary, institutional, and system-level dimensions of research culture in India, including the tensions between these lenses. These diverse perspectives also suggest that there may be nothing to be gained by attempting to define a single, universal research culture. Rather, it may be better to conceive of and explore India's research cultures in multiple and plural terms.

1.3 Layout of the thesis

The thesis is structured as follows. Chapter 2 provides an extensive critical review of literature in relation to research culture and situates the study within its empirical context. It begins by exploring the various conceptions of culture across theoretical contexts and argue that different framings of culture are required to study its properties. Then, the literature review focuses on the specific origins and orientations of research culture; this discussion is necessarily situated within the evolving understandings of science in society. Research culture is considered from the perspectives of those working within science and research as well as the wider economic and institutional context of this concept. This chapter then focuses on three strands of research culture: disciplinary, institutional and system-level. It is concluded that current studies about Indian research culture suffer from a poor conceptualisation of the issues at hand and that an empirical study that examines research culture through the distinct and interrelated prisms of disciplines, institutions, and regional system context would be of crucial value. I locate research culture within the context of the wider Indian landscape, including the capacity of the Indian higher education and research system, and highlight the case for research. Chapter Two concludes with an emerging conceptual framework to frame the present study, through which to investigate research cultures in Indian higher education.

Chapter Three is an overview of the research design and methodology. I frame the philosophical foundations of the study and reintroduce the study's research questions. Here, I explain the identification of participants and the wider sampling strategy pursued at the level of disciplines, HEIs, and regions and to recruit expert informants with policy, funding and system knowledge of India's research landscape. I also outline the methods of data collection, and the challenges encountered during the data collection period, including during in-country fieldwork. I then explain the approach to data analysis and interpretation, which involved drawing on reflexive thematic analysis. This chapter is completed with a discussion of the ethical considerations involved in the study and reflections on researcher positionality.

Chapter Four is the first empirical chapter of this study and discusses themes reflective of Indian researchers' perspectives in relation to disciplinary-level research culture. The findings are drawn from interviews with research-active staff, early career scholars and heads of departments. This chapter discusses key features across each of the disciplines of biomedicine (section 4.2), computer science (section 4.3) and the historical studies cluster (section 4.4). Key ideas that emerged from interviews across these disciplines are discussed, including: the context and initiation for research; norms and practices; capability and development; discipline-specific collaboration; success and impact measures; and resources, infrastructure and ongoing development. Ideas that are relevant to specific disciplines are also highlighted, such as interdisciplinary collaboration in computer science and biomedicine and the decline in status of historical studies. Across the discipline-specific sections, I synthesise these ideas and draw on the conceptual framework to describe the key features of disciplinary research cultures. Further

extending the conceptual framework, the chapter concludes with a comparison of the similarities and differences in disciplinary research cultures.

Chapter Five, the second findings chapter, is focused on themes that are most relevant to institutional-level research culture. While the findings centre on the experiences of research-active staff, their insights were complemented with the perspectives of staff in leadership positions and those with significant responsibility for the implementation of research policy and initiatives within HEIs. Sections 5.2 to 5.4 address key ideas across the different types of institutions selected for the study including PCUs, PHEIs, and the PNIS located in Maharashtra. This chapter discusses key ideas across these institutions such as research vision and leadership, as well as ideas that exist because of the interactions and tensions between institutions which will be discussed in section 5.5. These include ideas such as institutional collaboration and the movement of people and knowledge between institutions. This chapter is completed with a brief synthesis of similarities and differences in HEI cultures. This draws on the conceptual framework to describe key features of HEI research cultures, in section 5.6. This analysis will be harnessed later in thesis to illustrate the various models of research culture that exist in these contexts.

Chapter Six discusses ideas through the regional and national system lens, encompassing policy and funding as well as socioeconomic issues such as language, identity and caste. Given the heterogenous nature of India's regions, this findings chapter canvasses the insights and perspectives of system-level actors, researcher and expert informants within the Maharashtra and Tamil Nadu regions. Section 6.2 focuses on socio-cultural ideas including sub-national regional policy, bureaucratic capacity, languages, and attitudes towards science, whereas section 6.3 discusses national system-features including University Grants Commission (UGC) regulations, state councils of science and technology, funding provision, policy and infrastructure.

Chapter Seven, the final findings chapter of this thesis, focuses on the interactions between the three strands of research culture: disciplines, institutions, and systems (regional and national). It draws on the previous three chapters to highlight the ways in which the lenses influence each other and highlight key ideas that emerge at the nexus of these interactions. These include the concentration of resources, disciplinary autonomy, global and local orientation, and leadership vision.

Finally, in Chapter Eight, the thesis concludes with the key conclusions from the findings and discusses them in respect of existing literature. It asserts four imaginaries of research culture that have emerged from the interactions between the disciplinary, institutional and system-lenses considered in the study. It summarises the main empirical propositions emerging from the study. This chapter highlights the theoretical and practical implications of the study, articulating the contributions to new knowledge that

have emerged from it as well as the associated limitations Lastly, this chapter provides suggestions for future research and offers concluding remarks to the overall study.

A note on Covid-19

This study was conducted during the time of the coronavirus pandemic, particularly during the fieldwork period which was between 2021 and 2022. The associated disruptions to the study are discussed in the methodology chapter and where relevant, through participant narratives in the findings chapters. However, the conceptualisation of research culture and as discussed in this study extends beyond the pandemic period.

2 LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Introduction

In this Chapter, the first section appraises the various ways in which culture has been defined in literature including the tensions and contestations associated with it. It then locates culture within the literature on science, research and knowledge creation, including at the level of disciplines, institutions, and national and regional systems. Next, the chapter transitions to the context of India's research system and capacity. This section also considers India's political economy in the shaping of India's research system and discuss key implications.

In doing so, it is argued that the boundaries and the concepts of culture are not agreed and that choices need to be made to render it useful to the purposes of this study. Reflecting on the aims and purposes of the study, this chapter articulates a conceptual framework through which to depict the concept of research culture to frame the study and analysis of findings. The conceptual framework is underpinned by a critical theory perspective of culture, that has been adapted to address the research challenges of the present inquiry.

2.2 Defining culture

Culture remains an elusive concept that has been imprecisely defined, so much so that its usefulness has been questioned throughout history (Haslanger, 2017). However, key elements and applications of culture become less or more important in respect of the aspects of social life that is being studied. A review of the theoretical conceptions of culture below draws on perspectives from a variety of disciplines including anthropology, sociology, and psychology, as well as significant contributions from cultural studies.

2.2.1 Culture as 'everything'

Early culture theorists, including Tylor (1871), Benedict (1934), Radcliffe-Brown (1952), and later Kroeber-Kluckholn (1952) and Williams (1958, 1961), all shared in an imagining of culture that was comprehensive and expansive. Tylor's definition was the broadest, taking culture to encompass knowledge, beliefs, and capabilities and habits developed by individuals. Radcliff-Brown's emphasis was on the process and acquisition of these various elements (Harouel, 2001). Kashima (2000, p. 20) describes culture as "genetic metatheory" in that it is information that is symbolically transmitted between and within generations of individuals. The chief challenge with the culture as everything perspective is that it "includes too much and is too diffuse to separate analytically the twisted threads of human experience," (Keesing, 1974, p. 73).

In these conceptions of culture as everything, culture was broadly synonymous with society, civilisation and social life; it was therefore possible to discover culture almost everywhere, irrespective of time, place or space (Harouel, 2001; Keesing, 1974). Some, such as Williams (1961, 1976), despite putting forth a vaguely stated conception of culture as a "whole way of life" (1961, p. 14), focused more closely on defining the domains of culture that were located inside this container. This included: the social, in which culture describes ways of living and of expressing meaning; the documentary, in which culture is a body of imaginative work that draws on the material properties of culture including symbols, works of arts and texts; and the ideal, where culture is a journey towards human perfection, which emphasises universal values and certain absolutes (Williams, 1961).

Culture has also been simultaneously described as possessing "transcendental" properties in the Kantian tradition (Grossberg, 2010, p. 74), where the constitution of experience (phenomena) in the place of reality (noumena) is provided with meaning though human creation, otherwise known as culture; and yet, culture also has an aesthetic form. There is also the crucial role of individual action in the making of culture. This occurs in two ways, as Geertz (1973) denotes. Culture consists of patterns of meanings which are historically transmitted by which "men [sic] communicate, perpetuate, and develop their knowledge about and attitude towards life" (Geertz, 1973, p. 89; Shweder, 2007). Further, the meaning-

making and symbolising processes is one where the vocabulary and the status is provided by and for humans (Reckwitz, 2002).

2.2.2 Culture as an industry

In traditional Marxian philosophy through to contemporary cultural studies, to understand culture is to understand its artefacts, and it is impossible to do both without relating to the wider economic background. In the case of Marxian philosophy, the formula is simple: the base is the capitalist economy, and the superstructure is culture as well as other spheres that depend on the base (Henning, 2017). In this paradigm, economic contextualisation may change the meaning of a cultural artefact. Flowing on from this, Horkheimer of the Frankfurt School (Adorno, 1931), conceived of cultures in relation to time and geography, for example: traditional, modern and Western cultures. Horkheimer also conceived of cultural artefacts as expressions of the relevant period, such as scientific and religious ideas, poems, plays, pictures and symphonies, as well as other matters which reflected the overall aesthetic. (Horkheimer, 1936; Henning, 2017). Importantly, Horkheimer's theorisation of culture also concentrated on the doing of culture, in other words, the practices of culture. Practices were effortless, repeated behaviours, which integrated the cultural artefacts into the wider society or historical period (Henning, 2017). These three components, time-period, artefacts and practices, formed the core of Horkherimer's conceptualisation of culture.

Horkheimer's later works with Adorno (1944) extended these ideas, shifting away focusing on ideas of mass culture and culture as aesthetic towards a theorisation of the culture industry (Horkheimer, 1937; Henning, 2017). Human agency was significantly diminished in this conception, where "the world is faithfully duplicated by mass culture and is reified an autonomous entity beyond human control" (Gunster, 2000, p. 50). The emphases on aesthetic and creativity were replaced by a focus on sameness and uniformity for Horkeimer and Adorno (1944; Henning, 2017, p. 263): "it can be produced industrially… and that a process of industrial standardisation adjusts everything to the same level". There also was recognition here of the role of power and politics, in so far as commodifying artefacts into the so-called industry for economic gain. Bourdieu (1983) was concerned with the appropriation of culture and its relationship with society, conceiving of the cultural field as a reinforcer of class relations, that created, reproduced and legitimated relations structured around dominant and dominated classes (Bourdieu, 1983; Garnham and Williams, 1980).

However, the conception of culture as material has its limits. Latour (1993) asserts that artefacts or things do not participate in social practices as humans do. Material entities only come to be because of the distinction that is afforded to them through the "collective representations of a social group" In turn, there is ongoing tension about value of culture as material and industry. They cannot be completely equal with the embodied experience of social life and human action (Reckwitz, 2002).

2.2.3 Culture and power: from the mainstream to the margins

Power and culture are deeply linked. Some have characterised the interactions as unequal and asymmetrical (Bauman, 2004); whereas others explore how culture becomes legitimised in societies as a study of navigating and resisting power (Ogbor, 2001; Grossberg, 2010). Power is a part of culture and culture shapes power (Giroux, 2004). In part, Williams' early theorisations about culture harnessed the analogy of agriculture practices to construct a vision of the world built from the eyes of the farmer. This splits action and bearing the impact of the action, the manager and being managed, the refined and transforming the crude, all of which gives effect to culture. It is here where a critical theory perspective of culture, which focuses on ideas of emancipation and ideological domination, makes a helpful and most practical contribution. For instance, Ogbor's (2001, p. 596) critical appraisal of culture within a corporate context identified the contradictory interests of managerial elites versus workers, highlighting the presence of subcultures which can undermine the "monolithic" idea of an organisation's culture, and revealed that cultural phenomena can be the basis for consensus or conflict. Culture can be seen either as a tool for repression and hegemonic control by managers and curtailing diversity of perspectives or as a process for harmonisation of views and practices between workers and the elites (Ogbor, 2001).

The value of exploring culture in this way is not bound to contained settings such as organisations. It helps further understanding of ideas such as cultural imperialism within societies and to explain the dominance of ideologies such as racism within social spaces. Within these paradigms, there is room for tension and conflict, rather than just striving towards harmonisation of cultures. Postmodern studies of cultures encourage an examination of the perspectives at the margin, to provide attention to class, race, gender and ethnicity in the unfolding of histories and events (Berlin, 1992). This is a clear effort to counter the framing of culture as a totalising account as described earlier and instead to encourage the multiplicity of culture narratives from different vantage points. Scholars emphasise the political and social context of culture and locate it in a place of conflict. In doing so, culture is positioned as being actively engaged in a battle for the control of meaning (Castro-Gomez, 2002). Here, culture is construed in a "world-system field of ideological battles" (Wallerstein, 1994 as cited in Castro-Gomez, 2002). Built into Wallerstein's construction of culture (1990, p. 39) is that it is scarcely neutral and straddles the "antinomies of unity and plurality", the specific and broad. Wallerstein (1990) asserts that culture is the idea-system by which society attempts to make sense of contradictions and ambiguities.

2.2.4 Cultural studies and contemporary research

Despite the absence of an enduring, shared and theoretical basis for culture, this has not acted as a barrier to the way the construct has been used and applied across many fields of study. In fact, some scholars have lamented that understandings of culture have become most developed where they have

been progressed for, and with, other agendas (Raud, 2016). Power, values, motivations and behaviour are some of the areas that have benefited from a consideration of culture either in parallel or as context for these subjects (Raud, 2016; Sagiv and Schwartz, 2022). All the while, there is also concern that the concept of culture has become prisoner to these so-called deterministic, reductionist agendas (Raud, 2016) and has lost its grasp over its own purpose. However, through the contribution of these fields, understandings of culture have sharpened in different and important ways.

For instance, cultural psychology and anthropology have illuminated insight into the process of enculturation, which is the process by which people come to learn and behave in different ways because of variation in culture (Shimahara, 1970; Heine and Ruby, 2010). Cultural psychology has maintained that individuals' formation of identity and self-hood is drawn from relationships with others and their cultural environment (Heine and Ruby, 2010). In the context of psychology, key features of culture relate to repeated practices and derivation of meaning and understanding from those practices. Values are also characterised as key features of culture, as they help justify institutional policies, as well as group beliefs, actions and norms (Sagiv and Schwartz, 2022).

Culture is also conceived of in ecological terms, concerning the study of human adaptation to both social and physical environments (Markusen, 2011). This perspective has been influential within the creative sector in exploring the dynamic ways in which cultural activities interact with each other. It provides an understanding of culture that that involves the coming together of people and things in constellations and considers inanimate objects as actors as it does humans. The ecology perspective recognises that culture is created in the spaces between these interactions (Holden, 2015). Appadurai (1993) proposes a framework that explores the relationship between, and within, five dimensions of cultural flows, being: ethnoscapes, mediascapes, technocapes, finanscapes and ideoscapes (Appadurai, 1993). Appadurai (1996, p. 51) asserted that culture terminology entered a "post-blur era" where the boundaries between globalisation, culture and economy were becoming fissured. Culture in the context of globalisation offers insights into the relationship between the world, defined as the production and organisation of the life world, and the word, encompassed by all forms of textualised production (including film and art).

And then, at the nexus of these various disciplines and knowledge domains, cultural studies exist as a field of study of its own right. It is animated by all the theories and perspectives that have been discussed above and, importantly, reinforces the aesthetic properties of culture as it gives meaning to the historical and political challenges of human lives (Grossberg, 2010). Contemporary culture theorists including Raud (2016) conclude that for all the various perspectives relating to the production, dissemination, transmission and interpretation of culture, meaning making is the shared and most important denominator.

2.2.5 Summary

This review of literature makes apparent that it would be analytically impossible to explore culture as a whole way-of-life in the way Williams did. Further, though scholars have expressed a great deal of interest in the immaterial and inanimate aspects of culture, culture is a construct that requires human agency to create, transform and give meaning. Culture is underscored by individual motivation and action, while necessarily recognising the wider economic and social contexts. In turn, culture is less about the constituent materials and artefacts, enduring patterns, values and behaviours, although these are all important domains. Ultimately, it concerns the meaning derived from the relationship humans have with these elements. Extending this further, culture is even less concerned with where the boundaries are drawn than with the ideas and meanings that come from within the cultural world, or from the comparison of multiple cultural worlds.

Culture can be aspirational and immaterial: "culture is our destiny" (Hutcheon, 1999; Oancea, Flórez-Petour and Atkinson, 2015). But it also can be simultaneously material, seen through stories, media, works of arts, rituals and specialised knowledge (Williams, 1961; Griswold, 2004). While culture comprises many elements, it is considered particularly inseparable from language (Jiang, 2000; Kroeber, 1952 cited in Steward, 1962). To draw on the analogy of an iceberg, language is what is considered visible above the surface and culture is the dimension which is hidden beneath (Jiang, 2000). As Brown (1994; p. 165) explains, "a language is a part of a culture, and a culture is a part of a language". Ruscio (1987) posits culture as dynamic and evolving. This perspective is reinforced by Oancea, Florez-Petour and Atkinson (2018), who advance a dynamic model of understanding culture, creating culture and living culture.

Grimson (2010) acknowledges the intermixing between culture and identity, but where he positions identity as being concerned with individuals' feelings of belonging to a collective, Grimson describes culture as the beliefs and enduring rituals engaged in by members of that collective. Martin's (2002) conception of culture, comprising integration, differentiation, fragmentation and complexity, offers a partial solution to the varied perspectives. The integration perspective emphasises homogeneity, focusing on the actions and behaviours where there is consistency among people and groups, whereas the differentiation perspective emphasises that culture is not unitary and explores the factors which make for different cultures including occupational influences and demographics (Martin, 2002; Smerek, 2010). The differentiation perspective is interested in tensions. Meanwhile, the fragmentation perspective focuses on ambiguity, where culture is fleeting and contradictory and where consensus is transient (Smerek, 2010). It is the complexity perspective that is most illuminating. This view recognises there may be some elements of a cohesive culture that bind actors but that, at the same time, there are factions and subcultures that differentiate. This dynamic understanding of culture is the basis of a conceptual framework which is discussed in section 2.5. However, to contextualise this framework, I will first discuss the use of the concept of culture within a research context below.

2.3 Dimensions of research culture

In this section, I explore the specific theoretical and empirical literature that focuses on research culture and the various ways it has come to be understood by scholars. In doing so, I investigate key ideas about research culture at the level of disciplines, HEIs, and national and regional-level systems. Literature constructs and deploys research culture in different ways across each of the lenses of disciplines, HEIs, and systems. For instance, there is a stronger emphasis on patterns and artefacts in research culture at the level of disciplines, while normative ideas including quality and excellence are stronger at the level of HEIs and systems (Rescher, 2003; Ion and Castro Ceacero, 2017). There are also some overlaps in ideas across disciplines, HEIs and systems, which underscore the importance of conceiving of research culture as distinct but somewhat interrelated lenses.

2.3.1 Theoretical perspectives on research culture

The heterogeneous ways in which science and research are defined, and the assumptions that underpin these definitions, have led to various framings of culture in this field. Science and research are somewhat distinct terms that are used increasingly in similar ways (Godin and Schauz, 2016). Latour (1998, p. 1) distinguishes science as "certainty" from research as "uncertainty." Where science appears "cold, straight and detached", research is meant to be "warm, involving and risky" (Latour, 1998). Notwithstanding their particularities, it may be useful to consider science and research as interchangeable terms. Science and research are both concerned with rigorous and serious inquiry, are subject to "shifting fortunes" (Merton, 1973, p. 114), and add new ingredients to the "collective experiment" of society (Latour, 1998, p. 2). In the context of the present study, science and research are also sites of cultural production (Curtis, 1954).

There are several ideas that relate to the role of culture in science and research. First, there is the notion that culture emerges within scientific paradigms. Kuhn (1962) characterises paradigms as a set of intellectual frameworks, traditions and norms within which scientists work. Paradigms enable scholars to form a shared tradition (Kuhn, 1962; Hanson, 2012). Kuhn was not explicit about culture and by no means are paradigms the same as culture. However, the emergence of "normal science" may also give effect to shared cultures and practices among a community of scientists.

While Nowotny, Gibbons and Scott (2001) acknowledge the role of autonomous paradigms in science, their preoccupation is with the relationships between science and the wider culture of a society. In an earlier work, Nowotny (1993) details the dynamics through which science and wider social contexts become interlinked and legitimated. Among these include the ways science is influenced by and influences indigenous knowledge and the role of "protoprofessionals" who expand the influence of science (Nowotny, 1993, p.313). Latour (1993) proffers similar ideas, recognising that there is a hybridised network where science mixes and matches in complex displays with politics, economy, law

and religion. Nowotny, Gibbons and Scott (2001) assert that the barriers between science and society have become increasingly porous.

There are also debates about the aims and contributions of scientific culture to society. There are those who advocate that scientific culture must be humanistic and not so motivated by economic gain, while others put forward the view that scientific culture should concern itself with advancing economic development (Nowotny, Gibbons and Scott, 2001; Wellcome, 2020). Etzkowitz and Leydesdorff's (2000) triple-helix model helps us understand the cultural practices and orientations that are distinct to universities, industry and government as key actors in the research ecosystem (Etzkowitz and Leydesdorff, 2000). As described by Erosa (2012, p. 25), universities and government are motivated by goals that are broader than a "business culture [that] focuses on profit orientation and efficiency".. The distinctiveness and complexity of these cultures can influence their way these research actors interact with one another.

Finally, scientists are also shaped by their own personal cultural practices, which can challenge the scientists in their approach and interpretations of seemingly objective inquiry (Turner and Sullenger, 1999). Curtis (1954, p.3273) locates science as not a thing apart from, but as much the subject of human endeavour. He writes that "the culture of today is vastly conditioned and influenced by science, and the modern man ignorant of science can no longer be considered a man of culture."

These and other perspectives highlight that science and research culture can be discussed in many ways. It comprises several frames of analysis, including at the level of disciplines which emphasises shared norms among scholars. Literature also suggests that research culture can be explored at the level of institutions and regional and national systems, across a variety of country-contexts. Next, each of these frames of analysis will be explored in turn in relation to research culture, with implications for the present study to be discussed at Section 2.5.

2.3.2 Disciplinary research culture

Disciplines can be defined as epistemological bodies of knowledge which are embodied in a common set of intellectual tasks and methods (Becher, 1981). Within disciplines, academics are characterised by a shared commitment of apprehending the world who work within a common set of languages, norms, and traditions and who enforce these norms among emerging scholars (Ylijoki, 2000; Miller et al, 2008; Huber, 1990; Feuer, Towne and Shavelson, 2002). They share certain styles and patterns of working (Bernstein, 2000; McLean, Abbas, and Ashwin, 2013).

Biglan's (1973) and Becher's (1994) distinction of disciplines as hard versus soft and pure versus applied, with the combinations of hard-pure, soft-pure, hard-applied, and soft-applied, remains dominant in many studies of disciplinary cultures. However, disciplinary classification is not without contention and remains

an evolving concept (Jessop and Maleckar, 2016). Disciplines are continuously shifting and crossing boundaries, as highlighted by the rise of the interdisciplinary and multidisciplinary fields and specialisms (Klein, 2022). Nevertheless, disciplines provide a framework for day-to-day intellectual and social practices for researchers, govern the utilisation of shared resources such as laboratories and libraries, and act as an organising tool for HEIs (Jessop and Maleckar, 2016; Becher and Trowler, 2001). Recent studies highlight differences between hard and soft disciplines in relation to assessment and evaluation practices, accreditation processes, the use of titles in research articles, open science practices, and the recruitment of academic staff (Ylonen, Gillespie and Green, 2018; Jiang and Hyland, 2022; Steinhardt, Bauer, Wunsche and Schimmler, 2022; Reymert, Vabo, Borlaug and Jungblut, 2022).

A key contribution of Biglan-Becher's work is that they make a compelling case for the "high degree of universality" of disciplinary cultures (Becher, 1994, p. 153), in that disciplinary cultures transcend the boundaries of institutions and, in many cases, transcend national and regional boundaries. They highlight the mobility of academic staff between institutions, student exchanges and international discipline-specific associations as a few examples of the universality of disciplines. However, the framework does not consider the specific relationship with research activities and disciplinary norms. Different disciplines come with varying conceptions of what constitutes knowledge and how it should be applied (Rescher, 2003). Disciplines are not necessarily the same as academic departments, as the latter may draw on the same set of methods common to a discipline to investigate and/or provide courses in a specialised area of study. Disciplinary boundaries are also increasingly becoming fissured to create new domains of knowledge which do not share classical disciplinary characteristics (Nesi and Gardner, 2006). New entrants are socialised into these cultures, while bringing in differing perspectives that may variously expand, constrain and bolster the disciplines to which they find affiliation. However, the idea that disciplinary culture is all-encompassing does have its limits. Godfrey (2015) highlights that, even at a disciplinary level, there is contention over whether there is a common culture and posits that other influences can also shape the actions of a discipline's members.

In the context of research, Finnegan and Gamson (1996) investigated two different departments' adaptations to the increasingly dominant emphasis on research activity within their institution. They observed that the mathematics department adopted a shared intellectual style, characterised by high levels of mutual identity and that, in contrast, the English faculty was seen to display more divergent intellectual styles. Reinholz et al (2019) examined similarities and differences between STEM disciplines, including biology, chemistry, physics and mathematics across structures, symbols, people and the role of power. Where empirical research was central to the ways of working in biology and chemistry, deductive and inductive reasoning played a more central role within mathematics (Reinholz et al, 2019). Elsewhere, Nerland, Jensen and Teklu (2010) investigated whether certain disciplines are geared towards specialisation or generalisation and if methodological approaches promote pluralisation or unification.

They also examined whether the relationships between disciplines with the outside world is open or closed (Nerland, Jensen and Teklu, 2010). These dimensions highlight the commonalities as well as distinctions between disciplinary research cultures.

Despite the growing significance of interdisciplinary research, most of the research collaboration, including at the international level, is through disciplinary-led activity, reinforcing the importance of disciplinary cultures in driving collaboration (Wagner and Leydesdorff, 2005). Research collaboration within and across disciplines is influenced by a mix of intrinsic and extrinsic factors and by the interaction between them (Marginson, 2021a). These range from the growing mobility of scientists and increased electronic connectivity through to the geographical adjacency of research systems (Marginson, 2021a). Crucially, Marginson (2021a, b) theorises the role of cognitive accumulation, the desire of scientists working towards the larger pool of knowledge and activity, motivated to build on the ideas of others to make a scientific breakthrough, and preferential attachment to reinforce position and status within the knowledge system. Researchers want to collaborate with others who can "enhance their productivity and credibility" within their disciplines (Wagner and Leydesdorf, 2005, p. 21). They are also incentivised to collaborate within disciplines for the rewards of prestige on rankings and as directed by funding regimes (Hazelkorn, 2009). Ultimately, "shared values, collective commitments, cognitive content and positional self-interest are all in play" in the context of research collaboration, which shifts and evolves across the course of a scientist's career (Marginson, 2021a, p.96).

2.3.3 HEI research culture

Research culture at the level of HEIs, and within sub-organisational units, such as faculties, is concerned with universal values, aspiring to absolute norms and behaviours, and with attitudes towards research itself. Drawing on Schein's (1984) work on organisational culture, Hill (1999) extends the understanding of research culture as to concern the values, ideals and beliefs about research within an institution or within an organisational unit (e.g. faculty, department). She offers another definition of research culture:

> A pattern of basic assumptions about research – invented, discovered, or developed by a given group as it learns to cope with the external and internal problems of research… to be taught to new members as the correct way to perceive, think and feel in relation to research problems. (Hill, 1999, p. 2)

HEI research culture can be conceived of in normative terms, with the strength of an institution's research culture viewed as the congruence in values and traditions between scholars (Koroshetz et al, 2020). Scholars including Tierney (1988) and Bland and Ruffin (1992) developed widely utilised frameworks to understand the institutional culture of higher education institutions including with respect

to research. Bland and Ruffin (1992) identified a set of 12 characteristics as necessary elements of high-performing research environments.

These characteristics included: clear goals that serve a coordination function; research emphasis; positive group climate; assertive participative governance; decentralised organisation; frequent communication; accessible resources (particularly human); sufficient size, age, and diversity of research group; appropriate rewards; concentration on recruitment and selection; leadership with research expertise and skill in both initiating appropriate organisational structures and using participatory management practices; and of relevance to the present study, distinctive culture. While the authors concluded that the differential impact of each of these 12 characteristics is unclear, they also note that leadership has a significant influence on the other 11 variables. A distinctive culture is characterised by "shared values about academic freedom and the ways to establish truth" (Bland and Ruffin, 1992, p. 388) and is maintained through rituals. Bland and Ruffin (1992) highlight that a distinctive culture is a key element of creating productive research environments.

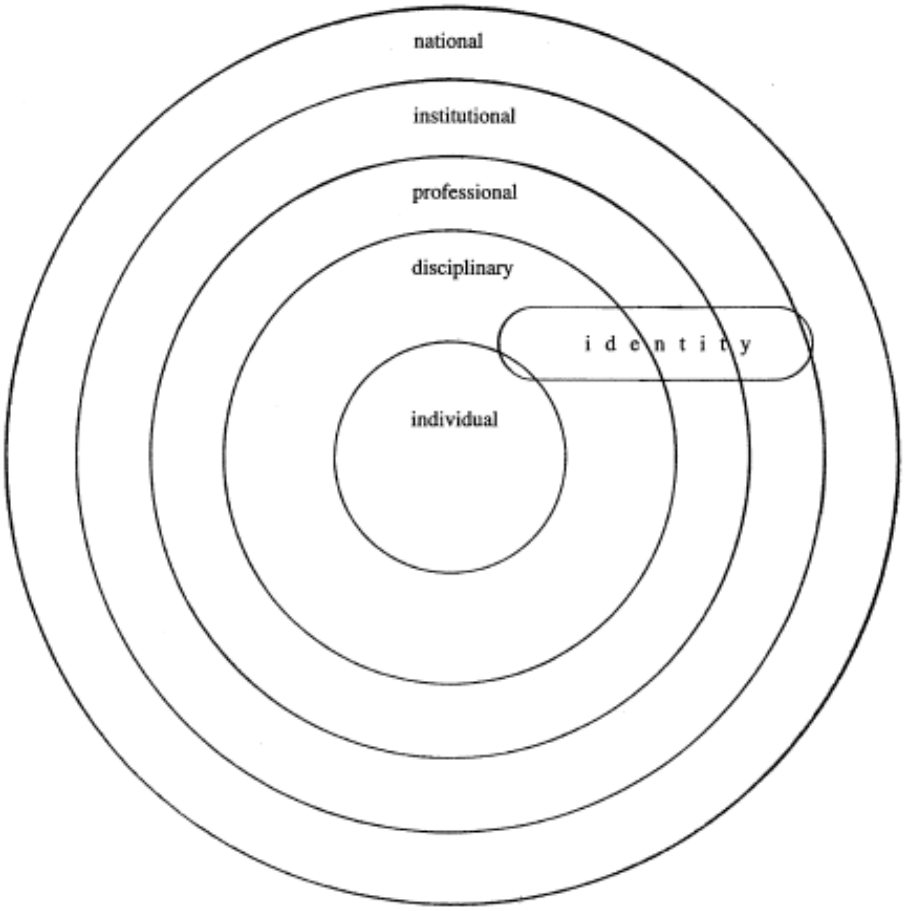
Meanwhile, Tierney's (1988) framework comprised a range of dimensions: mission of university, environment, leadership, strategy, information and communication, and socialisation as a system. Within these broad categories, Tierney (1988) proposed a series of essential concepts to be studied within an institution. This is shown below in Figure 2.1.

Figure 2.1 Elements of institutional framework (Tierney, 1988)

Dimension	Essential questions
Environment	How does the organisation define its environment? What is the attitude toward the environment? (Hostility? Friendship?)
Mission	How is it defined? How is it articulated? Is it used as a basis for decisions? How much agreement is there?
Socialisation	How do new members become socialised? How is it articulated? What do we need to know to survive / excel in this organisation?
Information	What constitutes information? Who has it? How is it disseminated?
Strategy	How are decisions arrived at? Which strategy is used? Who makes decisions? What is the penalty for bad decisions?
Leadership	What does the organisation expect from its leaders? Who are the leaders? Are there informal and formal leaders?

Building on Tierney and Bland and Ruffin, Välimaa (1998) observed a distinction between, on the one hand, disciplinary culture in the sense of the sociology of knowledge and the interplay between people and ideas and, on the other hand, institutional culture in the form of conditions and patterns of behaviour within a higher education institution. Välimaa reimagined culture as a series of interactions between different layers of academic identities, including the levels of disciplines, professional communities, institutions and the nation-state. The interplay between these layers is represented in Figure 2.2.

Figure 2.2 Dimensions of academic identity (Välimaa, 1998)



Mendez and Reyes-Cruz (2014) proposed a model of HEI research culture as the shared, "taken-for-granted" implicit assumptions that individuals of a university hold about research, which shape how these members perceive and behave with respect to research activities. Salazar-Clemena and Almonte-Acosta (2007) adapted Bland and Ruffin's (1992) indicators to expand on research culture using the following categories: institutional research policies and agenda; departmental culture and working conditions; budget for research; infrastructure; collaboration; policies and guidelines; publications; research committee; faculty workload; faculty knowledge; and attitudes to conduct research.

Research culture is often considered to be a lever through which to drive changes in the performance or character of faculties and institutions (Pratt, Margaritis and Coy, 1999; Ion and Castro Ceacero, 2017). As illustrated by Pratt, Margaritis and Coy (1999), in normative terms, research culture can be referred to as weak, strong or at all points in between. This also suggests that certain types of research culture can be less or more desirable. Ion and Castro Ceacero (2017) described research culture as existing in transitional stages, moving from being bound by collegiate relationships to a new model of research culture characterised by super-control, hierarchy and the market model. Holligan (2011) also signalled shifts in research culture, away from the traditional ideas of autonomy towards a managerial culture which is seen as a necessary aspect of a performative society. Yokoyama (2014) proposed a theoretical device to explain the relationships between culture, individual agency and structure in higher education relevant to the research context. Structure and culture influence agency, particularly in the actions of dominant agents such as experienced and successful academics. It also follows that agents can both enable the reproduction of existing structures and cultures or challenge these forces (Yokoyama, 2014)

Through her empirical work, Lee (2007) observed that departmental culture can be distinct from the HEI research culture. This study asserts that academic departments are a part of the institution, but that they conduct some of their affairs entirely independently of central management (Lee, 2007). Along similar lines, Rossouw (2020, p. 248) takes a sub-organisational faculty view to highlight the role of managers in reforming a "prevailing weak" research culture within their faculty. These conditions include strategy, building research capacity and collaborations, creating essential infrastructure and, in particular, the role of a manager in providing leadership and securing resources (Rossouw, 2020).

Building upon these normative ideas of research culture, Sporn (1996) proposed a typology to classify different types of university environments. These include weak internally focussed cultures, where individuals have divergent values, beliefs and attitudes (Sporn, 1996). In weak internally focussed cultures, university members do not identify with the institution as a whole and few are willing to adapt to changing conditions. There can also be weak cultures with an external focus, strong internally focussed cultures and, most desirably, strong externally focused cultures. Universities with strong, externally focussed cultures are institutions whose members share values and beliefs, in which activities are externally focussed and that can react flexibly to changes (Sporn, 1996). These typologies reveal the capacity of a university to respond to external, environmental changes, recognising that universities are nested within political, social and economic contexts.

2.3.4 Regional and national system-level research culture

At the level of the system, research culture is framed towards normative goals. Nuffield Council on Bioethics' (2014, p. 2) study on the culture of scientific research in the UK is underpinned by the notion that the "culture of scientific research… is high quality, ethical and valuable." Research culture is posited

as a construct with both enabling and disabling elements. Researchers described positive elements of culture, reinforcing themes such as collaboration, inclusion and support, as well as components that they find problematic, such as the narrow conceptualisation of impact and the intensity associated with the pressure to publish (Wellcome, 2020). The scope of research culture at the system-level is expansive, involving "everyone within the research system" including funders, administrators and leaders of institutions (The Royal Society, 2018). It stresses the importance of certain values: "rigorous, accurate, original, honest and transparent" (Nuffield Council on Bioethics, 2014, p. 3). These works highlight that while research culture can support or inhibit the achievement of desired system level goals, it is also something that can be manipulated and modified. System-level research culture is concerned with, and encompasses a wide array of dimensions, including careers, assessment, research governance, funding and knowledge dissemination (Nuffield Council on Bioethics, 2014). Research culture at the system level is a broad and evolving term.

There are also differences in system-level research culture between nations and regions. Marginson and Yang (2020) note that national culture variations overlap with, but are distinct from, normative differences in higher education systems. Research culture is encased within specific laws, languages, policies, and more generally, the social relations within countries (Marginson and Yang, 2020). In Japan, key aspects of research culture, such as the Koza system, are intertwined with its broader historical and political character as a nation (Mitsunobu, 1998; Baber, 2001). Kozas were small clusters of researchers, organised in a strict hierarchy around the senior-most professor, working on distinct issues. While this highly independent model afforded complete freedom to each Koza to conduct research in their field of choice, it also meant that different Kozas did not pool their resources together; there was uneven performance within and across institutions and inadequate focus in developing early career talent (Baber, 2001). These features continue to shape science and research performance in Japan, with a decline in the number of students pursuing doctoral study and fewer opportunities for early career scientists to secure permanent jobs (McNeill, 2019).

Shin and Lee (2015) likewise explained that in South Korea, the seniority-oriented culture that has long been institutionalised in scholarly culture has its roots in the history of the Confucian tradition. However, aspects of this research culture appear to be changing with the emergence of major state-led projects such as the BK21 project and Social Science Korea initiative. They observed that Korean research culture is shifting from a system that has tended to be largely seniority-oriented, where there was minimal room for meritocratic decision making in the hiring of staff, to a culture that has been more favourable towards performance-based criteria in faculty promotion (Shin and Lee, 2015). As a result, some top-ranking Korean universities have begun to hire leading performers as professors on the basis of their output and performance rather than on the basis of their academic networks alone (Shin and Lee, 2015).

Elsewhere in Asia, the journey of creating a research and development culture in Singapore suggests that excellent, state-funded infrastructure and access to a pool of foreign scientists do not alone secure success (Boon, 1998). Boon raised issues of limited academic freedom, particularly in the relationships between the university administration and disciplines, and the need to create an indigenous, self-reliant base of knowledge and innovation, which he considered to only come with shifting the sociocultural motivation, attitudes and behaviours of people towards science and technology. Through a sustained programme of reforms, Singapore has emerged as a global science powerhouse in recent years. The country's research system is characterised by excellent performance across a range of disciplines. It has successfully fused its technology-intensive industries with research through corporate R&D investment and leadership from the A*Star Agency for Science, Technology and Research, and is fostering strong interactions between local and foreign talent (Day, 2011).

In examining the changes in research culture across the Asia-Pacific region, including in East Asian countries such as China, Singapore, Japan as well as the Pacific Island nations, Braddock (2002) recognised that there is great diversity across countries. He contrasts, on one hand, countries where institutions have productive links with industry and which are sufficiently financially resourced with, on the other, nations where institutions lack secure and sustainable sources of income for research (Braddock, 2002). Literature typically highlights that the distinct historical, political and social contexts of countries in the Asia-Pacific region gives rise to more differences than similarities in relation to research culture. At a regional level, there is, for example, the "post-Confucian zone" of the East Asian nations of Korea, China, Hong Kong and Singapore among others, whose research systems share common features such as strong state support, accelerated public investment and a deep foundation of respect attached to scientific research, which in part, explain their vibrant research systems (Marginson, 2011).

Outside of Asian research cultures, Lewis and Simons (2010, p. 43) described the Caribbean research culture, where institutions are grappling with issues of epistemological colonialism and calling for a "new kind of independence". Ion and Castro Ceacero's (2017) work examining research culture in Spanish universities noted that, consistent with European trends, research carried out by universities is increasingly concerned with serving the needs of the market. There is a shift in research culture from a collegial model of governance to a more complex "academic capitalist" structure concerned with performance in international rankings (Ion and Castro Ceacero, 2017, p. 312). Other studies of research culture in various national contexts highlight differences in languages and the reconciliation of globalisation with indigenous knowledge systems as characteristics that give effect to country and region-specific understandings of research cultures (Sawyerr, 2004; Lewis and Simmons, 2010; Fussy, 2019).

The forces of globalisation mean that universities and research environments are sites of both indigenous knowledges and imported languages and practices. Universities adopt certain features of Western systems such as the tendency for English as a medium of instruction, the World Class University model

and a fixation with the international rankings (Tsung and Clarke, 2010; Gu and Lee, 2018; Salmi, 2009). These forces can create many dilemmas, including creating space for minority languages to be expressed, preventing cultural imperialism by Western countries and instituting mechanisms that reinforce a particular approach to the production of knowledge (Pan, 2006). The explanation offered by Marginson and Yang (2020), that national and cultural variations overlap with, but are distinct from, normative differences in higher education systems, helps describe the development of research culture between nations. As with other aspects of higher education, research culture is encased within specific laws, languages, regulation, policies and, more generally, the social relations within countries (Marginson and Yang, 2020).

2.4 India's research system

This section situates the rapid growth of India's higher education ecosystem within the wider political economy and discusses both the negative and positive implications of this transformation. It examines the underlying conditions that have contributed to the development of the system, including the features which can be considered specific to the Indian context. Literature and empirical works concerning India's research capacity are discussed, including gaps which will be addressed by the current study.

2.4.1 India's political economy and the development of the higher education and research system

The nexus between political culture and higher education and research in India can be understood in terms of three distinct time periods: i) before and during colonial rule, ii) post-Independence from 1947, and iii) into the 21st century.

Before and during colonial rule

Indian higher education preceded the arrival of the East India Company in the 1600s. Founded in either the fifth or sixth century B.C., Nalanda Mahavihara was a centre of advanced learning that was initially devoted to Buddhist studies (Agarwal, 2007). Nalanda Mahavihara was joined by countless other centres of higher learning, including the Taxila and Vikramashila institutions; it was considered a prized jewel until 12th century A.D. In addition to Buddhist studies, there is also evidence of teaching taking place in the disciplines of mathematics, philosophy, astronomy and spirituality, among other fields (Agarwal, 2007; Nalanda University, 2020; Hayhoe, 2019). However, the arrival of the East India Company meant that indigenous knowledge and these ancient institutions soon became the subject of intense scrutiny by British elites. At first, through establishing institutions of higher learning such as the Calcutta Madrasa in 1781 and the Asiatic Society of Bengal in 1784, the colonialists studied local knowledge intently for the purpose of being able to run an empire (Datta, 2017). As the empire strengthened its grip on India, a resolution was passed in 1835 to spread the knowledge of Western arts and sciences. A subsequent set of measures were put in place to: change the official language from Persian to English, dismantle the pre-colonial indigenous system of education and replace it with a new model of curricula, adapted in large part from the model of the University of London that was established in 1836. For the British, along with the judicial system and law enforcement machinery, higher education emerged as a vehicle through which they could exercise control and administer the colony (Datta, 2017). The intention was to design an inexpensive system that would produce the necessary workforce to support the regime. As Basu (1989) posited, the model was initially welcomed by the Indian polity as it was seen to give students access to power and employment in the political and economic system.

The newly imagined institutions of British higher education under colonial rule began with the establishment of universities in Calcutta, Bombay and Madras between 1840-1850. These were primarily examining institutions that granted degrees to students who were taught in affiliated colleges (Basu, 1989). The model was designed to organise citizens for work through a "test of eligibility for government employment" (Basu, 1989, p. 169). It was also shaped by a curriculum seen to favour Western thought that undervalued both Indian history, culture and philosophy and India's local needs and problems (Basu, 1989). The implementation of this model resulted in teachers at affiliated colleges instructing students primarily on what was prescribed for examinations. This did not foster a culture of original knowledge creation. The model also de-emphasised scientific and technical education (Basu, 1989, p. 169). The once entirely Indian set of institutions, which combined cultural, intellectual and religious aims, was transformed to a political vehicle, with the perceived agenda to implant an "alien" British culture (Basu, 1989, p. 178). However, Datta (2017) observes that although institutions such as the University of Calcutta propagated the attitudes of the colonial administration, they were also a site where the local academic community developed its own vision to counter the regime. There were other similar instances where the "inner spirit of the original Indian system" could not be fully constrained (Basu, 1989, p. 171).

Upon Gandhi assuming the leadership of the national movement in the 1920s, he quickly moved to establish a series of Indian universities that were a direct rebuttal of the Western model, an attempt to curb its growing influence (Basu, 1989). The Gujarat Vidyapath, Kashi Vidhyapath and Bihar Vidyapath were alternative institutions of higher learning, underpinned by a focus on character formation, truth and non-violence, using Hindi as the medium of instruction. Basu (1989) characterises these institutions as a national movement to fight the British Raj rather than to cultivate intellect. Nonetheless, this is an early rejection of colonial rule, responding instead with an alternative form of Indian nationalism, a pattern that would only intensify in the decades to come (Nandy, 1989). Elsewhere, Rabrindanath Tagore in Shantiniketan established another form of Indian university – Vishva Bharati – an institution that would attempt to synthesise Asian and Western cultures (Basu, 1989).

In the context of research, an important contribution emerged through the establishment of the Indian Institute of Science in 1911 by Jamsetji Tata and his associate, B.J. Padshah (Basu, 1989; Datta, 2017). Inspired by Johns Hopkins University in the US, this institution was established as a postgraduate teaching university that would also undertake research. However, the focus of the institution was an extension of science as it was practised in the West, with research of local relevance relegated to the background. Jamsetji had a wider vision than establishing one science-led institution: he wanted to reform the higher education sector such that it would be an environment that would cultivate original research and would enable India to be a part of the industrial revolution (Datta, 2017). Tata's vision was constrained by Lord Curzon, the then Viceroy of India, who wanted to inhibit the autonomy of this institution, fearing that it would undermine the objectives of the colonial regime. Nonetheless, the Indian Institute of Science

model has been highly influential, spawning the Indian Institutes of Technology in later years. It is now a model for collaboration between industry and academia (Datta, 2017). The story of higher education and research in colonial India is mostly one of the impositions of Western paradigms at the expense of, and in conflict with, nurturing a uniquely Indian culture. But some of the institutions that emerged were not carbon copies of the original. The forces of colonialism continued to wrestle with the indigenous character of India, resulting in a system of higher education that is in tension.

Post-independence India

The next phase was that of post-independence India. Pinto (1984) argued that it was a mistake of the Constituent Assembly charged with writing the 1950 Constitution to not explicitly link higher education and national development (Pinto, 1984; Rizvi and Gorur, 2011). Pinto saw this as a significant failing because the role of the central government in higher education since inception has been ill-defined (Pinto, 1984). It was at this time that the regional governments of India became much more significant actors in higher education. The control over the governance of higher education between the national and regional governments, became a battleground for conflict (Carnoy et al, 2013). Over time, the disagreement between the groups on direction is considered to have contributed to a lack of standards and, most potently, the unplanned expansion of the higher education system (Rizvi and Gorur, 2011).

An important distinction between the colonial and post-independence era relates to that of university autonomy. Basu (1989) observed that, in the colonial era, British officials insisted on government control of universities and that university autonomy was regarded as politically dangerous. This was distinctly different to that of British universities at the time, which enjoyed significant autonomy and freedom. This soon changed, following independence. Pinto (1984) remarked that in the drafting of the Universities (Regulation of Standards) Bill which followed the 1950 Constitution, regional governments and universities pushed back against the reach of the centre and saw it as their own role to regulate and maintain academic standards. These tensions appeared to have only intensified in decades since, especially given the proliferation of stakeholders involved in the governance of higher education (Pinto, 1984; Rizvi and Gorur, 2011). Autonomy also came into sharp focus post-independence with the establishment of the Indian Statistical Institute in 1959 (Datta, 2017). Established as an institute outside the mainstream university system, therefore bypassing a largely provincial university system and largely free from government intervention, the Indian Statistical Institute became highly successful as a research institution. Its success reflects the measures taken to avoid the bureaucratic labyrinth of provincial state–central relations.

The introduction of the UGC in 1956 to regulate HEIs and enforce common standards is considered to have had mixed to negative outcomes (Pinto, 1984; Rizvi and Gorur, 2011). The UGC is considered to have achieved little to stop the proliferation of colleges and private universities and has neglected its role

as a professional body in building the capacity and rigour of HEIs (Singh, 2004). The weak status of the UGC and other national agencies exemplified the inability of the centre to set a cohesive direction for higher education in India (Singh, 2004). In the vacuum created by the absence of a clear national vision, private sector interests and state governments have come to dominate the governance of higher education (Singh, 2004). As Saxena (1990) noted, failings in governance have led to major areas of concerns in Indian higher education, spanning issues of access, academic delinquency, corruption and politicisation of higher education. Of note, Kapur and Mehta (2004) and Sharma (2019) lamented the mushrooming of poorly regulated private colleges as one of the most significant challenges in Indian higher education over the past four decades.

21st century India

From the 21st century, and particularly in relation to research, scholars lament that the UGC has failed to create adequate research facilities and practices. Noting that even in areas that are primarily Indian in character, such as Urdu Studies, resources and infrastructure are seen to be of superior quality outside of India (Saxena, 1990). The present state of Indian higher education is characterised by: "bureaucratic timidity, archaic rules, regulations, callous indifference, besides nepotism and outright corruption" (Raj Kumar, 2018, p. 14). The outcome of these factors has manifested in a range of challenges in higher education, including academic corruption, wastage in funds, poor quality of instruction and an inadequate research environment (Misra and Singh, 2015; Tierney and Sabharwal, 2017). The state-central government relations in the dynamics of research culture remain less well understood, as does the role of internationalisation and global relations. The latter is particularly important given that science and research is an increasingly global and open network, that overlaps with but is distinct from national dynamics (Marginson, 2020; Wagner, Park and Leydesdorff, 2015).

Informed by the political forces that have shaped Indian higher education thus far, policymakers and HEIs must now directly confront the wider public role and responsibilities of research and scholarship to furthering the country's socioeconomic development (Raj Kumar, 2018). Raj Kumar (2018, p. 17) posited that rigorous research in all fields is critical to India's growth and that society has an expectation that universities are "fertile" environments in which new solutions are developed. Cultivating a research ecosystem that addresses this public need is an increasingly important ambition to Indian policymakers.

2.4.2 India's research growth and capacity

India's rapid economic growth, growing on average 7 per cent per annum over the past two decades, masks underlying inequalities and social divisions. While the economic transformation of China and other East Asian countries has led to significant and widespread improvements in living standards, the same

cannot be observed of India thus far (Siddiqui, 2020). India's size and heterogeneity, emerging in part from federalism, shapes much of its political culture and economy. Regional governments are becoming much more prolific in national politics, yet their dependence on the central government continues to increase (Subramanian, 2007). In India, while national governments oscillate between the extremes of being both interventionist and hands-off, this is not the same as being a "strong state" that successfully delivers on long-term economic and social policy (Bardhan and Mookherjee, 2006). These factors are also the makings of a complex and at times, unwieldly higher education, and research system.

The rapid growth of India's higher education system has happened in a very short amount of time. At the time of independence in 1947, there were only 20 universities and 500 colleges nationally, with approximately 210,000 students in the system (UGC, 2019b). Now, with over 37.4 million students enrolled in 993 HEIs, India has the second largest higher education system in the world next to China (Ministry of Human Resource Development - MHRD, 2021). Of the 993 HEIs, there is significant institutional diversity, with 46 central universities, 127 institutes of national importance, 371 state public universities established by state legislation, 304 state private universities, and other institutions of higher learning including deemed universities (Association of Indian Universities, 2020). Over and above these institutions, there are some 38,179 colleges that largely educate undergraduate students (MHRD. 2021). Currently, close to 80 per cent of students are enrolled in undergraduate level programs (MHRD, 2021). However, less than 0.5 per cent of these students are enrolled in PhD programmes within India, from which even fewer go onto academic careers (MHRD, 2019).

As India rapidly expanded higher education following Independence, there was a concern that without a research emphasis, institutions would become a "teaching mill" (Gnanam, 1990, p. 179). Research has since been the concern of successive government reviews and inquiries. These reviews have repeatedly highlighted issues such as the need for a larger research base; inadequate funding; inconsistent standards in admission to research; improving academic supervision; facilitating academic autonomy and, of course, a focus on building a research culture. (UGC, 1984, 2003; Gnanam, 1990; MHRD, 1992, 2020a). At the same time, there has been a growing recognition that research can make a critical contribution towards national economic and social development (Gnanam, 1990).

On research investment, India spent 0.69 per cent of its GDP on research and development in 2020 and has spent between 0.6 per cent to 0.7 per cent over the past two decades (Economic Advisory Council – EAC, 2019; Government of India – GOI, 2021a). This is well below the expenditure of countries such as China and the USA which spent 2.1 per cent and 2.8 per cent respectively (EAC, 2019). Further, the share of private expenditure in research is also significantly lower in India at 43.5 per cent than in China, where the expenditure is at 77 per cent and in the US, where the figure is at 71 per cent (Ravi, Gupta and Nagaraj, 2019). Nevertheless. India's research output over the past two decades has grown significantly with the annual growth rate of output exceeding that of the US and the UK. The overall volume of

research output is below that of the United States and China but above the UK, Germany, and Japan (Ravi, Gupta, and Nagaraj, 2019; National Science Board, 2020). In terms of the share of most cited-articles, India ranks well behind China, the UK, USA, Australia and South Africa (National Science Board, 2018). The researcher intensity is also lower in India at 216 per million, which is only 20 per cent of that in China and 4 per cent of that in Japan (Vedachalan, 2021). In relation to patents, where China made 58990 patent cooperation treaty applications in 2019, the USA at 57840 and Japan at 52660, India filed 2053 patent applications.

The sum picture of these indicators is complicated for India. On the one hand, there are no Indian institutions ranked within the top 100 of the SCImago Institutions Ranking and most of the heavy lifting in terms of research that is highly cited comes from a handful of elite, well-equipped institutions, such as the IITs (Sudhir and Murty, 2020). Yet, there has been a dramatic increase in research output over the past two decades, particularly when considering the relatively stagnant levels of financial investment in the system. Goyal, Chauhan and Kapoor (2020) remarked that while India has made substantial progress on global innovation and competitiveness, there is much more to achieve. They argue that systemic focus by government, higher education and research institutions, and business is needed to enhance India's innovation capability on the global scale (Goyal, Chauhan, and Kapoor, 2020). However, beyond these system-related perspectives, there is limited literature that focuses on the specific aspects of research culture within the Indian context, which is sought to be addressed through the present study.

2.5 Development of conceptual framework and implications for study

The preceding sections of this chapter have conceptualised culture, and research culture, through a variety of paradigms to serve different functions. Traditional theories of culture including that of Williams (1958, 1961) and Kroeber-Kluckholn (1961) emphasise a materiality to culture that is helpful, even if overly expansive. But the idea that culture is everything goes against Williams' own proposition of culture possessing value in and of itself. These perspectives failed to examine the role of broader social structures in shaping culture, and, through the notion of a 'common culture,' reinforce a sense of hegemony that does not fully reflect the multiplicity within human life and experience (Neale, 1985).

On the other hand, Horkheimer (1931, 1944), Adorno (1975, 1999) and other critical theorists recognise the role of wider structures such as politics and power but downplay the humanistic and individualist aspect of culture which has made it so enduring. Empirical works about research culture reinforce these tensions and pay little attention to the meaning-making aspect of the concept. The extant debates about research culture in India discuss a wide range of ideas and perspectives but do not root these in the lived experiences of researchers and fail to consider the influence of the diversity of disciplines, institution types and regional and national systems.

Through the conceptual approach and rationale outlined below, I propose a more dynamic model of investigating research culture. The conceptual framework is also aligned to the social constructionist epistemology that underpins the study, which will be discussed further in the following research design and methods chapter.

2.5.1 Conceptual framework for research culture in Indian higher education

The framework proposed in this study views culture as a dynamic, heteronomous construct with the potential for conflicts and tension (Martin, 2002) as well as harmony in perspectives. In turn, there is also the possibility for multiple cultures to emerge, as constructed from different focal points and units of analysis. The framework is interested in observable patterns and artefacts as expressions of values, as well as changes to the meaning or value that are ascribed to these material properties of culture. It draws on critical theory conceptions of culture and emphasises power and agency in shaping and subverting cultures.

The emphasis of this framework is less about the constituent practices and patterns itself, and more about the meaning that is derived from these artefacts by individuals or a social group. The significance and value of this material aspects of culture is linked directly to the wider Indian context. And in that sense, values and beliefs are of cornerstone importance to this conceptualisation of culture. Similarly, meanings that are forged from relationships and interactions with others are also a key feature of this framework of culture, and how it shapes the values and beliefs of individuals and/or a social group. As

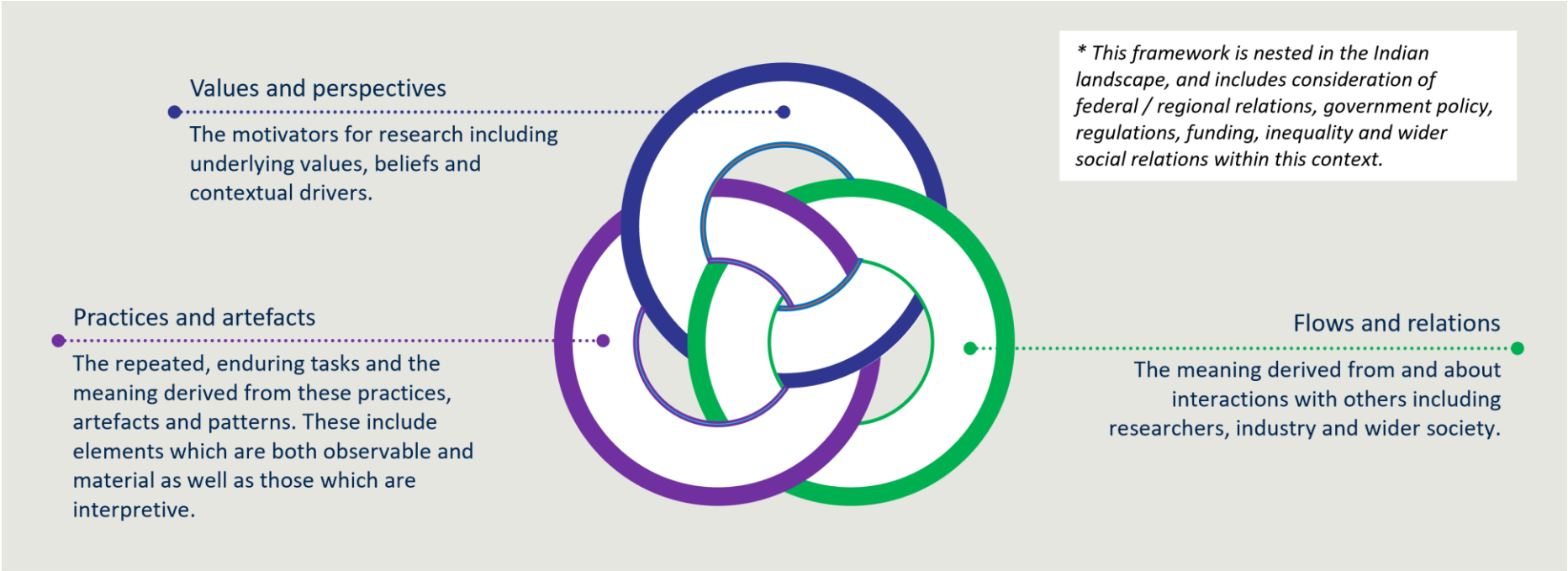
shown in Figure 2.3, the framework consists of three key elements as shown below: values and perspectives, practices and artefacts, and flows and relations. Each of these will be discussed further below.

The ideas that are discussed pertain to research activities, practices and behaviours. The conceptual framework considers diversity in relation to disciplines, institution types and regional / national system lenses. Each of the elements of the conceptual framework will be appraised against these scales and informs the analysis of findings at Chapters Four through to Seven of this study.

The framework will act as a vehicle to explore key ideas as related to the Indian landscape. Informed by the preceding review of literature, a snapshot of these ideas is presented in the conceptual framework but there are other key themes that have emerged through the analysis of data. In sum, the various components of this framework all interact with each other to give effect to the rich picture that is research culture in Indian higher education.

Figure 2.3 provides a visual summary of these key elements, following which I provide further explanatory detail on these elements.

Figure 2.3 Conceptual framework of research culture in Indian higher education



Values and perspectives

This element focuses on the ideas and beliefs that motivate researchers to undertake scholarly activity, and the enduring beliefs and desires held among individual members in a group (Lee, 2007). It provides the basis for shared practices and norms. In other words, it holds the container which binds a group of researchers and locates their 'research culture.' In turn, this enables comparison between groups of researchers and their respective cultures. Within this study, the contexts include the disciplinary, institutional and regional dimensions as the lenses where research culture is being explored.

Practices and artefacts

Practices and artefacts refer to the doing of culture (Benedict, 1934; Oancea, Florez-Petour and Atkinson (2015). They are both implicit and explicit, and are transmitted through symbols, artefacts and behaviours across generations of researchers (Shweder, 2007). Patterns of behaviour shape the life of researchers including their interactions with other scholars as well as with significant others, such as participants of a research study (Tierney, 1988). Differences in practices and artefacts provide an important distinguishing feature between research cultures; however, the deeper meaning emerges from exploring the underlying drivers and rationale for these practices. Within this study, practices and artefacts will be explored at each of the lenses as well as any patterns that emerge at the interactions between lenses.

Flows and relations

This category refers to the dynamics between researchers and the external world, including changes in ethnoscapes, mediascapes, technoscapes, finanscapes and ideoscapes (Appadurai, 1993). Exploring flows requires an examination of power, politics, conflict and ambiguity (Smerek, 2010), as well as shared ideals where that is present. Here, the emphasis is not on the wider shifts themselves, but the relationship that researchers have with these dynamics, which may be expressed as ideals or as observable artefacts and behaviours. These flows will need to consider ideas at the level of disciplines and institutions but are especially important at the level of regional and national systems.

The relationships dimension of this category will explore ideas about the types of relationships researchers have with their peers, internal and external actors (such as industry, study participants), as well as with themselves. It will also focus on the impact of these relationship(s) on their motivations, patterns, and other components of the conceptual framework of research culture. It is also concerned with any conflicts or tensions that emerge between researchers in the undertaking of their scholarship activities.

The framework also seeks to distinguish those elements which are easily observable and material, from those that represents ideas and that are immaterial. However, the boundary between the observable and ideological aspects of culture are more fissured in practice than visually represented below.

Of the three core components of the conceptual framework, practices and artefacts are highly material and observable. For instance, working in teams within a laboratory setting and using technology to pilot simulations are two examples that are rooted in action. On the other hand, values and perspectives speak to imaginations that have been largely formulated in the minds of researchers. However, this does not mean that those inner expressions do not have an external basis, directly or indirectly. Rather, it characterises how researchers themselves experience these ideas and practices.

Taken together, the conceptual framework provides the vehicle to organise and appraise a range of ideas that individuals ascribe to culture, to evaluate for linkages and tensions within and between the elements and in turn, helps articulate a comprehensive view of culture. The conceptual framework describes research culture at the level of discipline(s), HEIs and national / regional systems and facilitates comparison between these lenses and explores the role of conflict and differentiation between them. In turn, the ideas from the various lenses of culture can be synthesised to provide an aggregate view or they may reveal conflict and differentiation. Therefore, the framework supports the development of multiple culture typologies to emerge from the data.

2.6 Summary and working definition of research culture

This literature review chapter explored various attempts to define culture across disciplines and concludes that, notwithstanding controversy about its usefulness, the concept of culture remains powerful as a tool of studying social and human phenomena. This chapter explores the use of culture through a range of theoretical paradigms and argues that it is particularly useful to conceive of culture as heteronomous and concerned with tension, not just as an ideal state. It also cautions against a framing of culture as involving all aspects of social life. Boundaries are important to give the culture term meaning. This chapter then located culture within the context of the research topic, which in this case involves the undertaking of research and knowledge creation, including at the level of disciplines, institutions and national and regional system.

Here, I posited that different dimensions of culture become important at each of these lenses, with a strong emphasis on patterns and ways of working at the level of disciplines and a focus on ideals and values at the system-level. Importantly, the literature review situated these ideas within India's wider research capacity and ambitions. These appraisals make clear that this is an issue of growing significance to policymakers, though there is little to no agreement on the purpose, aims, distinctiveness and realisation of the so-called research culture. In turn, drawing on the extant theoretical and empirical literature, I offer a working definition of research culture alongside the development of the conceptual framework. This will be revisited in relation to the current study context towards the conclusion of the thesis.

Working definition of research culture

Research culture refers to the context-specific values and motivations, practices and artefacts, and flows and relationships engaged in by researchers, including the interactions that researchers have with those in the wider research ecosystem (including funders, participants, and decision makers). Research culture is nested within the wider political, social, technological, ideological and economic dynamics of the world, though the context in which research culture is being explored can lead to different imaginations, tensions and possibilities.

Hence, research culture is not a singular construct with a rigid agenda of activities and practices. Rather, it provides multiple understandings of researchers' lives, inner realities, aspirations and worries that emerge through differentiation, harmonisation and fragmentation of perspectives. In the case of this study, this includes conceiving of research culture through the disciplinary, institutional and the region / national dimensions and the interactions between these lenses. This working definition, together with the conceptual framework sets the stage for the subsequent research design and methods chapter.

3 RESEARCH DESIGN AND METHODS

3.1 Introduction

This chapter describes the overall research design and methodological approach to the study. In it, I outline the philosophical foundations of the study, describe the research questions and explain how they emerged from the theoretical and academic literature covered in the previous chapter as well as my earlier MSc thesis. Then, I explain how my research design was informed by these questions and provide an overview of the three dimensions through which research culture was explored: disciplines, types of HEIs and regional systems. I explain the rationale for the disciplines selected for the study, the types of HEIs in focus and the regions from which HEIs and disciplines were selected. Here, I also explain and justify the approaches that were employed for data collection, transcription and analysis and how these were informed by the philosophical foundations of the study. This includes the specific methods that were undertaken for both the selection, organisation and approach to conducting semi-structured interviews with participants and the analysis of data drawing on reflexive thematic analysis. Finally, I discuss limitations of the approaches that were undertaken and acknowledge my positionality and reflexivity at the various stages of research design and data collection, analysis and interpretation. The chapter concludes with a discussion of ethical concerns.

3.2 Philosophical foundations

As Guba and Lincoln (1994) observe, research rarely falls into one philosophical domain. Positioning philosophical stances as flexible, porous frameworks that are informed by broader research aims and questions can yield new understandings (Boucher, 2014). This study is framed by an interpretivist, social constructionist paradigm, as it is ultimately concerned with providing clarity to the "subject meanings of persons" (Goldkuhl, 2012, p.137). This is the basis for knowledge creation in this study, in that the study aims to provide a re-constructive understanding of the social and historical context to participants' experiences of research culture, drawing on their narratives, relationships and life experiences, and paying attention to power and social capital (Goldkuhl, 2012; Cohen, Manion and Morrison, 2017; Burr and Dick, 2017).

3.2.1 Social constructionism

Even proponents of this epistemology, such as Gergen, are cautious of prescribing the constructionist terminology for fear that it "treats ideas as complete and fixed" (Wang, 2016, p.483). But in essence, social constructionism engages with ideas, concepts, values, nature of persons and characteristics typically thought to be immutable such as gender, race and ability, as products of human definition and interpretation shaped by social relations (Subramaniam, 2014; Wang, 2016). Human action and relationships are foundational to the constructionist view of knowledge building in the world: "constructionists point that together we create understandings of what exists…and the shared understanding guide our action" (Wang, 2016, p.485). The natural extension of this theory is that alternative conceptions can co-exist and there is a possible ideological basis of "virtually all truth claims" (Wang, 2016, p.483).

Social constructionism recognises that aspects of reality exist between the subjective mind and an external reality (Terre Blanche and Durrheim, 2006). Constructionism considers the role of factors such as language and power (Terre Blanche and Durrheim, 2006; Rees, Crampton and Monrouxe, 2020). Constructionism emphasises the social context as the moderating force in constructing meaning (Rees, Crampton and Monrouxe, 2020).

The study is shaped by poststructuralist inflections. Postructuralism posits that truth is not a fixed concept, but instead constantly changing based on political, social, economic, and cultural position in the world (Harcourt, B, E, 2007). It challenges the idea that so-called facts and beliefs reinforce the dominance and power of key actors (McMorrow, 2018). The building block of poststructuralism is that truth and knowledge are to be produced rather than discovered (McMorrow, 2018). These perspectives are highly consistent with a social constructionist paradigm, where knowledge is considered pragmatic and contextual rather than fundamental (Damaschin, 2024). Further, as will be discussed elsewhere in this chapter, the study design is underpinned by the notion that knowledge is formed through action as well

as representation (Damaschin, 2024). Given that the study is built around the exploration of cultural practices within research contexts, it firmly centers the knowledge as action perspective in coming to these understandings (Damaschin, 2024).

This inquiry relies on the inner realities of researchers and the meaning that they provide to various elements of social life, materials and behaviours as research culture. Participants in this study primarily construct the building blocks of research culture, which is further interpreted and analysed by me as the researcher. It requires the development of a research design where the emphasis is on participants' agency to freely express their inner desires and realities in relation to research culture. Throughout this chapter, I illustrate the ways in which the social constructionist foundations of the study have informed key elements of the study design and approach.

3.3 Research questions and design

There are two guiding research questions for this project, the first of which is as follows:

RQ 1: *What are the key features of research culture at the level of disciplines, institutions, and regional and national system in Indian HEIs?*

As the review of literature highlights in earlier chapters, it is not possible to consider research culture as separate from the personal cultural practices of scientists, the disciplinary communities that emphasise shared norms, organisational practices and resources, and wider social factors and the interactions between science and society (Turner and Sullenger, 1999; Kuhn, 1962, Nowotny, Gibbons and Scott, 2001). In the case of the Indian context, there is a particular gap in knowledge around the features of research culture at the disciplinary domains given the overwhelming focus on studies about research culture at the national or system level and within specific HEIs (Ravi, Gupta, and Nagaraj, 2019; Srivastava, 2017; Patel, 2016). It follows, therefore, that to explore research culture meaningfully within Indian HEIs, the research design should build evidence at these various levels. Slightly different approaches are required to properly interrogate each of the lenses of disciplines, HEIs and systems.

Disciplinary research culture explores the norms and rituals of researchers with shared epistemological communities. Members of a discipline share certain commitments and ways of working (McLean, Abbas, and Ashwin, 2013).

This lens required an emphasis on understanding researchers' ways of working within a range of disciplines including their patterns of communication, supports and networks, means of producing scholarship, and interactions with resources and equipment. Given that disciplines vary so greatly in their content and character, the research design required an analysis of disciplinary culture across several distinct bodies of knowledge. As shown in Figure 3.1, disciplinary cultures interact with but are also distinct from institutional and regional-level cultures. The findings from this lens are presented in Chapter Four of this thesis.

HEI research culture emphasises values, attitudes and behaviours formed on an institutional basis in relation to research itself and is positioned as a lever through which to drive changes in the research practices of an individual, team and/or an institution including research output and performance (Tierney, 1988; Mendez and Cruz, 2014).

This lens requires detailed knowledge about the interactions within organisational units, the role of leadership, policies that enable or prohibit research activity, researcher autonomy, managerial expectations and oversight, attitudes towards own and others' research, financial investment in research, workload and wellbeing, and the effectiveness of strategy and vision, among others. Evidence was required at the level of individual experiences, but which could be aggregated and triangulated with others who were within the same institution, to form a more coherent picture of HEI research culture.

This second lens necessarily involved interviewing to gather the perspectives of a range of researchers within the one institution and those who worked in similar disciplines across different types of institutions. The findings are detailed in Chapter Five of the thesis.

System-level research culture consists of a range of concepts, behaviours, instruments and other factors that are practised in the national and/or regional scale and relate to the contribution of research to national economic and social development, the undertaking of research in an ethical manner, scientific integrity, and the role of governance and regulation of the research enterprise (Wellcome, 2020; Nuffield Council on Bioethics, 2014).

This lens warrants an understanding of the goals of research at the regional level (and national-system where appropriate) and consists of an expansive scope of ideas, instruments and behaviours, including collaboration, inclusion, funding, regulation and impact. It includes factors which pertain to the working of the research system as well as wider socio-political factors such as language and politics. Here, research culture considers the direct and indirect impact of system-wide incentives and evaluation regimes on the motivations, experiences and tensions faced by researchers (Xu, Oancea and Rose, 2021). System-level research culture concerns "everyone involved within the research system" including funders, administrators, leaders of institutions and industry (The Royal Society, 2018, p.11). Thus, the research design required an interrogation of research culture that included individuals who were key to the development and maintenance of the research ecosystem, including policy officials, research funders and informed observants. Their perspectives were triangulated with researchers and institutional leaders. The findings from this chapter will be explored in Chapter Six of the thesis.

As the earlier literature review illustrates, most studies of research culture in India do not adequately deal with the heterogeneity of the country. Further, these studies do not consider the relationships between various disciplines, the diversity of institutions and the system-levels in the shaping of research culture. In doing so, the study sought to understand the interactions and tensions between these factors and to assess whether any of these factors were more important than others in the Indian research context. The social constructionist orientation of the study is vital to addressing this question given the emphasis placed on relationships to derive meaning. Reflecting this, the other central research question was formed:

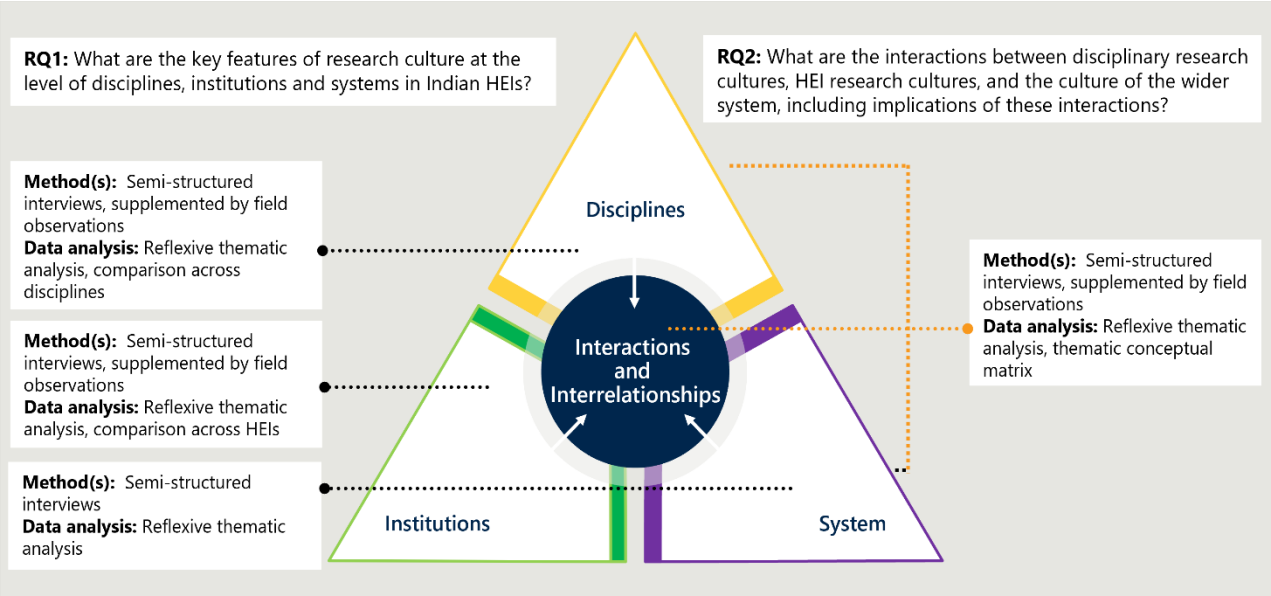
RQ 2: *What are the interactions between disciplinary research cultures, HEI research cultures, and the culture of the regional and national system, including implications of these interactions?*

As with the previous research question, participant interviews on the interactions between the three lenses and detailed accounts of how these factors shaped their research activity were necessary. In addition, field observation of research environments sought to expand participants' reflections about factors such as resources and collaboration. Observations in this study consisted of interactions with

participants, but also non-participant features such as surroundings, events, documents, with an emphasis on the content, context of interactions and key concepts that emerged through the course of the observations (Fetters and Rubinstein, 2019).

These interrelationships will be explored in Chapter Seven of the thesis and in the discussion chapter, with a focus on how each of the lenses of discipline, institution and system affect the other, including the disabling and enabling features of research culture. The research design and underpinning method for data collection and analysis for this study is summarised in Figure 3.1 and will be discussed in turn next.

Figure 3.1 High-level research design including data collection and analysis



Crucially, this study builds on my earlier MSc investigation that explored research culture within Delhi HEIs. The scale and scope of that study meant that I could only focus on institutions within one specific region, and I did not interrogate discipline-specific practice sufficiently. However, through this study, I was able to develop an understanding of concepts to be studied, such as the role of leadership, teamwork, resources and regulation. The MSc study also served as a pilot of some of the methods of data collection and analysis employed in the present study. For instance, I was able to build and expand upon the interview instrument deployed in the MSc study and embarked on the doctoral study with a clear sense of how to analyse qualitative data.

Further, the doctoral study provided an opportunity to address many of the limitations of the earlier work. In this study, I was able to develop a conceptual framework that paid close attention to each of the discipline, HEI and regional / national system lenses of research culture and considered the perspectives of a significant pool of researchers including their diverse identities and motivations for undertaking research.

3.4 Selection of participants

The sampling frame for this study involved a combination of 'top-down' and 'bottom-up' approaches. The regional system dimension, followed by institutions, provided the initial top-down framing, while disciplines served as the bottom-up filter through which individuals were identified and approached for participation. Institutions became a determinative variable, in so far as shaping the overall volume and mix of available researchers within the core disciplines of interest, as well as those in research or institution wide leadership positions (e.g. Dean, Research, Heads of Department). Another consideration was to recruit participants at various stages of their research career, including those that were early career researchers and/or postdoctoral scholars.

The previous chapters highlight the role of socioeconomic factors in shaping India's research culture and inequalities between institutions and regions in conceptions of culture (Agarwal, 2009; Altbach and Mathews, 2019). With that in mind, I sought to recruit researchers from a range of institutional contexts. However, given the scale of the study and the other variables that needed to be considered within the sampling frame, I was not able to systematically prioritise other personal characteristics (e.g. gender, ethnicity groupings, personal income). Nevertheless, there was a balance in gender representation in this study.

The diversity of participant perspectives was crucial to address the research question and embraces a key tenet of social constructionism, in that harnessing multiple perspectives on any given event or ideas is a necessity to provide it with meaning (Burr and Dick, 2017). Through harnessing the perspectives of different research actors, I hoped to develop a thorough and sophisticated picture of research culture than was previously possible. Further, factors such as tenure of research career and leadership provides a window into the formal and informal power relations between participants in the context of research activities and practices (Young and Popadiuk, 2012).

I pursued a combination of purposive sampling, where specific experts in the disciplinary fields and as active researchers were recruited, and 'snowball sampling' where I would use the networks and affiliation of the initial group of researchers to identify and contact other potential members with desired characteristics to participate in the research project (Mesa et al, 2016; Reeves and Harper, 1981). In parallel, I deployed purposive sampling to identify and recruit specific individuals within government departments and from research funding and policy organisations who were expert informants to "provide rich and varied insights into the phenomenon" of research culture at the system-level lens of RQ1 (Dornyei, 2007, p.126).

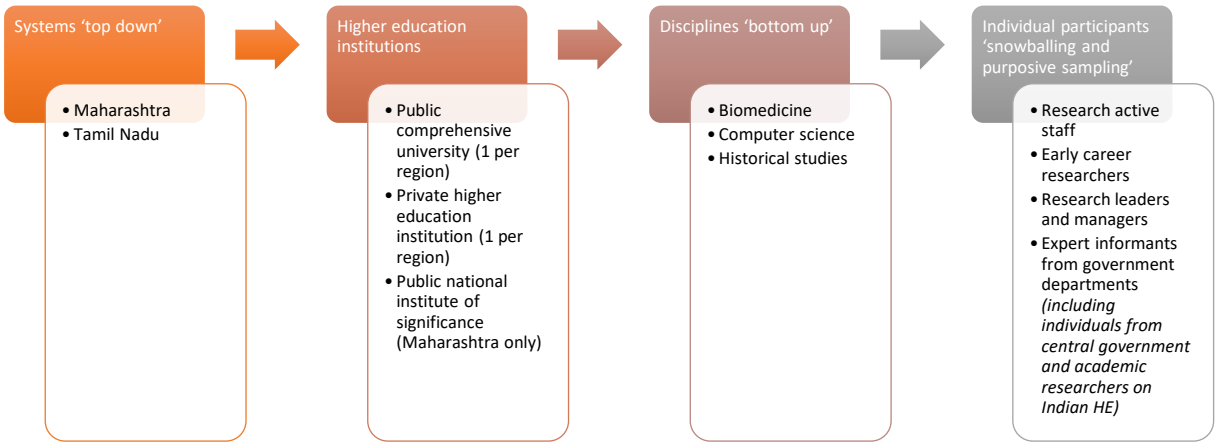
Participants were recruited through a multipronged approach. Having identified suitable institutions (suitability was primarily driven by the concentration of researchers that matched the disciplines of interest) within the Maharashtra and Tamil Nadu regions and against each of the institution types: PCUs,

PHEIs and PNIS. I then made a list of all the researchers who had an active research profile, either through their publicly listed research projects or if they had current research collaborations.

This point warrants clarification. Within certain institutions, irrespective of their status as a private or public entity and even if they publicly express an institutional commitment to research, that research is a secondary function to teaching (Angom, 2015; Altbach, 2014). Therefore, it was important to maximise the chances of interviewing those staff who could talk broadly to research activities and their experiences of research culture, rather than in abstract. I sent emails directly to these individual researchers with the background information to the study (as set out in Appendix A) and a participant consent form (as set out in Appendix B). In parallel, I contacted the Heads of Department of relevant departments and those who held positions of institutional or research leadership (e.g. Dean, Research Strategy, Pro-Vice Chancellor, Research) to interview those staff who could offer perspectives in relation to research culture at the level of HEIs. I made it explicit within the recruitment communications that I was seeking participants who could share their perspectives in relation to their capacities as researchers of a discipline, or in relation to research leadership of an area or institution at large. As set out earlier, I contacted policy officials and other expert informants directly through a communications approach that was very similar to that of contacting HEI participants.

Below at Figure 3.2 is a flowchart that describes the sequence of steps in the selection of participants and the desired sample volume and mix.

Figure 3.2 Sampling flowchart sequence



Informed by the top-down framing of the regional context, Table 3.1 below sets out the final composition of participants for the study as compared with the initial sampling strategy. This includes both participants from HEIs as well as the targeted group of policy officials and expert informants to provide perspectives on system-related features of research culture. Bottom-up sampling factors such as disciplines and institutions more closely impacted the choices and decisions that were made during the data collection period and will be discussed subsequently. I was able to interview a total of 52 participants (the initial

sampling plan set out a goal of 71 participants which was broken down by institution, discipline, regional / system context and associated factors). The numbers in bold represent the actual breakdown of participants interviewed and the figures in brackets represent the original plan. Limitations of this will be discussed further below).

Table 3.1 Participant composition, comparison against initial sampling strategy

Disciplinary and HEI perspectives					
Bold represents final participant composition		Public comprehensive university	Private higher education	Public national institute of significance	***Total per discipline***
Tamil Nadu	Biomedicine	**3** (3) including postdoctoral fellows	**4** (3) including research leader	1	**11** (15)
	Computer science	**2** (3) including PhD scholar	**8** (3) including post-doctoral fellows, PhD scholar, research leader	-	**13** (15)
	History (and cognate disciplines)	**0** (3)	**1** (3)	**2**(0)	**12** (15)
	Research leadership	**1** (3)	**0** (3)		
Maharashtra	Biomedicine	**0** (3)	**1** (3)	**2** (3)	
	Computer science	**0** (3)	**2** (3)	**1** (3)	
	History (and cognate disciplines)	**4** (3) including PhD scholars, research leaders	**2** (3)	**3** (3)	
	Research leadership	**0** (3)	**0** (3)	**3** (3)	
Total per HEI type		**10** (24)	**18** (24)	**12** (12)	
System perspectives					
Policy and funding	**6** (6), including from state-based higher education departments, state science and research departments, Office of Principal Scientific Secretary, Ministry of Human Resources and Development, funding agencies				
Expert informants	**6** (5), including academic experts on Indian higher education and research administration				
Total per system	**12** (11)				
Overall total	**52** (71)				

A detailed breakdown of participants, organised by their categories, institution types, regions and additional information, where relevant, is shown in Table 2 below. For the purposes of ensuring anonymity, identifying information in relation to research affiliations and position titles is omitted.

Next, I discuss the selection of each of the key sampling frames at the regional, institutional and disciplinary lenses, and their associated limitations.

Table 3.2 Full list of participants

Participant ID	Category	Discipline	Institution type	Regional system	Additional information
1	Researcher	Computer science	PNIS	Maharashtra	
2	Researcher	Computer science	PHEI	Maharashtra	
3	Researcher	Computer science	PHEI	Maharashtra	
4	Researcher	Computer science	PHEI	Tamil Nadu	Position of leadership
5	Researcher	Computer science	PHEI	Tamil Nadu	
6	Researcher	Computer science	PHEI	Tamil Nadu	

7	Researcher	Computer science	PHEI	Tamil Nadu	
8	Researcher	Computer science	PHEI	Tamil Nadu	
9	Researcher	Computer science	PHEI	Tamil Nadu	Post doctoral fellow
10	Researcher	Computer science	PHEI	Tamil Nadu	Post doctoral fellow
11	Researcher	Computer science	PHEI	Tamil Nadu	Doctoral scholar
12	Researcher	Computer science	PCU	Tamil Nadu	
13	Researcher	Computer science	PCU	Tamil Nadu	Doctoral scholar
14	Researcher	Biomedicine	PNIS	Maharashtra	
15	Researcher	Biomedicine	PNIS	Maharashtra	Post doctoral fellow
16	Researcher	Biomedicine	PHEI	Maharashtra	
17	Researcher	Biomedicine	PHEI	Tamil Nadu	Position of leadership
18	Researcher	Biomedicine	PHEI	Tamil Nadu	
19	Researcher	Biomedicine	PHEI	Tamil Nadu	
20	Researcher	Biomedicine	PHEI	Tamil Nadu	
21	Researcher	Biomedicine	PCU	Tamil Nadu	
22	Researcher	Biomedicine	PCU	Tamil Nadu	Post doctoral fellow
23	Researcher	Biomedicine	PCU	Tamil Nadu	Post doctoral fellow
24	Researcher	Biomedicine	PCU	Tamil Nadu	
25	Researcher	Historical studies	PCU	Maharashtra	Position of leadership, Marathi literature
26	Researcher	Historical studies	PCU	Maharashtra	Position of leadership, political science
27	Researcher	Historical studies	PCU	Maharashtra	Doctoral scholar
28	Researcher	Historical studies	PCU	Maharashtra	Political science
29	Researcher	Historical studies	PHEI	Maharashtra	
30	Researcher	Historical studies	PHEI	Maharashtra	
31	Researcher	Historical studies	PNIS	Maharashtra	Indian studies and Indian philosophy
32	Researcher	Historical studies	PNIS	Maharashtra	Indian political theory and philosophy
33	Researcher	Historical studies	PNIS	Maharashtra	Indian political science
34	Researcher	Historical studies	PHEI	Tamil Nadu	Indian archaeology
35	Researcher	Historical studies	PHEI	Tamil Nadu	Indian and English literature
36	Researcher	Historical studies	PNIS	Tamil Nadu	*Affiliated with PNIS in Maharashtra*
37	Leadership and management		PNIS	Maharashtra	
38	Leadership and management		PNIS	Maharashtra	

39	Leadership and management		PNIS	Maharashtra	
40	Leadership and management		PCU	Tamil Nadu	
41	System and policy		Department for Science and Technology	Maharashtra	Senior public service official responsible for science and research policy
42	System and policy		GoI	India	Senior public service official that developed National Education Policy
43	System and policy		PNIS	India / New Delhi	Academic expert on Indian higher education
44	System and policy		PHEI	USA	Academic expert on Indian higher education
45	System and policy			New Delhi	Academic expert on Indian science policy
46	System and policy		PCU	New Delhi	Academic expert on Indian science policy
47	System and policy		PHEI	Noida	Academic expert on Indian higher education
48	System and policy		Funding council	India	Research funder
49	System and policy		Private funder	India	Research funder
50	System and policy		Government of Tamil Nadu	Tamil Nadu	Public service official responsible for higher education and research policy
51	System and policy			Tamil Nadu	Academic and community expert on Indian higher education
52	System and policy		Office of the Principal Scientific Secretary	India	Research funder and academic expert on India's science and research policy

3.4.1 Regional system

The regional system of research culture is interlinked with but distinct from institutional and disciplinary factors. Regional systems within India are unique in their own political cultures, languages and demography. They also vary considerably in their expenditure on research and development (R&D) activity. Within each region, there are a plethora of institution types including public institutions that are established by either central or regional act of government, private higher education institutions and public national institutes of significance, among others. I chose geographical regions where there was a high presence of research activity, as characterised by overall investment in research funding, overall

levels of research output (as measured through the national ranking framework for research performance), completion of doctoral students and investment in commercialisation and innovation activity (EAC, 2019; NITI Aayog, 2020). In turn, the following two regions were identified:

Tamil Nadu

Tamil Nadu is ranked among the top three states in India in R&D through output indicators and, as of 2021, has the second highest state expenditure for R&D activity (Government of Tamil Nadu, 2023). The region is home to 59 state universities, 2,639 colleges, 200 central and state research institutes, two central universities and seven institutes of national importance (Government of Tamil Nadu, 2023). A dedicated R&D policy sets out grand challenges that the state wishes to address through funding projects. These include improving clean energy, sustainable and advanced manufacturing, health and life sciences, future of mobility, and the digital and data economy. In turn, the state government has set out a vision to "transform Tamil Nadu into a knowledge-based economy by 2030, driving manufacturing and service excellence". Tamil is the dominant language spoken in the region, which is also characterised by populist politics and a political culture of freebies and celebrity-dom (Padmanabhan, 2021; Wyatt, 2013).

Maharashtra

Of all regional governments, Maharashtra is one of the top five states in relation to expenditure in science, technology and environment (EAC, 2019). The Indian Innovation index (NITI Aayog, 2020) highlights Maharashtra as one of the top three states in the innovation environment. Maharashtra is home to one central university, 34 state universities and eight institutes of national importance (GoI, 2021). Further, Maharashtra has 4,494 colleges, significantly higher than in Tamil Nadu. In relation to doctoral enrolments and completion, science, engineering and technology fields are the dominant fields. The Maharashtra New Industrial Policy (Government of Maharashtra, 2019) focuses on the creation of standalone R&D industrial units through fixed capital investment, provision of a special fund to support industrial R&D activities and encouraging industry-academic linkages. This underscores the importance of research outputs that delivers commercial benefit for the state. Maharashtra is a site of high-end research activity; together with Tamil Nadu, Karnataka and Delhi, these states contribute to 65 per cent of all patents filed in 2018-19 (GoI, 2021a). Unlike Tamil Nadu, Hindi and Marathi are the more dominant languages spoken in Maharashtra. Importantly, the political culture of Maharashtra is fraught with crisis; there are complex inter- and intra-party dynamics, recurrent assertions of a culture of nativism and dynamics of a deeply unsettled democracy (Verma, 2011; The Hindu, 2022).

Sampling considerations for other regions

Given the concentration of research activity in the Karnataka region, there was some attention given to including this region as an additional site. However, the scale and constraints of a doctoral project,

complicated further by the need to gather perspectives across a range of institution types meant that it was feasible to focus on only two regions. Similarly, given that national institutes of importance are regulated by the central government and have a largely national focus, I felt it was sufficient to focus on one such institution within solely Maharashtra. Further, I was able to build on existing personal and professional connections to identify a suitable list of institutions to approach within each region. As a native of the Tamil Nadu region and being relatively proficient in both Tamil and less so in Hindi also enabled me to navigate some initial communications with participants with ease (though the interviews were conducted primarily in English).

3.4.2 Disciplinary fields

Research culture was explored within biomedicine, computer science and historical studies disciplines. The selection of these disciplines was shaped by three factors: they were disciplines where: there is a significant volume of research activity in India; the disciplines were represented within the HEIs of focus; and, there were material differences in epistemologies, ways of working, emphasis on the global versus local orientation, and constructions of knowledge (Biglan, 1973; Becher, 1994; Rescher, 2003; McLean, Abbas and Ashwin, 2013).

On the final criterion, decisions were nested in wider understandings around disciplinary characteristics and largely drew on the Biglan-Becher typology of disciplines, as discussed in the literature review in Chapter Two. The sampling considerations within these disciplines, and the steps taken to resolve issues in data collection are discussed next.

Biomedicine

With a strong global orientation, advances in biomedicines are central to India's economic aspirations within the region and the world at large. The discipline presents substantial opportunities to improve the quality of people's lives locally and globally (Ministry of Science and Technology, 2023). Applying the Biglan-Becher typology, biomedicine is characterised as a hard-pure discipline, with a disciplinary culture that has been previously described as competitive and well-organised, with high publication rates and task orientation (Becher, 1994; Reinholz et al, 2019).

In identifying and recruiting biomedical researchers, I focused on those individuals whose research profiles and projects most closely aligned with biomedicine. I commenced my search by examining the webpages of relevant HEI departments that focused on biomedicine and compiled a list of all relevant staff that worked on biomedical research projects and/or in biomedical groups by reviewing their job descriptions and publication output. Where I was not able to recruit staff from within these Departments, following multiple attempts at reaching out to them, I then broadened the scope to examine departments

where Biomedicine interacted with a related discipline, such as the Department of Biomedical Engineering.

This process required multiple rounds of careful searching, filtering, contacting and refiltering, which was made complicated by how biomedicine was configured within HEIs. Research projects engaged in by the individuals selected for the study also ranged widely, from investigating the use of ultrasound technology in detecting ulcers with those living with diabetes through to experimental studies that look at the cellular-level interactions in patients affected by cardiovascular disease.

Computer science

Computer science research has grown substantially over time and across a far wider range of countries; in relation to publications, it has grown by a factor of 10.6 in the period between 1991 and 2020 (Demetrescu et al, 2022). Almost all subareas including artificial intelligence, multimedia and neural networks have all increased in size (Demetrescu et al, 2022; Fiala and Tutoky, 2017). Drawing on the Biglan-Bechler typology, computer science is considered a hard applied discipline with a both global and local orientation, with a disciplinary culture that is entrepreneurial, dominated by professional values and interests and where there is a strong focus on patents (Clark, 2003; Becher, 1994).

In the context of this study, it was mostly straightforward to identify and recruit computer science researchers except in one public comprehensive university in Maharashtra. Across each of the institutions that were selected, there was a Department of Computer Science or a variation such as the Department of Computer Science and Engineering. Most researchers were also affiliated with research centres and labs and demonstrated significant local and/or global collaborations. While most researchers had an applied focus to their research area, I was also able to speak with some researchers who worked on theoretical interests. The disproportionate focus on applied areas is congruent with the direction of the field.

Historical studies

Since ancient times, history has been championed by an enduring community of scholars and has added a great deal to self-understanding of the Indian nation (Chakrabarty, 2008; Macfie, 2013). Modern Indian history is said to have emerged post the British Imperial rule in August of 1947, with the first master's degree in modern and medieval history courses being established at the University of Calcutta (Chakrabarty, 2008). History contributes to the study of social problems such as casteism: Shah and Lerche (2021, p.75) posit that by turning to disciplines such as anthropology, sociology and history, and by elevating the voices of people from the margins, "new visions to shape the world can emerge". The Biglan-Becher typology classifies history as a soft-pure discipline with a strong local orientation, with a

culture that is highly individualistic and pluralistic with loose structures (Becher, 1994). As the study progressed, I broadened the history discipline to consider cognate disciplines, the rationale for which is set out below.

Assembling the pool of history researchers that were suitable for this study proved to be one of its most challenging components. Given the fragmented state of the discipline in the country and factors which are distinct to its culture and way of working, such as the plurality of regional languages and scepticism from historians about the perceived consequences of participating in such a study, it was difficult to recruit historians across the range of higher education institutions and regions of interest. Historians were also located in a diverse range of departments and organisational groupings, and in some cases, were sole members of their discipline within their institution. For these reasons, I broadened the pool of researchers to include those working in cognate fields and who were explicitly focused on topics concerning India's national identity and development over time, namely in political science, sociology and archaeology. Where relevant, I have marked these cognate fields in table 3.2. Given the heterogeneity across these disciplines, I paid particular attention to the research interests, projects and publications of participants.

As compared with biomedicine and computer science, where there were clear boundaries around ways of working, here the emphasis was on shared areas of research interest and academic expertise about India. I focused on recruiting researchers who were working at the forefront of issues to do with India's identity and nationhood or about regional histories. These are dominant themes in these fields and provided a consistent frame of analysis. Notwithstanding the limitations of this approach, and the degree of heterogeneity in methodological approaches across these disciplines, the participants I recruited for the study worked substantially with texts and archival material, which provided another boundary to this grouping. Once again, I was able to identify these features through my repeated filtering and searching of university webpages, and through the initial contact I made with participants to clarify my understanding. The snowballing approach proved particularly helpful in recruiting participants within this discipline, where individuals were more likely to engage with the study if they were recommended by others.

Sampling consideration and limitations for disciplines

At the early stages of the doctoral study, mathematics was also identified as a discipline of interest. However, given the scale and constraints of the doctoral study and given the overlap of the discipline with computer science as another hard applied discipline, mathematics was omitted from the sampling strategy.

The decision to expand the grouping of history researchers to include other cognate disciplines contributed greatly to recruiting an adequate supply of participants; if that had not been done, this

disciplinary field would be severely underrepresented in this study. This outcome remains a limitation of the inquiry. The diverse mix of participants in this group do not make them specifically indicative of the discipline of history, in the same way that could be inferred about the researchers from the computer science and biomedicine disciplines.

As shown above earlier in this chapter, Biomedicine is less well represented than initially expected. This was largely driven by the lack of engagement from researchers in this discipline who were located in the public comprehensive university in Maharashtra. Despite repeated attempts at contact over a four-month period, I was not able to garner sufficient interest. However, as I had completed several other interviews with biomedicine researchers at other HEIs by this time, including at a public comprehensive university in Tamil Nadu, I felt that I had sufficient data in terms of volume.

The weighting of participants across both regions is tilted in favour towards Tamil Nadu, driven largely by computer science and biomedicine researchers from the identified private HEI in Tamil Nadu who were very enthusiastic and willing to participate in the study. Reasons for this are explored next together with the overarching rationale for the identification of institutions in the study. Across each of the disciplines, I identified a mix of research active staff, as well as those who held disciplinary-specific leadership positions (including those who led research labs) and those that were early career scholars.

3.4.3 Types of higher education institutions

The scope of higher education institutions in India encompasses some 1,113 universities, 11,296 autonomous institutions and 43,796 colleges. Across and within these institution types, there is a diversity of affiliation and accreditation arrangements, institutional missions and funding sources and there are differences in the role and emphasis of research (Ministry of Education, 2024; GoI, 2021b). The scope of this study was limited to those HEIs where there was a sufficient concentration of research activity, as defined through the National Institutional Ranking Framework and excluding standalone research institutes.[1] Given the diversity of institutions, an important first step in this study was to consolidate the institutional categories to a simpler set of groupings from which institutions could be selected. This is summarised below at Table 3.3. In turn, the revised institutional groupings include PCUs, PHEIs and PNIS.

[1] As defined by overall eligibility for registration and in relation to research and professional practice, comprising the combined metric for publications; the combined metric for quality of publications; IPR and patents: published and granted; and footprint of projects and professional practice (National Institutional Ranking Framework, 2024).

Table 3.3 Institutional groupings for purpose of sampling

Institution category	Institution type	Eligibility for common and discipline-specific rankings	Revised institutional groupings for this study
University and university-level institutions (institution which are empowered to award degree under an Act of Parliament or State legislature)	State public university	Yes	Public comprehensive university
	Central university	Yes	
	Deemed university-government	Yes	
	State private university	Yes	Private higher education institutions
	Deemed university-private	Yes	
	Institute of national importance	Yes	Publicly funded national institutes of importance
	State open university	No	-
	Deemed university – government aided	Yes	Public comprehensive university
	Institution under legislature act	No	-
	State private open university	No, unless they have a teaching and research campus on their own	-
	Central open university	No, unless they have a teaching or research campus on their own	-
College / institutions (which are affiliated / recognised with universities)	Affiliated college	Yes	Public comprehensive university
	Constituent college	Yes	
	Postgraduate and off campus centre	No	-
	Recognised centre	No	-
Standalone institutions (which are not affiliated universities and only deliver diploma level programmes)	Technical institutes	No	-
	Teacher training institute	No	-
	Nursing institute	No	-
	Institute under ministries	No	-
	Hotel management and catering institutes	No	-
	Paramedical institutes	No	-
	Postgraduate diploma in management institutes	No	-

PCUs

The types of institutions within this grouping share several features in common: they receive funding from the Department of Higher Education, the GoI or their respective state or union territory government department. In some cases, a university established by a state or union territory government can also receive funding from the central government through the UGC (UGC, 1956). By regulation, these institutions are required to establish broad-based undergraduate, postgraduate and research programmes in several disciplines with firm interdisciplinary linkages (UGC, 2010).

Within both Maharashtra and Tamil Nadu, I identified one public comprehensive university where there was both sufficient concentration of researchers in the previously identified disciplines of biomedicine, computer science and history with cognate disciplines. Established in 1857 in the model of the University

of London, the University of Madras was an appropriate choice for Tamil Nadu. It includes: a dedicated School of Historical Studies, comprising both a Department of Indian History and Department of Ancient History and Archaeological Studies; a School of Mathematics, Statistics and Computer Science, which housed a Department of Computer Science; and, both a School of Life Sciences and a School of Basic Medical Sciences, between these two Schools were various biomedicine groupings (University of Madras, 2022). In addition, the University of Madras funds 46 research centres of various disciplinary and interdisciplinary fields (University of Madras, 2022). Regarding Maharashtra the University of Mumbai was established in the same year, it has two dominant school in humanities and science and technology (University of Mumbai, 2023a). While there is a dedicated Departments of History (and departments for cognate disciplines) and a Department of Computer Science and Department of Biotechnology, the overall strength of the faculty is comparatively less than the University of Madras. This created challenges in identifying and recruiting participants, which are discussed later in this chapter. However, both institutions recruit students and staff from a wide range of socioeconomic backgrounds with targeted initiatives to support these ambitions, which are reinforced by regulation.

PNIS

The growing number of premier public higher education institutions that are deemed as institutes of national importance derive their status from individual acts of the GoI. For example, the IIT Act (1961) sets out the status and powers of the IITs, where they have a specific duty to advance knowledge and research within a field: “to provide for instruction and research in such branches of engineering and technology, sciences, and arts, as the Institute may think fit, and for the advancement of learning and dissemination of knowledge in such branches” (p.678). The institutes are primarily funded by the GoI, receive higher levels of funding and autonomy and enjoy significant esteem within and beyond higher education.

Given that national institutes of significance are more specialised in their list of fields than public comprehensive universities, I focused on those institutions that had a high level of research activity within the fields of biomedicine, computer engineering, and history and cognate fields. As the most established national institutes of significance in the fields of interest, the IITs were the clear choice. However, as will be discussed in the limitations section elsewhere, while the IITs had extremely high levels of research activity in biomedicine and computer engineering, the history and cognate disciplines categories was sparsely populated with the research workforce. It was also because of these factors that the definition of the history discipline used in the study was broadened in focus to incorporate other related, disciplinary perspectives.

PHEIs

The growth of private higher education institutions in India is a relatively recent phenomenon. While there is significant institutional variation between these HEIs, research is growing in focus and significance (Matthews, 2022). Once again, I identified PHEIs based on researcher concentration in biomedicine, computer science, and history and cognate disciplines. Sri Ramaswamy Memorial (SRM) Institute in Tamil Nadu has a globally leading reputation for, and significant research capacity in, the biomedicine and computer science disciplines, which strongly factored into my decision-making (SRM Institute, 2024a). However, the institution has reduced capacity in relation to history, which is a limitation of this institution as a case. As will be discussed below, I was able to immediately garner interest within this institution for the project and I felt it was important to conduct as many interviews across the two disciplinary fields of biomedicine and computer science, as well as with research leaders who expressed interest. This explains the overrepresentation of computer science researchers set out in Table 3.1.

I initially identified Chatrapathi Shivaji Maharaj University as the institution of choice in Maharashtra. However, following multiple attempts of unsuccessful engagement with the institution, I pivoted focus to Amity University in Mumbai. While Amity University was established outside the Maharashtra region in Uttar Pradesh, the Mumbai campus of the university has well established programmes in computer science, biomedicine and biotechnology, and in history (Amity University, 2023a). For these reasons, and given the research orientation of the institution, Amity was identified as a suitable PHEI for inclusion in the study.

Sampling considerations and limitations for institutions

The final sample departed from the initial sampling approach in several ways. The most significant of these were the overall volume and mix of historical studies researchers and the need to change the PHEI within the Maharashtra region, which constrained the time available to gather data. This meant that there are fewer number of participants from the PHEI in Maharashtra. Similarly, despite being one of the largest, public comprehensive universities in Maharashtra, the very many researchers I contacted at the University of Mumbai did not reply to emails or offers to meet when on-site. Those that did reply were sceptical of the project's purpose and study aims and did not want to engage with me as a researcher. On the other hand, there is strong representation from the publicly funded national institute of importance in Maharashtra, where researchers were much more receptive to the study and engaging with me as the researcher. Within Tamil Nadu, there is balanced representation of researchers across the different institution types.

Overall, this study is largely an account of research culture where there is adequate research activity within an institution and constituent departments. Therefore, there is a bias in the study as I did not consider contexts where research activity is limited or non-existent. This also informed the choice of

regions and disciplines. However, it is very difficult to study research culture in the settings where research activity is absent. This is a limitation of the current study, although I do explore similarities and differences in research activity across disciplinary, HEI and regional / national system lenses.

3.4.4 Policy, funding, and system perspectives

In identifying and recruiting those who were working at the level of the research ecosystem, the approach was simultaneously focused and wide-ranging. Relevant groups included: government officials who were experts in relation to India's higher education and research landscape and/or research funders.

I identified specific agencies at central and regional levels of government that were involved in the funding and regulation of research, and I made direct contact with individuals who held relevant positions (e.g. policy officials within the Office of Principal Scientific Secretary). The background and professional experience of these individuals was a determinative factor in recruiting them as interviewees.

Similarly, based on a literature search (including grey literature) of leading academic experts and policy officials in relation to India's research ecosystem, including those employed in centres of higher education and research studies, I made a list of specific individuals to contact and approached them through the means described earlier. In addition, I contacted relevant named individuals within funding agencies directly. Funding agencies included the Indian Council of Social Science Research and the Department of Biotechnology, which funds biomedical research projects in the institutions previously identified. Through networking with the UK Research and Innovation office[2] based in India and the specific funding collaborations that are supported through the agency, I identified further relevant actors that were appropriate for inclusion to explore system-level ideas about research culture. While this method was susceptible to sampling bias and relied on the close judgment of me as the researcher, it was the only available method of participant recruitment that could adequately explore and interrogate ideas about research culture at the level of the system. While I was able to recruit research funders affiliated with a government agency, given the scale and scope of the study I was not able to recruit industry partners or other actors from the private sector.

[2] UK Research and Innovation (UKRI) is an international office of the UK's designated research and funding agency. Since 2008, the UK and Indian governments, and third parties have invested in approximately £330 million in co-funded research and innovation programmes, across 258 research projects involving more than 220 lead institutions from the UK and India. They are a densely networked satellite office with links to several public comprehensive universities, public national institutes of significance and private higher education institutions based in India.

3.5 Methods of data collection

The research design required a method that provided flexibility, so that as new information was obtained, the emphasis of the research topic could be adapted and nuanced. This was necessary to understand the multidimensional perspectives comprising research culture. The value of qualitative interviews lies in their ability to provide a networked understanding of the topic at hand, which is built from the varied perspectives and backgrounds of researchers, rather than limiting understanding to that gained from one contained group of participants. Yet simultaneously, the method needed to explore a consistent set of themes at a sufficient level of depth, sophistication and rigour and to centre making meaning from the motivations and ways of working of researchers. Given their intrinsic focus on interpretation as informed by values and life experiences, qualitative methods were identified as the most appropriate for this type of inquiry. These methods also reflected the collaborative nature of the present inquiry, where the researcher is actively involved with the participants in the development of new knowledge (Creswell and Guetterman, 2019). Flowing on from constructionist paradigm, a romantic or emotionalist conception of interviewing assumes that genuine subjective experiences are available from interviews and that the role of the interviewer is to bring out that which is hidden from human view (Alvesson, 2003; Roulston, 2020). This epistemological framing emphasises the importance of participants making meaning and of the sharing of experiences, as valuable in and of themselves, rather than relying on the robustness and precision of factual accounts, which is a traditional positivist framing (Roulston, 2020). The content of individual interviews was crucial, as were the relationships that were formed across a set of interviews within a discipline or institution or system, as the study has been built on the assumption that there is no one objectively defined truth about people (Burr and Dick, 2017)

From the qualitative methods available, I employed semi-structured interviews as the most suitable methodology for this inquiry, and the primary means with which I could explore the perspectives of researchers working across the previously identified disciplines and types of institutions, as well as those involved in the research ecosystem such as research funders and expert informants on policy and higher education. Semi-structured interviews are particularly beneficial when engaging elite experts of a field, such as researchers who are active in their disciplines, as they are “well-versed in the specific operational details within their realm of expertise” (Ahlin, 2019, p.3). This kind of interview also helps to accommodate the contextual differences in relation to disciplines and institutional arrangements. Semi-structured interviews provide the ideal balance of structure and flexibility, especially in relation to those issues that warrant more detailed probing, and which arise during researcher-participant interactions (Ahlin, 2019). This method was also the least likely to dislocate the experiences and accounts of participants from their context, again centring their voices in the construction of knowledge (Burr and Dick, 2017).

In addition to the data collected from these interviews, select documents were reviewed and analysed. These documents included publicly available reports, material retrieved from HEI webpages, and

brochures and research strategy documents provided by individuals at institutions. In addition, I conducted a limited number of field observations within the institutions that I visited in-person and where I conducted the semi-structured interviews. The perspectives and ideas of the researchers, research leaders and expert informants was the substantive focus of the study; the data provided through the means of field observations and documents was considered largely complementary. It provided an additional source from which comparisons and triangulations could be made in relation to the ideas of participants. Next, I explore the rationale for semi-structured interviews in more-depth, followed by a shorter section on field observations (and considerations of documents within this).

3.5.1 Semi-structured interviews

Semi-structured interviews can be effective in anchoring an inquiry so as to explore the issues that are of most significance to participants from their viewpoints and within a bounded field of knowledge (Ahlin, 2019). They are most valuable where there is some but not substantial amounts of information about a topic or a field and where there is value in generating new perspectives or expanding upon existing information (Ahlin, 2019). However, they require the interviewer to have familiarity with the broad academic terrain so that appropriate lines of enquiry are pursued. It can be valuable for the interviewer to have first-hand experience working in some capacity within a field (Ahlin, 2019).

As with other forms of interview methods, semi-structured interviews rely on self-reported data. Researchers are required to grapple with the factual inaccuracies in the recollections of participants' narratives and memory; participants' willingness to share experiences is also mediated by the way in which they understand the interview context and the perceived or real motivations of a researcher. Brinkman (2016) challenges the translatability of interviews from a Western context to other cultural settings where there is likely to be less of a focus on the sharing of "authentic lived experiences (p.524)". Semi-structured interviews are a highly interactive, tailored social practice that is fallible to misinterpretation.

I considered and discounted methods such as institutional ethnography, narrative research and other approaches grounded in the traditions of organisational sociology. While these methods could have provided detailed insight into the cultural realities of participants and emphasised the temporal changes as well as the movement of ideas and practices between different spaces and places (e.g. transitions between institutions or regions), I prioritised being able to gather and triangulate a diversity of researcher voices and perspectives. Semi-structured interviews were the most effective and efficient means of yielding insights in those terms.

The steps taken to provide rigour to the method, including developing interview guides through reviewing previous knowledge, formulating an initial schedule of interview questions, and piloting and iterating interview guides, among others, all are important in providing strength and credibility to the study (Kallio

et al, 2016). As an insider-outsider, I have also exercised great sensitivity to avoid making sweeping, broad ranging claims about Indian society nor about key actors and institutions within the national, indeed sub-regional, context from the interactions I had with participants in this study. My observations are limited to the context and themes that have been explored here; further reflections on my positionality are discussed below under ethical considerations (see section 3.7). The semi-structured interview method was applied and interpreted in two distinct ways to address the research questions, and required the development of two interview guides, which are further described below and included at Appendices D and E. The collection and interpretation of data through this method is illustrated in Table 3.4:

Table 3.4 Overview of semi-structured interview data collection

<table>
<tr><th colspan="3">RQ1: Features of research culture</th><th>RQ2: Interactions between research culture</th></tr>
<tr><td>Features of research culture in disciplines</td><td>Features of research culture in HEIs</td><td>Features of system level research culture</td><td>What are the interactions between disciplinary research cultures, HEI research cultures, and the culture of the wider research system, including implications of these interactions?</td></tr>
<tr><td colspan="3">Interview guide 1: exploring perspectives of research culture from actors within HEIs (e.g. researchers, research leaders etc)</td><td rowspan="2">Analysis of material across both interview guides</td></tr>
<tr><td></td><td colspan="2">Interview guide 2: exploring perspectives of research culture from policy and system perspectives across the wider research ecosystem (e.g. research funding agencies)</td></tr>
</table>

The two semi-structured interview guides were necessary to address both the research questions and to adequately gather evidence from researchers, research leaders and others involved in the research ecosystem, including expert informants given their diverse interactions and contributions to the research ecosystem. Their insights were applied to the key lenses of research culture, though interview guides were tailored to participant backgrounds. Below, I describe how this research design was implemented in practice.

3.5.2 Approach to recruiting and interviewing participants

The three broad categories of participants are described as ‘researchers’, ‘research leaders’ and ‘research system’ but it is important to note that there are intersecting professional and disciplinary identities assumed by participants across the categories (Välimaa, 1998). Equally, there are important differences that are masked between the participants in each category. For the purposes of the study, researchers were those who primarily engaged in research activity within the disciplines of interest and undertook interview guide one (as set out in Table 3.4). Research leaders, who have a disciplinary or institutional responsibility for research activities, also completed interview guide one. Participants who provided research policy and funding perspectives, and those that were expert informants about system-level perspectives on research culture, completed interview guide two. While both interview guides explored

overlapping themes in relation to research culture at the level of HEIs and system, interview guide one emphasised disciplinary ways of working and interview guide two examined ideas about the interactions between HEIs in relation to system and wider factors at a greater level of depth. I conducted interviews virtually over a secure Microsoft Teams platform and in-person, which is discussed further below.

3.5.3 Approach to conducting interviews and collecting data

I collected data over a period of 15 months between October 2021 and January 2023. During the time in which the study was conducted, the coronavirus pandemic remained a significant global challenge. This had implications for the present study including in relation to travel restrictions and the willingness of participants to engage in interviews (particularly in a face-to-face setting). In turn, I made several trade-offs with the data collection schedule, the most significant of which was commencing the data collection virtually. It was extremely challenging to interview participants in this way; participants would often not reply to emails or even if they had agreed to a time, they would not appear for an interview. Others were only able to meet for a portion of the agreed interview time and there were connectivity issues, which disrupted the overall flow of some interviews.

Early into the data collection period, a decision was made to conduct a three-week in-country 'fieldwork sprint,' in February 2022. I attempted to conduct as many in-person interviews as possible. This decision was also triggered by personal reasons to go to India. I was able to receive some external funding, and financial support from Wolfson College, University of Oxford. As a self-funded research student, this was a crucial factor enabling the in-person interviews to take place. The time of the fieldwork was designed to be split equally between the Tamil Nadu and Maharashtra regions, though I had to truncate the Maharashtra element due to personal reasons (as a family member passed away). While the in-person interviews were very valuable to the study, there were additional logistical considerations to work through, particularly in a condensed fieldwork period. These included: finding suitable confidential spaces within each institution; conducting interviews in a disruption free manner; travelling from place to place in a timely manner; being flexible to accommodate interviews that emerged whilst being on site; and, having to reschedule interviews due to onsite disruptions which impacted subsequent appointments.

Between March 2022 and September 2022, data collection waned; it was during this period that participants were most reluctant to engage in the study. I can only speculate about the reasons as to why. However, as pandemic-related restrictions were beginning to ease in many countries and workplaces globally, participants reported they had many competing demands that were occupying their time. For these reasons, and with the support of my supervisors, I decided to conduct another three-week in-country 'fieldwork sprint.' This second time I focused on the disciplines and perspectives that were less represented in the desired sampling frame set out earlier in Table 3.1. During this period, I focused intensely on eliciting perspectives from policy officials, which required a lot of preparation and logistical

coordination to gain access, including rescheduling appointments several times at quick notice and liaising with local contacts. I transcribed interviews throughout the collection period but shifted my focus to analysis towards the end of 2022 when I had exhausted my avenues to collect data The practicalities of time and funding constraints also loomed larger in significance. By this stage, I was also satisfied with the comprehensiveness and diversity of participant perspectives across the disciplinary, institution and regional dimensions. The data collection timeline for the project is shown in Table 3.5.

Table 3.5 Data collection schedule

Activity	Dates	Additional detail
Design of interview instrument	June – July, 2021	Initial adjustments made following Transfer of Status
Pilot and iterate interview instrument	July, 2021	Piloted instrument with previous MSc study participants
Participant recruitment	August – September, 2021 Initial call for participants	
Virtual interviews	October, 2021 – January, 2023	
In-person fieldwork and interviews	**Fieldwork visit 1** 14 February, 2022 – 3 March, 2022	This fieldwork focused mostly on HEI interviews, specifically meeting with computer science and biomedicine researchers. • Week One: Tamil Nadu HEIs • Week Two: Maharashtra HEIs • Week Three: Tamil Nadu HEIs and policy and system experts
	Fieldwork visit 2 3 September, 2022 – 22 September, 2022	This fieldwork focused mostly on interview with historical studies researchers and policy and system experts. • Week One: Tamil Nadu • Weeks Two and Three: Maharashtra
Transcription and analysis	Initial transcription as interviews were conducted: October, 2021 – September, 2022 Reviewing transcription notes: September, 2022 – November, 2022 Analysis: September, 2022 – March, 2023	

All participants who participated in the study were provided consent forms in English and had the options to refuse to be recorded for the interview and suspend their participation at any time. For participants who did not complete their consent forms, I commenced the interview with an explanation of the study and obtained their consent verbally, which was recorded. There were a few participants who expressed some reservations about participating in the study: typically, those in positions of leadership and those from history and cognate disciplines. These perspectives warrant their own discussion in the findings

chapters, but every effort was taken to protect the anonymity of participants and the reputation of their institutions. Interviews were conducted in English and recorded via means of audio and fieldnotes. The fieldnotes contained additional observations about the interviews, such as when the participant emphasised certain themes and the general tone and demeanour of the interview. Two participants requested a summary of their contributions, which was prepared and sent to them. All data was recorded and saved to a secure, encrypted folder in a password protected local laptop. As indicated in the above table, prior to conducting interviews, I piloted the interview instrument and made several adjustments. The design of the interview instrument is discussed next.

3.5.4 Designing interview protocol

I designed the interview protocol with two considerations in mind: providing a structure that would encourage participants to share their experiences freely and openly and an overall protocol that sufficiently unearthed the participants' perspectives and realities in relation to the lenses of research culture set out in Chapter Four. Ensuring a base level of understanding among participants about research culture which crossed cultural and disciplinary boundaries was particularly important. In turn, the interview protocol was designed through the matrix structure outlined below in Table 3.5.

Following a brief introduction to clarify purpose and build rapport, the interview guide followed two-levels of questions: main themes, that explored the questions that were central to the issues of research culture at each lens, working through these in a logical fashion; and, follow-up questions that were spontaneously devised, based on the participant's answers (Krauss et al, 2009; Kallio et al, 2016). This is described in the horizontal categories of the table. Where the main questions elicited responses that were illustrative, in describing the aspect of research culture that was concerned with ways of working, practices and traditions, the follow up questions probed ideas further, in contrasting various elements of research culture and discussing features which participants found to be enabling or limiting.

The vertical dimensions set out the core concepts and questions, as developed through key themes emerging from literature, and as set out briefly in Table 3.6 below. I was able to apply the lessons and adapt the interview guide from my earlier MSc research inquiry to consider research culture through the various lenses than as a singular concept. Within each lens of discipline, HEI and system-level research culture, I generated questions that were core to these categories but created enough flexibility to go beyond those themes where it was necessary to do so. I included definitions where it was important to provide clarity and orientation to the participants, particularly when distinguishing between themes that pertained to more than one lens (e.g., resources was a concept that was a focus of disciplinary and HEI research culture).

With all those who were researchers in HEIs and that completed interview guide one, the schedule of questions began with a general discussion of their immediate disciplinary environment to orient them to

topics and themes they were most likely to be familiar with. This was followed by a deeper examination of HEI research culture and its constituent elements, in a logical and progressive manner. With those who undertook interview guide two, the schedule of questions typically began with their role and key activities as pertaining to research before moving onto the more substantive themes. It was important to exercise flexibility here; some concepts straddled more than one lens of research culture.

Administering this interview guide required a careful balance of gathering rich data, while maintaining a free flowing, engaging conversation. This was helped by sending the interview guide in advance, and stating to the participants at the outset, that while there were key questions to explore, that we could spend more time on the areas that they were particularly keen to share perspectives around. This type of preparation and flexibility was appreciated by participants, who were in almost all cases, researchers themselves, and helped foster a sense of trust in the overall interview process (Buys et al, 2022).

Table 3.6 Approach to interview design

Stage of the interview	Main themes (Krauss et al, 2009)	Follow up questions	Interview
Introductions and opening	Provide welcome and outline purpose of study		
Disciplinary research cultures (McLean, Abbas and Ashwin, 2017; Bernstein, 2000)	• Norms and rituals of researchers • Materials and resources • Support and collaborations	• Differences and similarities with other disciplines • Strengths and challenges in ways of working	Interview guide one
HEI research cultures (Tierney, 1998; Mendez and Cruz, 2014)	• Recruiting and attracting talent • Expectations of researchers • Incentives • Research strategy • Measures of excellence	• Specific questions about research strategy; e.g. relationship between research and teaching • Changes over time	Interview guides one and two
System-level research culture (Oancea, 2019; Wellcome Trust, 2020; Nandy, 2016)	• System level incentives • Governance • Regional differences • Plurality of languages and traditions	• Impact of recent policies and regulatory changes, e.g. New Education Policy	Interview guide two
Closing	• General reflections on research culture (s) • Opportunities to clarify or further explore contradictions	• Discuss issues not previously explored	Interview guides one and two

Ahead of interviewing participants, I piloted the interview instrument with three past participants from the MSc inquiry including with two mid-career researchers from a PCU based in New Delhi. Upon considering their feedback, the instrument was revised in several ways: some questions needed greater specificity, and the sequencing of the guide was reordered. They reinforced the need to provide clear definitions of terms, including the multiple ways a term could be understood, for example, incentive in the context of institution-led activity and in relation to system-level incentives and metrics. However, the piloting and adapting of questions continued as the study progressed, particularly with the early set of

interviews. This is expected of semi-structured interviews, and is a type of field-testing, where based on early interviews, the order and form of questions are reformulated to be made more practical (Kallio et al, 2016; Krauss et al, 2009). Through this process, the main themes were largely unchanged, but I refined some of the follow-up questions to facilitate a level of predictability and improve coverage of the themes (Krauss et al, 2009). Even still, I encountered challenges in the administering of this instrument. This included probing a range of themes within a set time duration, while not disrupting the flow of the interview. However, as the interviews started to accumulate, so did my confidence as an interviewer and my awareness of when a participant had provided sufficient perspective on an area of focus.

3.5.5 Field observation including documents

Given that the perspectives of individual researchers and those working in the research system is the primary focus of the study, the approach taken to field observations was more passive in nature (Johnson, 2017). The observations were deliberately informal in nature as I wanted to explore the "tacit and explicit" aspects of researchers' environments (DeWalt and DeWalt, 2011, p1). The observations took place either before or after an interview with a participant, where I was shown around their immediate research environment and where I had the opportunity to make annotations about the physical setting, activities and behaviours that I observed of individuals across a range of research environments. I typically allocated 30 minutes to conduct the observation, though in some cases I was able to see a greater variety of environments (e.g. wet laboratories). I took down jotted field notes while I was in the environment and added to these immediately afterwards. This was particularly important to "preserve experiences close to the moment of occurrence" (Emerson, Fretz and Shaw, 2011, p17).

The notes I made were reflective as well as descriptive, as I was engaging in observations that were often in reference to the interviews I had with participants. For example, if a participant had spoken about constraints with resources, I was able to reflect on the issue more closely during the field observations and understand how it impacts their ways of working and interactions. The emphasis of field observations was to learn more about implications and the context of participant's research environment.

Where I interacted with individuals other than the project interviewees in a research setting, I disclosed myself as a doctoral researcher and informed them I would just be making brief observations about the environment and would not make any attributions to them as individuals. I did not seek to request consent separately given that I had already obtained it for the purposes of the interviews, and I was primarily making notes about the environment. I recorded my reflective notes in a journal that was kept separate from the interviews and organised my ideas loosely along the interview guide so that I could organise by themes about the research topic later. In a similar way, I considered documents such as research strategy documents, annual reports and examples of research project statements, which were almost always volunteered to me by participants over the course of the interview process, presumably

reflecting the trust and rapport that had been established through the interviews. In the context of this study, documents, and artefacts such as these were used to "furnish background information and context," providing additional detail, rather than being used as a primary data source (Johnson, 2017, p.113).

However, it is important to note that documents from which I sought data were selective, and I only extracted and analysed data that was relevant to the study, as informed by the research questions and scope of the study. Findings should be considered in the context of these limitations; equally as the researcher, I exercised my subjective judgment in selecting and interpreting the data that was of relevance to the study. This matter is further explored in the methods of data analysis section (Bowen, 2009).

3.5.6 Approach to transcription

I largely relied on the audio recordings and verbatim transcripts as the primary form of data for the study. These were complemented by my reflective journal notes which were taken by hand. At the conclusion of each interview, I uploaded both the audio recording and interview transcript to a password protected laptop and securely saved these. I undertook a similar process for fieldnotes which were typed up from my handwritten notes, before being transferred to NVivo.

Again, these files were saved on my laptop computer. Kowal and O' Connell (2004) distinguish transcription from the description of a conversation and note the selection of the feature of behaviour to be described is determined by the goals and question of a specific research project. With that in mind, and as will be discussed below, I maintained a very open, broad approach to transcribing participant interviews. I made no attempt to infer meaning from what participants said or to apply symbols at this stage. Where I wanted to make reflections or had further queries about participant interviews, these were made separately on interview notes and were later moved to a separate document.

3.6 Methods of data analysis and interpretation

The methods I chose for the analysis and interpretation of data were those that corresponded with research questions and the overall constructionist paradigm of the study. The methods should be considered in the context that there is no universal knowledge, and to conceive of the findings as a single source of truth would be inappropriate, given the underpinning orientations of the study (Damaschin, 2024; Burr and Dick, 2017). However, this does not mean that the data has not been rigorously analysed and interpreted. Rather, our understandings of reliability and validity must be broadened in a social constructionist study such as this (Burr and Dick, 2017).

The strength of the findings emerged in the diversity of perspectives gathered and as discussed below, through the processes of iteration and theming that was collaboratively developed with participants. In so doing, the data were rooted to participants' contexts and environments and emerged as a more democratic process between them as participants and me as the researcher (Gergen, 2012). Moreover, I paid particular attention to the way ideas were represented in similar and different ways with language and the methods deployed below supported these aims. In turn, I drew upon reflexive thematic analysis to interpret data.

The coding process deployed in this study enabled me to clearly see relationships between ideas, as well as points of tension and fragmentations. In so doing, the knowledge that emerged was less fixed and neutral and more sensitive to the changing realities of participants in this study (Damaschin, 2024). Another core feature of these methods was routine, reflexive engagement with the data to ensure I was appropriately exercising my judgment as the researcher while undertaking this process in as collaborative a way as possible.

3.6.1 Reflexive thematic analysis

While a range of analytical methods could have proved useful to interpreting the data gathered through the study, reflexive thematic analysis was chosen as the tool is well-suited to the multidimensional, multi-perspective nature of research culture as the subject matter, where the emphasis lies on developing themes and patterns across a diverse range of cases, rather than on forming a detailed view from any one case (Trainor and Brundon, 2021; Braun and Clarke, 2021). This method requires the researcher to make thoughtful choices in their engagement and interpretation of participant insights, and in relation to the research question and wider theoretical paradigms; in doing so, this analysis explicitly underscores the importance of subjectivity in the analysis (Terry and Hayfield, 2020).

Initially, I immersed myself in the data by hand transcribing the interviews verbatim. This involved listening back to the interview recording and cross-referencing this with the short-hand, written notes and/or typed up notes that I took during the interview itself. On the margins, I made observations about the interview itself, by way of concepts that required emphasis, questions or clarifications that emerged

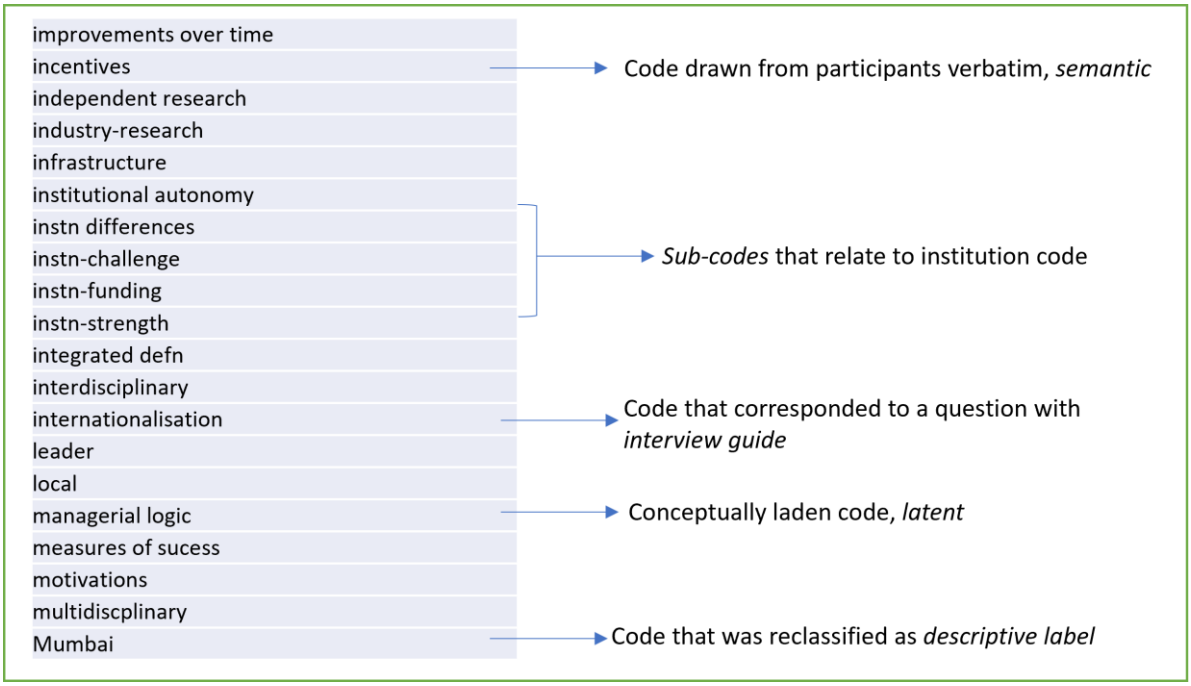
through the research questions and links to other interviews or cases. I eventually transferred these observations to a separate journal of reflective research notes. My primary notes focused solely on what participants were expressing and saying within the transcript. I transferred the interview transcript into NVivo. I then re-read each interview transcript in NVivo and made additional annotations through the lens of research questions on the separate journal; these were generally broad, underdeveloped reflections.

3.6.2 Coding and theming

The coding process was an open, inclusive and iterative process which became meaningful over time. The initial coding process involved a combination of inductive interaction with each individual raw transcript, with an awareness of the research questions in the background and which guided the interesting information that stood out to me as the researcher (Terry and Hayfield, 2020). At the initial stage, I did not rule out codes, even if they seemed like earlier codes as I did not want to erroneously misinterpret the nuance in them. However, some sub-themes organically emerged over repeated engagement with the data.

Two challenges I encountered and worked through the initial coding process were distinguishing between those features which were descriptive labels and those that represented ideas and concepts. I was able to use the labelling feature in NVivo to make these distinctions clearer, which subsequently enabled me to analyse data by disciplinary and/or institutional groupings, as well as relationships between the lenses of research culture much easier. Another challenge was to code by semantic expression and by applying latent meaning, the latter of these required a careful exercise of judgment by me as a researcher (Terry and Hyfield, 2020). Here, I relied on my theoretical engagement with the wider literature and the codes that were produced in my earlier MSc study as the basis for ascribing meaning. I also labelled categories that were ‘enabling factors’, ‘challenges’, and ‘definitions of research culture’; these corresponded with the interview guide and were areas of interest to the study. Figure 3.3 provides an extract of the initial codes and the ways in which the above decisions were applied. Once I felt the initial coding process was complete, I re-read the entirety of the transcripts and began the theme refining and theming process.

Figure 3.3 Extract of initial coding and annotations



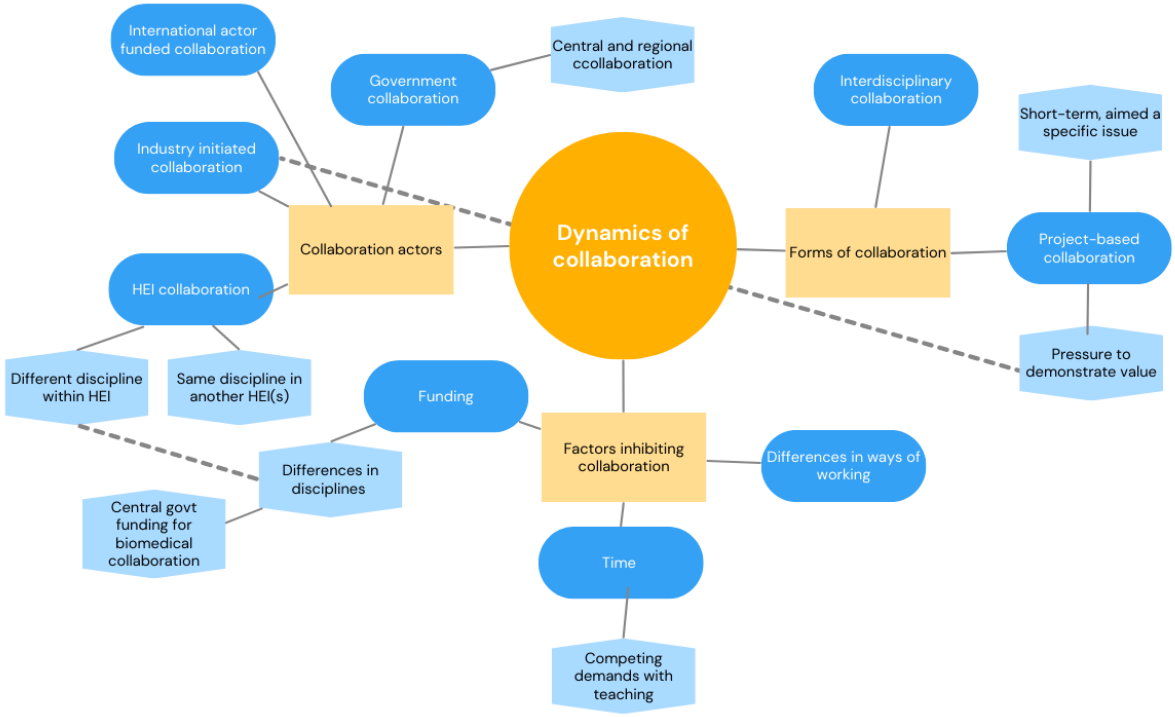
Braun and Clarke (2022) insist that undertaking reflexive thematic analysis is only useful when a researcher has engaged in serious conceptual and design thinking. I found this to be especially relevant at the stage of drawing out themes following the process of coding; even after arriving at an initial set of themes where certain codes took on different meanings or their relationships with other codes were different to my initial assumptions. In this way, themes are not waiting in the data to 'emerge', but they are conceptualised and reconceptualised through repeated analytical engagement with the data (Braun and Clarke, 2022). In theming the data, I largely clustered codes based on similar ideas and which were central to the research questions. Where themes consisted of competing ideas, I returned to the original interview transcripts to probe the reasons as to why this was the case, and which at times sparked new insight. As the emphasis of reflexive thematic analysis lies in looking for patterns across the data set, this was a limitation of this method as it can underplay the nuances within an individual narrative. It is for these reasons that it was particularly important for me to return to the original interview transcript, so that the meaning of participant reflections could be understood in wider context.

Flowing on from this, the findings chapter will present participant narratives in their verbatim quotes (or with minor rephrasing for ease of comprehension) and with narrative so that the arising themes can be clearly understood through context. Below in Figure 3.4, I present an example of a candidate theme, with constituent coded data and interrelationships between codes. In the example below, it was sensible to bring these wider codes under one theme, though in other cases, I reorganised themes where it was overly dense (Byrne, 2021).

I drew on the data analysis functions within NVivo to look at patterns across the various cases and made mind maps to help organise the codes around central themes. Drawing on Canvas, I also deployed the

process of mind mapping helped define boundaries to the theme, in both the properties that it included and that sat outside the theme, as well as interrelationships between themes (Terry and Hayfield, 2020). This helped develop and refine a thematic conceptual matrix.

Figure 3.4 Example of candidate theme and associated coding



3.7 Ethical considerations and positionality

Ethics management

Participation in qualitative, semi-structured research has the potential to be an enriching experience for interviewees in "profound and potentially life-changing" ways and in a manner that is often not initially anticipated by the researcher nor the participant (Husband, 2020, p.1). Therefore, with the aim of ensuring that participants were able to have a meaningful experience through their engagement with the present study and that all reasonable action was taken to protect their wellbeing, I considered the British Educational Research Association (BERA) Guidelines for Educational Research (BERA, 2011) and the University of Oxford Ethics committee ethical guidelines at every stage of the research design. As detailed in Appendix C, the University of Oxford Ethical Committee approved this research project following ethical review that involved preparation of a participant information sheet, risk assessment form, overseas fieldwork assessment form, a consent form and a checklist. The study received ethics approval on 12 May 2021.

In the context of semi-structured interviews and the overseas fieldwork component of the study, the most pertinent ethical issues in this study involved confidentiality, particularly in the sharing of personal experiences in relation to ways of working within disciplinary teams and about the effectiveness of organisational and system-level policies. In addition, the study also contended with the differing power-relations between researcher and the participant. These are explored in turn.

Participant confidentiality was a key concern, particularly for researchers working in history and cognate disciplines, where their research environment is already a subject of critique and interference. In turn, I approached my researcher responsibilities to uphold participant anonymity very seriously. At the commencement of each interview, I communicated the aims of the study, emphasised the confidentiality protocol and provided the opportunity for participants to withdraw at any point. This extended to when I conducted interviews in-person with a single participant, where they were largely held in a private office within the institution where no other observers were present. In all but two cases, this process was closely followed. In one situation, the interview was interrupted by another member of staff, where discussion was paused and resumed once they had left the space. Another instance challenged my ability to enforce confidentiality due to situational factors, where I arrived at a researcher's office within a university, and they informed me that two of their colleagues would also like to contribute to the study and were in the same office. I advised them of the confidentiality protocol, but they were insistent that they all wanted to contribute together and that they each were voluntarily providing consent, and that they would not be able to participate otherwise.

In this instance, as a researcher, I had to make decisions that considered the wellbeing of participants and the application of confidentiality in practice (Jackson, 2021). Here, I pivoted to conducting the individual

interview to a group interview format and provided assurances that their contributions would be analysed individually, but that their contributions would not be known to anyone, other than each other given that they were present in the same room. As a case study of managing relational ethics in practice, this study sought to balance the complexities of participants' lives and concerns alongside the desired goals of myself as the researcher (Jackson, 2021). I subsequently debriefed this experience with my supervisors for guidance and clarification of my actions (Jackson, 2021).

All participants were advised that interviews would be audio recorded and transcribed by writing, and only on consent of approval, did the recording take place. All audio material was transferred securely to a password protected, encrypted folder on a local privately accessed laptop.

Researcher positionality

In relation to my positionality, I was acutely aware of the unequal balance of power I occupied as an early career researcher with participants, who were often more senior and distinguished researchers and who had varying degrees of confidence in English as the primary language in which the interview was conducted. However, it would be an oversimplification to characterise my positionality as lacking awareness about the participants' research environment and participants as not possessing sufficient command of the English language to discuss interview topics effectively. Prior to conducting the interview, I provided some detail about my academic and professional background as a way of establishing credibility with participants and set out the parameters of the interview to be conducted in English, when seeking participant consent. Some participants also asked for remuneration in advance of the interview, which I was not able to provide but I always followed up with a note of thanks for their participation. I also acknowledged my personal characteristics as an Indian Australian with proficiency in Tamil and less so in Hindi. While I am not a resident of India and have not worked in the Indian higher education system, I found these traits provided comfort and relatability to some participants. Interviews were almost always conducted in English but where participants used certain expressions, particularly in Tamil, I was able to contextualise and interpret these with confidence. This adds to the richness and depth of analysis I was able to draw out from the findings.

More generally, I note that it was essential to exercise ethical mindfulness throughout the interview process, particularly in relation to power dynamics (Guillemin and Heggen, 2011). I sought to balance an appropriate level of respect and humility towards those that I was interviewing with my own power and agency in the interview process as a researcher. While maintaining confidentiality, I was able to debrief these experiences at great length with my supervisors and through my routine progress reports with them, who were most helpful in balancing reflexiveness, reframing challenging experiences, and focusing on the purpose of the interview. These actions helped provide rigour and emotional detachment from the

process of collecting data, while enabling me to immerse myself to the extent that was appropriate to make meaning.

Overall, the research including fieldwork involved few ethical risks and concerns, and participants stated that they relished the opportunity to share their frank perspectives on institutional, disciplinary and system-level features of research cultures. A clear marker of success of this project is the many examples of thanks and appreciation received from participants, often describing their involvement in the research as helping them think about their experiences in new and empowering ways. In doing so, I hope that I have contributed positively to participants and their learning in a way that was at least equivalent to their contribution to the present research study (Husband, 2020).

As explained above, I continually developed reflective research notes throughout the project as a safe space to explore assumptions, doubt, and questions I generated. Having completed the earlier MSc inquiry and given my professional experiences working in higher education, I recognised that I had several beliefs and ideas about what participants would share with me. While some of these assumptions were correct, there were many times during the data collection and analysis stage of the project that my assumptions did not hold. Again, I discussed these routinely with my supervisors, and as explored above, have put in place measures as best possible so that the data could be considered as fully and thoroughly as possible with a recognition of those subjectivities in interpretation.

3.8 Summary

This chapter outlines the research design and method that was developed to explore the three intersecting yet distinct lenses of research culture in Indian higher education. The philosophical foundations of the study through a social constructionist orientation, my key research questions and the methods that were chosen to address them demonstrate the need to consider each of the lenses of disciplines, institutions, and system in relation to research culture, as well as the interrelationships between them through diverse perspectives. These interrelated agendas required a qualitative engagement using semi-structured interviews, where flexibility was vital and that emphasised the areas of focus that were most important to participants.

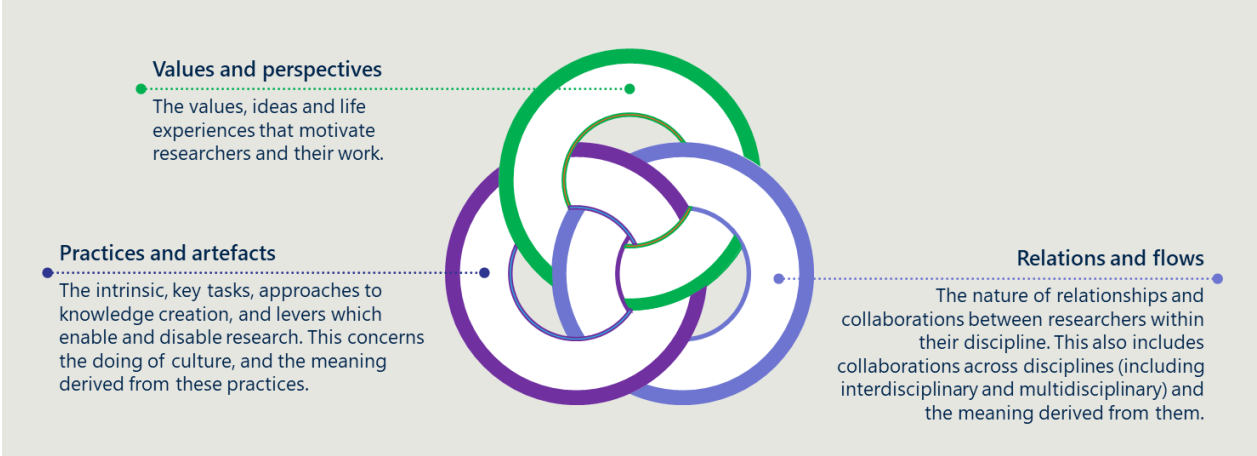
Throughout the data collection period, I navigated a series of challenges locally in relation to participant recruitment, fieldwork in-country, as well as navigating the ongoing impact of the globally significant coronavirus pandemic. The subsequent findings should be considered with respect for these limitations. Regardless, I was able to analyse a substantial, diverse range of researchers' experiences in relation to research culture through reflexive thematic analysis. These methods of data analysis helped draw out insights that were faithful to participants' realities, while helping address and advance the empirical objectives of this research. The subsequent presentation of the four findings chapter for this project are organised into a focus on each of the lenses of discipline, institution and system. The final findings chapter engages with their interrelationships and implications and in relation to the extant empirical and theoretical literature presented in Chapter Two.

4 FEATURES OF DISCIPLINARY RESEARCH CULTURE

4.1 Introduction

This chapter presents themes reflective of Indian researchers' perspectives in relation to features of disciplinary-level research culture. The data is drawn primarily from interviews with research-active staff, including early career scholars and heads of departments affiliated with the biomedicine, computer science and historical studies. The chapter directly responds to Research Question One. Researchers' perspectives are enmeshed with field observations and literature and are appraised against the conceptual framework developed in Chapter Two, to highlight where there is consistency in perspective and where there are tensions. Consequently, I have situated the conceptual framework to the disciplinary dimension of research culture below at Figure 4.1.

Figure 4.1 Conceptual framework of research culture, as applied to disciplines



For each of the biomedicine (section 4.2), computer science (section 4.3), and historical studies (section 4.4) disciplinary areas, I discuss key themes that have emerged through the *bottom-up* analysis of transcripts, though these themes are expressed in both similar and different ways. These include motivation and initiation of research; scholarly practices; approaches to knowledge creation; capability and development (including supervision); discipline-specific collaboration; success measures; interdisciplinarity; and resources, infrastructure and ongoing development of discipline. I also consider discipline-specific issues, such as the decline in status of historical studies.

The *bottom-up* themes were mapped onto the conceptual framework through a process of iteration, though this is an imperfect exercise. Scholarly practices, approaches to knowledge creation, and resources and infrastructure were collapsed into the *practices and artefacts* domain. The motivation and initiation of research mapped directly onto *values and perspectives*. Ideas drawn out from discipline-specific collaboration as well as interdisciplinarity shaped the *flows and relations* element. Some ideas mapped onto more than one element of the conceptual framework. For example, capability and development had

relevance for *practices and artefacts* and aspects that were also pertinent for *flows and relations*. At each discipline-specific section, I apply the conceptual framework to distill key ideas.

Lastly, I conclude this chapter with a synthesis of the similarities, differences and linkages in the key disciplinary features of research culture (section 4.5) using the conceptual framework. The key features of research culture are then revisited in the context of interrelationships across the three lenses of disciplines, HEIs and systems in Chapter Seven.

4.1.1 Description of disciplines

Chapter Three sets out the rationale and selection for the disciplines explored in this study (section 3.4.2). Notwithstanding the previously discussed limitations of the Biglan-Becher typology (1994), I have drawn on this framework to re-introduce the key characteristics of biomedicine, computer science and history. This is briefly summarised below in Table 4.1.

Table 4.1 Key characteristics of disciplines considered in this study (Biglan-Becher, 1994).

Discipline explored in study	Disciplinary grouping	Nature of knowledge	Nature of disciplinary culture
Biomedicine	Pure sciences 'hard-pure'	Cumulative; atomistic; simplification; resulting in discovery / explanation	Competitive, gregarious, politically well-organised; high publication rate, task-oriented
Computer science	Technologies 'hard-applied'	Purpose; concerned with mastery of physical environment; resulting in products / techniques	Entrepreneurial, cosmopolitan, dominated by professional values, patents substitutable for publications, role-oriented
Historical studies	Humanities and pure social science 'soft-pure'	Reiterative; holistic; concerned with particulars, qualities, complication, resulting in understanding / interpretation	Individualistic, pluralistic, loosely structured, low publication rate, person-oriented
**Not explicitly considered in this study*	Applied social sciences 'soft-applied'	Functional; utilitarian; concerned with enhance of semi / professional practice; resulting in protocols and procedures	Outward-looking; uncertain in status; dominated by intellectual fashions; power-oriented; technical reports; consultancies

4.2 Biomedicine

Biomedicine was configured in diverse organisational groupings across the institutions selected for this study. Most researchers worked on biomedical projects, though some were also engaged in interdisciplinary activities in fields such as biomedical engineering, which is discussed further below.

4.2.1 Motivation and initiation for research

Most of the biomedical researchers that participated in this study described their motivation for research in terms of addressing a social need. They described responding to a call from a funding agency or actors such as a local hospital, who commissioned their research through a call for proposals. Below, an early career biomedical researcher detailed one such account:

> There is a lot of interest in thermal imaging from our own (university affiliated) hospital. They wanted to better understand the properties of ulcers in diabetic patients. So, I got medical clearance from them, and where we have a diabetology centre. From there, I collected data from the normal and abnormal subjects.
>
> Biomedical researcher B2, PHEI, Tamil Nadu

Other researchers provided examples of global and national organisations such as the Centre for Excellence in Astrobiology or dedicated centres in Diabetology and Endocrinology within institutions, which funded research projects on specific diseases and called for expressions of interest from researchers. Relatedly, several researchers emphasised the high degree of responsibility they felt towards external organisations and funders who were supporting their research endeavours, as though to imply the interests of these parties were felt more urgently than to the higher education institution that employed them as staff. For instance, researcher B5 whose work was funded by government agencies, for example, the Indhira Gandhi Centre for Atomic Research expressed that their “main priority was to address industry challenges” rather than engage in department-wide research programmes.

Biomedical researchers emphasised the role of wider life experiences including their work in other occupations. Some participants in this study had wanted to be doctors or were involved in clinical work in some capacity, before becoming interested in research. Given the focus of biomedicine in addressing illness, researchers B6 and B9 shared compelling personal narratives relating to the experiences of family members with certain conditions, and the significant prevalence of a disease across Indian society at large, as motivators for initiating research. Researcher B1 shared their experiences working at a global biotechnology organisation, where they witnessed the biological impacts of pollution on Indian society. This prompted them to switch careers to pursue research exploring how the nuclear industry was impacting human enzymes.

The specific interests of researchers and the scale of the research programme supported at their institution, mediated the extent to which research was a priority for them individually and the role it played in advancing their careers. While a primary motivator for many researchers in this study was to improve quality of life for humans through their research findings, for others, such as B8, valued the opportunity to contribute to the training of future clinicians through "research-led" teaching.

4.2.2 Scholarly practices

Central to the research culture of biomedicine is the emphasis on teamwork within a laboratory setting, both within large and small-scale teams. It presented several benefits and challenges:

> We do a lot of experimental, lab-related research. We work with PhD students a lot, and there's experimentation that needs to be happen. If you go into a wet biology lab anywhere in the world, you will see very large teams of people working together. Because that's just the nature of the game. We have to work in teams, either large or small. It sets up a dynamic that is positive and extremely powerful because you work very well together. But it could also be a little difficult… because unlike the humanities side where you go off and explore your ideas and so on, here if you can't work in teams, you just cannot get the work done. There is also the possibility you can be exploited because of the power dynamics.
>
> Biomedical researcher B8, PNIS, Maharashtra

This narrative is pertinent to the discipline of biomedicine but as remarked by the above researcher, it is not necessarily unique to India. There can be a range of challenges in relation to the experience of researchers working in teams, such as inconsistent approaches to career development and differences in the contribution of individuals to research projects (The Academy of Medical Sciences – AMS, 2016). This is an important point, because as will be discussed elsewhere in this section, there is a tension between the team-based ways of working that are desired within biomedicine and the measures of success that remain rooted in a tradition of individual scholarship (AMS, 2016). These factors adversely impact those most early in their research careers, an opinion which was shared by researchers B6 and B9 in the present study (AMS, 2016).

However, teamwork does not negate the need for individual effort and research activity, particularly when developing research outputs. Further, I heard that researchers at various stages in their career perform distinct, structured roles within the context of a team including:

> We work as a team, as a part of our project. I help set the objectives. We then divide our individual objectives and perform it together in the lab, and our own individual works as well.
>
> Biomedical researcher, research group leader, B1, PHEI, Tamil Nadu

> The interaction between the juniors and senior is very friendly, we get to know each other's experiences and the impact of this on our research is that it becomes easier to troubleshoot problems in the lab. I didn't know a lot about Western blotting which she then spent time teaching me.
>
> Biomedical researcher, early career scholar, B6, PCU, Tamil Nadu

> We draw on our senior research fellows extensively to teach junior colleagues on how to use instrumentation and expose them to subject knowledge.
>
> Biomedical researcher, head of department and lab director, B3, PCU, Tamil Nadu

The above examples describe the type of roles required within a biomedical research team, including the roles of leadership, developing skills in others and workload allocation as components of teamwork. Taken together, these factors can be characterised as a distributed approach to knowledge creation, where all members of a research are required to contribute. Teamwork is also a practice that requires parameters to be set; researcher B11 expressed the view that distributing work between too many members risks the dilution of work and there is an optimal size for a team as between one and four researchers.

Fieldwork is another core practice identified by biomedicine researchers, taking place through different forms and contexts and involving a range of interactions (including with participants and instruments). Biomedical fieldwork is a planned activity that requires dedicated time, preparation to set up as part of the experimentation, and the management of resources. Researchers approach fieldwork in a highly methodical, structured manner, partially in recognition of the uncertainties that can come about from working with human participants:

> It is amazing that they (patients) sit through the whole and are wanting to cooperate but when we work with human beings, there is always a chance that people drop off.
>
> Biomedical researcher B2, PHEI, Tamil Nadu

Researchers were extremely alive to the issues that come with interactions with human participants, including the need to maintain ethical standards, safety and, notably, securely managing data. Within the Indian context, the growing investment in the discipline comes with added ethical scrutiny (Brandt & Freidenfelds, 1996). As articulated above, these considerations are balanced alongside the need to conduct fieldwork in a timely manner where data can be gathered to meet funder expectations.

4.2.3 Approaches to knowledge creation

The relationship that biomedical researchers have to the production and dissemination of new knowledge is complex. On the one hand, biomedicine is highly globally networked, where researchers stay abreast of developments through conferences, publications and the sharing of ideas with peers. On the other hand, researchers in this study worked to a rigid rhythm of defined tasks that needed to be completed week to week within a hierarchical team structure. There is a tension between time for creative work with that required for experimentation, which will be expanded below in the section on success and impact (section 4.2.6).

The experiences of researchers in this study broadly echo Biglan-Becher's typology of hard, life science disciplines (Becher and Trowler, 2001) in that researchers were closely connected to each other and focused on generating experimental knowledge. However, several researchers in this study including B4 and B7 emphasised the desire to develop products and technologies, while others such as B8 considered sharing new knowledge within the classroom as contributing to research. Not all researchers were oriented towards publications and patents, though they understood the overarching significance of these outputs to their career progression. Researchers were interested in contributing in different ways, which they identified as a strength of the discipline:

> Biomedicine is increasingly multicultural and multilinguistic, and we need and all everyone, no single person can do everything.
>
> Biomedical researcher B5, PNIS, Tamil Nadu

4.2.4 Capability and development

The biomedical research workforce has grown substantially in India, which is mirrored in the institutions in this study (DST, 2023). Consequently, the experiences of researchers highlight mechanisms for continuous learning, supportive peer relationships and challenges in relation to time and resource capacity. Biomedical researchers are recruited from diverse academic backgrounds and were required to develop common skills to work well as researchers, particularly for those at early-career stages. Participants emphasised the role of on-the-job learning, which is expanded below:

> I was not familiar with animal handling in my UG and PG, but here it's a very important step in pre-clinical trials and in the development of drugs. So, they (colleagues in the research lab) showed me how handle animals, how to induce, studying the behavioural patterns and all…it's really helpful as I start to do deep research.
>
> Biomedical researcher, early career, B6, PCU, Tamil Nadu

The emphasis on learning through practice also goes hand in hand with the lab-based, team-oriented ways of working, where individuals are required to frequently train in new practices to address the research problem at hand. Other examples from researchers B7 and B2 described using new and novel instrumentation and protocols for working in locations outside a traditional laboratory. Researchers that were more established in their careers discussed on-the-job learning in the context of providing leadership to research teams:

> We are all trained to do research but none of us are trained to be lab managers. We learn as we go. You don't know how to manage this team of people. I have found over the years, I've read a lot, reading documents about running a lab. I used to talk to my colleagues about what works, what doesn't… this is often left to us.
>
> Biomedical researcher B8, PNIS, Maharashtra

Researchers in this study described a range of ways through which they are supported by peers and colleagues; examples included providing cover for teaching workload, peer encouragement, formal committees to raise concerns (particularly important for early career scholars), dedicated patent offices, and importantly, supervision. Notwithstanding the COVID-19 related disruptions to PhD supervision (Borgeson et al, 2021), which was a live issue during data collection and amplified in biomedicine due to needing regular access to wet labs and specimens for trials, early career researcher B6 stressed they experienced a structured approach to supervision. Researcher B2 at a PHEI emphasised that their work is scrutinised every six months; they are required to achieve specific work requirements, which includes publishing two research outputs from their doctoral thesis.

Early career researcher B9 described their work as following a predictable routine, where they have a project meeting at the start of every week to plan their tasks and "divide project overall deliverables into achievable tasks" for that week. The guidance provided by supervisors is considered influential to the shaping of early career scholars and to boosting their productivity. There is also recognition of the high expectations placed upon PhD students to undertake wider activity within their lab or research group:

> We have many students here on campus who are a kind of manpower support to us. I have been putting them on small projects where they complete tasks related to my project. However, it is all unpaid and they do this along with their academic studies. We demand a lot.
>
> Biomedical researcher B4, PHEI, Maharashtra

4.2.5 Discipline-specific collaboration

Researchers in this study described discipline-specific collaboration in biomedicine through several prisms: at the level of operational activities, including sharing resources between institutions or

undertaking training at an overseas institution, through to larger-scale endeavours, such as working with an industry organisation to solve a research problem. The scales of activity that researchers pursue are mediated by resources, leadership and administrative processes which differed by institution, as will be addressed in Chapter Five.

The most consistent discipline-specific collaborations heard through interviews and observed through fieldwork were collaborative activities that took place at a single institution, same department, involving faculty from different research groups. These collaborations are borne out of necessity; in recognition of the fact that some labs may "own" certain equipment or possess expertise in a technique, as described by researcher B2. Such activities are observed more widely in this discipline within other country contexts (AMS, 2016). Researchers' experiences of working with external organisations were not without challenges. Where collaborations of this nature were less successful, this was typically due to resource constraints:

> We would like to have collaboration with clinicians. In the West, there are no such issues accessing human samples. But as an academic institution, we are not associated with any major hospital here in Tamil Nadu. We don't do much research with clinicians. Those clinicians are not coming forward with research and I don't blame them, because they have pressure to see the patients.
>
> Biomedical researcher, head of department and lab director, B3, PCU, Tamil Nadu

Other challenges included limited funding to support collaborative efforts with industry, workload pressure, lack of institutional support, and not knowing how to form collaboration effectively. These are challenges in biomedical research collaborations experienced elsewhere (AMS, 2016) but are sharpened in the Indian context due to the substantial resource constraints on resources within many institutions.

4.2.6 Success and impact

Most biomedical researchers aspire to excel in the twin categories of publication and/or patent performance, but it is not without tension. The below narrative reflects the way biomedical researchers consider success in their discipline:

> Within our department, there are two types of success for researchers. Those that say, 'I want a product' and who set out to make products, secure patents and those that say, 'If I don't see a product, then I see a paper' and publish in peer-reviewed journals.
>
> Biomedical researcher B4, PHEI, Maharashtra

Most of the participants interviewed for this study spoke in detail about the publication requirements for their research, and the corresponding incentive structures. Researchers who published in a high impact factor journal and/or journal that was indexed in Scopus were able to receive additional incentives. As described by researcher B7, their performance in relation to publications was considered a "mandatory requirement" for their career development. This is a notion that is introduced to them from the early stage of their careers, as part of the requirements from doctoral degrees. While most agreed that their works ought to be published in journals of repute, some such as B4 noted institutional and departmental preferences, for example, to publish in journals that were also affiliated with the Web of Science, PubMed platforms and not just those listed on Scopus. Other researchers including researcher B7 also highlighted that India's UGC publishes a list of CARE journals deemed as quality publications. The point here is that publishing in high-repute journals is codified in this discipline as a clear metric of success. Critiques around quality and irreproducible studies have been a focus of earlier biomedicine research culture studies (Lushington & Chaguturu, 2016) but did not reveal themselves in the present study. Whereas, previously, biomedical research culture in India and in academic medicine has been described as a culture of cheap imitation and fraudulent research, and lacking originality (Jacob, 2019).

Patents as a measure of success is gradually being embraced among researchers in this discipline. Apart from one researcher B8 who described their institution's long-standing focus on product development, the majority of those I interviewed spoke largely in terms of ambitions and a desire for their work to result in patents and that mechanisms were being introduced within institutions to expedite these processes:

> We have to improve our industry collaborative works. Our college is also supporting start ups, but all of the processes are not yet implemented. But we must be able to convert out patent into products and think like a small entrepreneur. This is what our college is expecting and also what our ranking agency is as well.
>
> Biomedical researcher B7, PHEI, Tamil Nadu

Metrics around journal publications were more widely and deeply understood than metrics in relation to patents, which is described as an earlier stage of maturity. Where participants were probed on their views around the relative importance of publishing in high-impact factor journals versus patents as measures of success in biomedicine, their views were largely neutral. They described publication output as essential to their own career progress and capacity to earn income, but also as those outputs most positively regarded by their peers. Tijdink et al (2016) describe undesirable effects appearing in research teams from high expectations around publication. This includes a narrowing of focus in relation to research projects and hyper competitive behaviour (Tijdink et al, 2016). However, these issues did not feature as a central theme in this study. This is not to suggest that these experiences were not present across the sample population, rather that they were not evident in interviews.

Working in teams emerged as a dominant theme in norms and practices but most researchers framed success in individual terms. This echoes earlier work which suggests a disconnect between promotion criteria that rewards individual performance, and incorporation of team science approaches (AMS, 2019). Another idea that was a feature of some interviews was the traditional academic notion that "teaching is a part of research and research is integral to teaching". Researcher B11 emphasised that two decades ago, doctoral degrees were not mandatory to employment in higher education whereas PhD qualifications are now considered mandatory and increasingly, there is emphasis on post-doctoral experience, overseas experience and publications output. Others expressed that the collective value of these activities should also be realised through teaching and sharing knowledge with others.

4.2.7 Resources, infrastructure, and ongoing development of discipline

The provision and maintenance of infrastructure to support experimental work is crucial to biomedical researchers. While institutional factors mediate differences in the quality of infrastructure, researchers interviewed for the study described the various ways in which infrastructure is integral to their endeavours:

> I need to work with a highly sensitive thermal imaging camera…purchasing and dealing with sensitive facilities, costs come to 12 lakhs (approximately 11000 GBP). But the department has provided a huge support by investing in these and other facilities.
>
> Biomedical early career researcher B2, PHEI, Tamil Nadu

> Within this building, we have high tech research facilities that are supported by research technicians around the clock. We have an equipment portal, which allows us to see which instruments are available and we can book online.
>
> Biomedical researcher B1, PHEI, Tamil Nadu

> Despite the limited spaciousness of the lab, which is packed with instruments, and it can become tiring to move around…we have very good facilities, and we don't need to depend on other institutions for our instrument use.
>
> Biomedical researcher B9, PCU, Tamil Nadu

The complex, large-scale infrastructure to support biomedical research is expensive and moreover, as described by researcher B5, there is a need for all members of a research project team to manage the range of instrumentation on a routine basis. This includes early career scholars, technicians, and administrative staff. Researcher B8 also emphasised that the mechanics of "running big facilities is another level of how to work well with people", including with stakeholders beyond the discipline, whose

buy-in was crucial to sustain support for high-end instruments. Researchers had mixed views on whether the instrumentation was adequate at meeting their research goals. Established researchers such as B1 and B8 observed improvements to the overall provision of infrastructure over time, but other researchers who were early in their careers were more negative.

Researchers in this study had wide ranging experiences in relation to the time available to conduct research. The UGC Regulation on Minimum Qualifications for Appointment of Teachers and Other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education (2018, p. 50) set outs guidelines for 180 days of teaching, otherwise, a "minimum of 30 weeks of actual teaching in a 6-day week". Some institutions have expectations that go above beyond these requirements. For some of the biomedical researchers in this study including B4, their teaching responsibilities constrained their research activity to one or two days a week, which were largely focused on supervision. Researcher B5 working at a PHEI described two different categories of staff within their department; those who are teaching and research (whose work is split half-time between research and teaching) and a relatively new model of employment, that of research-active staff who able to dedicate more time to research activity and are employed based on strong research performance. These differences mediate the extent to which research activities feature as the primary purpose for individuals.

4.2.8 Interdisciplinarity in biomedicine

Most biomedical researchers in India described a broad conception of interdisciplinarity in biomedicine, including shared use of equipment and recruiting the most talented postgraduate students and early career researchers from a range of undergraduate disciplines such as chemistry, biology and zoology, among others. Some used interdisciplinarity interchangeably with multidisciplinarity, reflecting a varied understanding about these concepts. For research leaders such as B3, taking an interdisciplinary approach was important to "bring different ideas to the table" while maintaining overall rigour to the discipline of biomedicine. There were fewer examples of interdisciplinarity as involving integration of topics, methods and problems, which is how interdisciplinarity is more traditionally understood in scholarship (Alvargonzalez, 2011; Zhou, Guns and Engels, 2022). Nonetheless, there was a recognition that these approaches would be valuable in addressing novel and complex problems:

> There are many areas all over the world which are analogous to early Mars…In India, we have the Ladakh region which is analogous to early Mars. And we are trying to look at the geological timescale of that region to see if there was the presence of microorganisms and how they have developed. Also, we have AI where people are now trying to integrate artificial intelligence with microbiology and to understand how the infection progresses to be able to predict, and explore are there particular reasons for that infection?
>
> Biomedical researcher B4, PHEI, Maharashtra

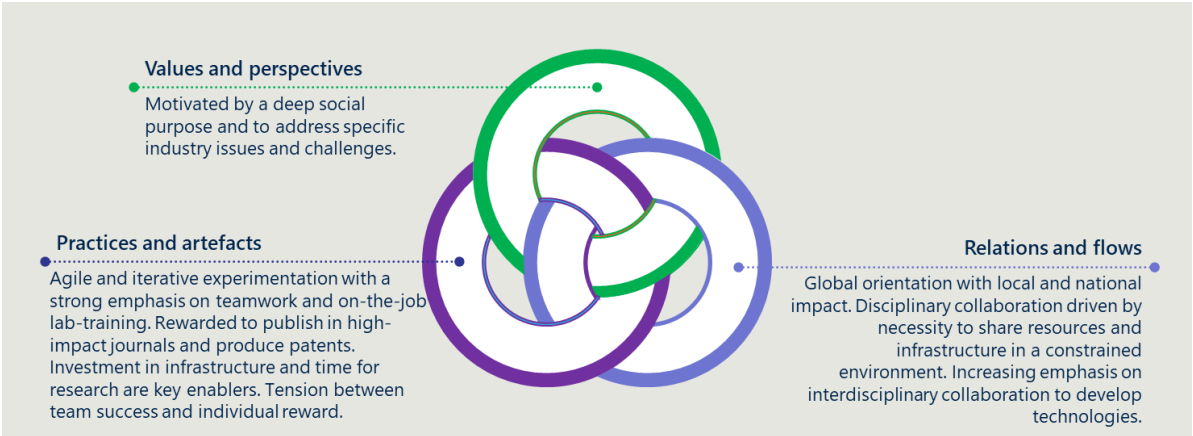
There was also an understanding of the challenges associated with interdisciplinary work and that this was a long-term endeavour for scientists in India. These challenges largely centred around funding and the capabilities of researchers and needed to be overcome to facilitate the interdisciplinary collaboration that was desired by some researchers. There was a clear sense that one discipline alone could not address the complexity of challenges facing society and it would also take more than a multiplicity of methods and practices, which is another enduring idea of interdisciplinarity (Rogers, Scaife & Rizzo, 2005)

The growing emphasis on interdisciplinarity is blurring the boundaries between biomedicine and related disciplines. And as Kastenhofer (2007) observes, there is a shift towards technology and to co-producing knowledge with industry, which leads to different types of products and outputs being developed by researchers. However, these activities were not occurring at scale across the sampling population. In sum, while the ambition is present for interdisciplinarity through research activity, the tangible actions and results have not yet materialised in the experiences of researchers involved in this study.

4.2.9 Biomedicine in India: agile and globally ambitious, constrained by resources

Synthesising the ideas above, the key features of the biomedicine research culture as shaped by the study population are characterised by a deep social purpose (*values and perspectives*) with a focus on iterative and shared experimental effort (*practices and artefacts*). Biomedicine research culture is characterised by a global orientation *(flows and relations)* and collaborating with others in the discipline in a cooperative way to share resources and infrastructure (*flows and relations*). Figure 4.2 summarises these characteristics under the three categories that make up the conceptual framework for this study and is followed by further detail on the key features.

Figure 4.2 Research culture conceptual framework, as applied to biomedicine



Features of biomedicine research culture also includes an aspiration for greater collaboration across disciplines (particularly in the development of technologies and products) and borders (by way of institutions, external organisations, and nations); an emphasis on agile experimentation, involving instrumentation and interaction with live specimens; and, where learning-on-the-job is a core practice.

Most researchers emphasised the importance of publications to their career progression, which is a feature of the originating Becher (1994) disciplinary classification. However, Becher did not anticipate the entrepreneurial and product-focused shifts taking place within biomedicine, as discussed in the approaches to knowledge creation (*practices and artefacts*). This is unsurprising given the developments in disciplinary practices since Becher's formative work. Biomedical research in the Indian context and likely in other country contexts also melds into the 'hard applied' disciplinary grouping, though the dominant mode of communication of knowledge and by which success is measured is through publications. As discussed above, this is reinforced through incentive and promotion structures.

Biomedicine has an exceptionally global orientation, with the role of technology playing an increasingly important role in connecting researchers and translating research outcomes for economic and social benefit. However, the ongoing investment and maintenance of infrastructure is a challenge at some resource-constrained institutions and partially explains the reluctance of industry to partner with HEIs in biomedical research. The potentialities of biomedical research to deliver economic value through patents and improve quality of human life and productivity make it a lucrative discipline for those that work within it as researchers and those engaged in the allocation of resources to invest in the discipline:

> There's a lot of emphasis on the technologies which we can put into the market…the low-cost technologies, and things that are frugally developed but which are going to be useful for our country and help make life better.
>
> Biomedical researcher, B8, PNIS, Maharashtra

But this also helps highlight some of the growing pressures in the discipline, as observed by those researchers who are grappling with the competing demands of producing patents as well as publications, and in narrowing the areas of focus for some researchers. Researchers highlighted other pressures within the discipline, including the impact of the UGC Regulations around teaching have a significant bearing on the time and capacity of biomedicine researchers to undertake research, which will be a focus of Chapter Six.

4.3 Computer science

The data focused on the experiences of research-active computer science scholars, coupled with insights from staff in leadership positions. While specific research interests varied between individuals, nearly all computer science researchers pursued a consistent set of practices and norms.

4.3.1 Motivation and initiation for research

Computer science researchers were animated by bringing about pragmatic, practical change across a variety of sectors and problem areas. Interest from an external partner was an important initiator for research in this field. Over half of the computer science researchers involved in this study described their experiences of responding to a call from a funding agency that was interested in investigating a particular subject matter. For instance, the Government of India's Bhabha Atomic Research Centre funding schemes encouraged computer science researcher C1 to examine the role of artificial intelligence and deep learning in the context of safe use of atomic energy. As a result of multi-country collaborations between India and countries like Germany and the USA, several researchers were invited to submit proposals in response to wider themes. These forces trigger a sequence of activities to initiate research endeavour in computer science:

> Usually whenever we come up with any research topic or we get a research call from the DST, first we need to see if that field is suitable to us or not. Everyone is not expert at everything…. so first we would filter, for whom this respective topic is going to be suitable, and what would be the benefit from these works for people…to understand why this research is needed.
>
> Computer science researcher C1, PHEI, Maharashtra

Other participants emphasised the role of wider life experiences, including working in other occupations that informed their research interests. Computer science researcher C2 described their prior experiences of working on the Indian railways system and how a former colleague approached them to contribute to a project on improving the way services were scheduled using artificial intelligence. This researcher emphasised that they previously saw themselves as sitting "somewhere in the middle" between theoretical and applied work, and the opportunity to put their conceptual research in artificial intelligence into practice was a compelling idea that came to them from industry. They have since worked with industry partners on various research projects, spanning multiple years, that have focused on artificial intelligence in the context of the scheduling for the Indian railways system. Successive research projects have also shaped the community that this researcher has nurtured around them, including the work of doctoral students who work on specific projects.

Computer science researchers in this study also spoke about the imperative to work on a novel research topic and the need to articulate an original idea to themselves and to others:

> Here in our team, we have a strong research ethics culture…we have to be able to say to ourselves and to each other, the idea that I propose is my own, the idea that I propose is novel and new.
>
> Computer science researcher C3, PHEI, Tamil Nadu

The importance of exploring new terrain in knowledge was reinforced by researcher C4, who described that the biological reactions associated with the practice of Yoga had been significantly unresearched. Their motivation to undertake an enquiry in this area was fuelled by a sense that the discipline and methods of computer science can help explore the role of Yoga practices in reducing cholesterol levels.

4.3.2 Scholarly practices

A plethora of intellectual traditions including mathematics and physics led to the formation of computing, and growing branches comprise the modern-day computer science discipline. Yet, according to participants, there are core practices that define this discipline, and the tools required to undertake research. In this study, computer science researchers are engaged in conducting simulations and experiments, developing technologies, programming using software and interpreting data. These form the major activities undertaken by researchers. Throughout the study, various programming software were referenced in describing research tasks, reinforcing the view that programming as a linguistic tool is "ubiquitous" with the culture of the discipline (Nofre et al, 2014; Petricek, 2019):

> We use open-source software for everything, involving for example, Python language programming to work on machine learning algorithms.
>
> Computer science researcher C7, PHEI, Tamil Nadu

> Most of my work is concerned with prediction…whether my hypothesis is correct using the software I have available. The implementation of results from our analysis is distinct to computer science. We have to prove that the result we've got is enhanced from the use of these tools.
>
> Computer science researcher C8, PCU, Tamil Nadu

The latter example is emblematic of the heightened expectations that computer science researchers place on themselves that the use of such software should aid their research endeavours. Relatedly, several researchers, including C8, emphasised an algorithmic mindset to conducting experiments and problem solving. Computer scientists are not only bound by their intellectual agenda and interpersonal networks, but also by engaging in a particular type of cognitive process (Tatarchenko, 2019). Terms including "predicting", "experimental", "trial and error", "simulation" (and prototyping) and "application and

development" were frequently repeated throughout interviews, consistent with an algorithmic way of thinking (Tatarchenko, 2019).

A central idea that was highlighted by all computer science researchers except for the early career scholars interviewed in this study was in relation to the importance of teamwork:

> It is an ecosystem of ideas, primarily people coming together and trying to think up something together. That is the half the battle in computer science projects and of course having the people to execute it; the people that have the technical background and so on. We spend six months together which will be usually enough time to develop a prototype and implement it in a reasonable form. But if it's a big, applied project, then it will take some more time…A group that has been looking at a problem for five – six months has a good chance of coming up with a project that has scientific value…
>
> Computer science researcher C2, PNIS, Maharashtra

Researchers insisted that teamwork happens alongside independent activity, particularly when analysing results and producing answers to individual researchers' hypotheses. It is not all a collective activity. Nevertheless, there were several ways in which teamwork played out across the research lifecycle:

- Establishing the aims and purpose of a research project.
- Inputting into the delivery of a method, through administering a software and collating data.
- Analysing perspectives on results, though there were examples of this work taking place independently.
- Developing skills, particularly technical skills, and offering and receiving mentoring from senior colleagues as well as from peers.
- Writing up findings and publications and disseminating research outcomes through conferences.
- Filing patents.

At times, the teamwork involved researchers from outside the computer science discipline, which will be later discussed in the context of interdisciplinary collaborations (section 4.3.8). Here I emphasise that many day-to-day undertaking of research activities took place within the context of a group involving computer science researchers. An exception to this dominant idea was expressed by early career researchers – both at the postdoctoral and doctoral levels – who were focused on the undertaking of their standalone research project where they were the sole investigator:

> We sit with each other and come together (referring to other PhD students and postdocs), but my PhD is very much my own individual activity. It is between me and my supervisor.
>
> Computer science researcher C10, early career scholar PCU, Tamil Nadu

Contrasting this narrative though, I also heard from several senior computer science researchers about the efforts to inculcate teamwork among early career scholars within their research units. Researcher L2, who was head of a research group, emphasised that as part of researcher training scholars were required to meet with their peers on the weekend to engage in shared learning on topics such as how to write seminar papers and present ideas to their peers in advance of formal presentations. This was emphasised as a structured mechanism to developing their research skills. The emphasis on individual work among doctoral students is an indication of the significance of the doctoral project for PhD scholars, which is now compulsory to gain employment (UGC, 2019a) and to establishing credibility among faculty peers in the context of future opportunities. Early career scholars were involved in a mix of individual and team-based projects.

4.3.3 Approaches to knowledge creation

In the present study, there were many examples of computer science researchers working in a purposive and pragmatic fashion, where their research efforts were geared towards developing products. These characteristics were consistent with Biglan-Becher's description of computer science as a hard-applied discipline (Becher and Trowler, 2001; Nerland, Jensen and Teklu, 2010). Approaches to the generation of new knowledge typically focused on specialisation within larger, established topics. Researchers within a team cooperated for a time-bound purpose to solve challenges and their theories add to the growing corpus of computer science knowledge (Nerlend, Jensen and Teklu, 2010; Katenshofer, 2007).

Yet, the experiences of researchers in this study also showed some deviation from these highly networked approaches, as shown below:

> What I say to my lab is that we need to work on ideas that make a difference. One is working with the medicine department on a diabetes related simulation, the other is involved in agriculture, and another with engineering. They all have the freedom to implement their own ideas in practice, but we come together to evaluate research outcomes and share technical skills.
>
> Computer science researcher C3, PHEI, Maharashtra

In this case, this researcher and their lab of early career scholars drew on a common practice, machine learning and artificial neural networks, but applied it across different thematic areas. While the nature of their projects and the scholars with whom they collaborate vary between each other, they cooperate as a lab because of their affiliation with machine learning. This is different from the earlier example of researcher C2 who was working on improving scheduling within the Indian railways system. All members of this research team were working on the same, complex project and contributing to various tasks such as "setting out the algorithm to this mathematical abstraction" and "working on a proof of concept". Early career scholars in this context worked with the senior researcher to identify and progress ideas within the

parameters of the wider project. Despite these different approaches to knowledge creation, computer science researchers as an epistemic community are focused on translating theory for practical impact.

4.3.4 Capability and development

Most researchers described a vibrant scholarly community, with established norms and ample opportunities for skill development:

> All the Professors here have observed that most of the PhDs we are seeing are now in computer science... that is why in my field in artificial intelligence, it is now very dynamic, very interesting. In our department, we have 120 – 130 full time scholars. When I joined, we had 20 faculty, now we have 300 faculty.
>
> Computer science researcher C5, PHEI, Tamil Nadu

In part, this may be explained by the meteoric growth of computer science in India over the past three decades, which in turn, has fostered an ecosystem where there is typically a critical mass of computer science researchers across most institutions (Demetrescu et al, 2022; Chandresh & Singh, 2019). The sheer scale of the computer science community also means that most researchers experience continuous "positive pressure" in that they are motivated to undertake research work by observing the practice of others:

> It is an intellectually enriching field, and where we all want to perform and we ourselves improve by learning from each other.
>
> Computer science researcher, early career scholar C6, PNIS, Maharashtra

This dynamic environment is not without its challenges. There was a critique of the long hours that are needed to be spent in laboratories and time spent outside of working hours to stay on top of reading, engaging in peer review and participating in wider discipline-related tasks. Ultimately however, most participants described in-depth the encouragement of colleagues, training in both technical capabilities and conceptual thinking, and fellowship schemes to support their research endeavour. Researchers C3 and C8 from different institutions emphasised that they both had sufficient autonomy to trial different ideas with no interference from either other colleagues or parties external to their department or institution.

Supervision was often described in highly structured and traditional terms. The practice of supervision at a private higher education institution in Maharashtra involved weekly meetings between doctoral students and their supervisor. The supervising researcher C9 also participated in regular group review meetings with fellow computer science researchers to discuss the progress of their doctoral student. This

role of the supervisor typically involved a blend of technical skills development, supporting the development of doctoral projects and where they routinely engaged with their supervisee through projects. The pastoral contribution of supervision was emphasised by the early career scholars:

> For a long while, I have wanted to drop out, but my supervisor was very keen for us all to finish within the stipulated time. They have had a lot of faith in me.
>
> Computer science researcher, early career scholar, C10, PCU, Tamil Nadu

Relatedly, as expressed by both early career researchers and established research leaders in this study, several computer science researchers straddled additional duties in industry or juggle working and family lives that created additional challenges in their development as researchers:

> If a student is a part-time researcher, or if a faculty is working part-time at another institute, then time which is required to be given to complete the PhD. The priority therefore becomes the job…as a teacher, or if he is at a company, and the second priority goes to the PhD because of the work pressure.
>
> Computer science researcher C9, PHEI, Maharashtra

4.3.5 Discipline-specific collaboration

Working in teams of computer science researchers to solve a shared empirical challenge is a commonly practised example of discipline-specific collaboration. Two further examples which will be discussed here include researchers' desire to collaborate with industry and non-academic organisations and the role of international collaboration.

The indisputable trend in computer science research is towards multi-researcher collaboration; successive scientometric analyses have confirmed that most papers are produced by more than one author and Indian researchers collaborate with a greater range of international partners year-on-year (Singhal et al, 2016; Chandresh & Singh, 2019). The value of collaborating with industry to address a real-world issue for the purposes of economic and social development was a key narrative expressed by many participants and across various stage of a research project:

> My last project was funded through the BRNS who promote research in the country by collaborating with different organisations, academicians, industry. So, in developing the problem statement, we the working PIs for project across the collaborations… together we came up with the research goal.
>
> Computer science researcher C1, PHEI, Maharashtra

> Right now, I am working on an industrial project… they are very target-oriented and expect to see solutions. This kind of collaboration elevates our thinking and overall, what we can do output wise… on the flip side, there is pressure from industry, from the much more target-oriented focus.
>
> Computer science researcher, early career scholar C6, PNIS, Maharashtra

Importantly, the latter example highlights that while collaborations with industry are desirable to achieve 'real world' impact, they are not without their challenges. Researchers L2 and C9 spoke about the mismatch in aspirations between industry partners and researchers, that some industry partners are reluctant to work with computer scientists, and that the interactions between industry and researchers are not yet mature as compared with Silicon Valley in the US.

Most participants described collaborations with industry in the context of research projects with defined aims, resources, and method, and some computer scientists described their role as one of trusted advisor, to provide organisations and governments with expert knowledge, as well as in the context of research administration, for example accessing patient data from a hospital. These interactions were highly structured with protocols set out to facilitate effective engagement.

In relation to international collaboration, Indian computer scientists are highly networked with the major computer science researching nations of the world, including the US, Singapore, Canada, UK, Germany and France (Singhal et al, 2015; Chandresh & Singh, 2019). The international orientation of computer science is a point of attraction for researchers:

> What is distinctive here is that we are working across a number of areas where there is a lot of international research…this is a field with a global orientation where we have lots of opportunity for international work.
>
> Computer science researcher early career scholar C6, PNIS, Maharashtra

The degree of exposure to international collaboration varied by institution type, with a significant volume of activity concentrated in the PNIS, which is consistent with the purposes of the IITs and will be discussed in Chapter 5 (Singh, Uddin, and Pinto, 2015). While international collaboration is important to the advancement of new knowledge in computer science, narratives in this study highlight its role in furthering the careers and capabilities of computer science researchers in India. Over half of computer science researchers in this study had completed their doctoral degrees or postdoctoral training in another country, typically in the USA or UK.

4.3.6 Success and impact

Success indicators are clearly and universally codified in the practices of computer science researchers, which drives their day-to-day behaviours:

> For us, success looks like publishing in an indexed journal, a highly reputed journal. This includes any conference presentation we make, even these we wish to publish in a Scopus-indexed journal. Need to concentrate on these journals.
>
> Computer science researcher C7, PHEI, Tamil Nadu

The imperative to publish in a journal of repute was a prevalent theme across researchers working in this field, irrespective of institution, and was directly attached to the financial benefits they accrued. While the value of benefits differed between institution type, the overall approach to incentivisation was similar within the discipline. One researcher C5 explained the mechanics of this process; if they published in a journal that was ranked in Quartile 1 or Quartile 2 (as defined by the SCImago Journal Rank), such as the Journal of Ambient Intelligence and Humanized Computing and with an impact factor of 6 or 7 (as measured by Clarivate, a journal intelligence platform), they would then receive an incentive between 8,000 – 10,000 INR together with their monthly salary. Further, they explained that similar arrangements were in place for patents, where they would receive 3,000 INR per month for their work or publications arising from the patent and could also receive a 10 per cent commission on their salary for participation in funded research projects.

These are all measures that go above and beyond the base salary that they received as researchers. And while most researchers were generally favourable about these measures, citing that it was helpful in developing their careers, not all were positive:

> All of this is the motivations that are given to each and every one of the faculties, they (university) try to motivate us and so we can publish in good journals and get good results for academic's sake…we also receive recognition at our annual meeting through the Best Citation Award.
>
> Computer science researcher C5, PHEI, Tamil Nadu

> As researchers, we now conform to those successes (well-reputed, high-impact journals) but only 10 per cent of our focus feels like it is relevant to society, not just for industry. Are we transforming basic research? That is the itching in my heart.
>
> Computer science researcher, early career scholar C6, PNIS, Maharashtra

These contrasting perspectives partially reinforce Chakraborty's (2017) assessment that researchers in India are overly concerned with publishing rather than producing quality works, a criticism levelled at

many other disciplines. For many of the researchers interviewed in this study, their aspirations also challenge these sentiments, in that publishing in high-impact journals went together with producing work that had a wider social impact and was deemed as high quality by their peers. Some researchers encountered difficulties with the peer review and publishing processes associated with top-ranking journals; one early career scholar observed that some publishers do not provide adequate support:

> They gave us unhelpful comments and did not acknowledge my article for a long time. I also posted questions on the community forum, and no one answered my questions.
>
> Computer science researcher C10, early career scholar, PCU, Tamil Nadu

Participants discussed a growing focus on patents, spin-offs, income generation activity and improving efficiency within industries. It reflects the wider focus around commercialisation and the possibilities presented through this discipline to generate economic and social value for communities. These outputs are consistent with the computer science research output in jurisdictions such as the UK, as collated through an analysis of impact case study documentation in Research Excellence Framework (Koya & Chowdhury, 2020). The interviews reveal a maturing of the discipline that goes well beyond the characterisation of computer science as a field in service of "training engineers of all specialisations". It is now firmly in the business of knowledge-creation and, increasingly, knowledge translation (Narasimhan & Rao, 1984; Xie & Willett, 2012). There is a desire to show value for the effort undertaken by researchers through practical changes in industry and other settings:

> Nowadays with different specialisations of machine learning, deep learning, cloud, cyber security… we have a lot more scope where everywhere we can apply the concept of computer science and we can help the people of those respective fields to analyse their data more properly.
>
> Computer science researcher C1, PHEI, Maharashtra

During a visit to the public national institute of significance in Maharahstra, I was signposted to consider the work of the Industrial Research and Consultancy Centre by several computer science researchers. The purpose of this dedicated unit is to "enhance engagements with industries and public sector organisations and develop sustainable long-term interactions with industry", including through sponsored research projects, sponsored research labs and facilities, and endowed Chair professorships (IIT, 2023).

The resources and infrastructure available to support researchers to engage in translation activity differed between institutions and will be examined in Chapter Five. However, as with publishing in journals of high repute, the ambition to undertake translation activity and demonstrate impact of research beyond publications was frequently heard. Challenges associated with translation activity including funding and competing demands between publication expectations and translation efforts. These were also well-rehearsed issues among these researchers, and this is case with the discipline more globally (Abramson &

Parashar, 2019). While these issues may not be distinct to computer science researchers working in India alone, the findings from this study illustrate that their impacts may be felt more sharply in this country context.

4.3.7 Resources, infrastructure, and ongoing development of discipline

Rapid developments in technology have altered both the characteristics of computer science in the problems that are able to be explored, and in turn, the resources that are available to undertake research. A key idea that emerged from interviews was the widespread agreement about the key resources that were needed within this discipline and the ease with which research could be conducted within computer science:

> See in contrast with other fields, we don't need much to do research works in computer science – all you need is the cloud and a brain.
>
> Computer science researcher C2, PNIS, Maharashtra

> For us, our research environment is all about our mind, the laptop and the graphical processing unit which can handle large data.
>
> Computer science researcher C8, PCU, Tamil Nadu

> Generally, we use our computer lab, cloud software and online resources such as Elsevier. Of course, we need Wi-Fi. And if we need licensed software, say cloud computing, resources at the department level needs to be sanctioned.
>
> Computer science researcher C11, PHEI, Tamil Nadu

Being able to access the hardware (computing machinery) and software (programs) which was often cloud based and widely available, constitute the core resources required to enact computer science research. Of note were the advantages that the accessibility of these resources provided to researchers – they could work from home, they were able to work with other researchers with ease, they could access resources quickly with little procurement difficulties and they were able to interact with colleagues in other jurisdictions and time zones. Researcher C3 remarked that as computing was becoming cheaper generally, therefore the funding required for resources was not as substantial as in other disciplines. However, institutional differences mediated the breadth of licensed software that was able to be procured.

Two researchers C4 and C8 spoke about needing to work with medical instrumentation and other biomedical equipment as part of an interdisciplinary research project. However, they worked with other researchers from those disciplines to gather that data and analyse it using methods and resources that

were already available to them. Other researchers observed the different concentrations of resources and investment in computer science projects between regions and between urban versus regional precincts within regions:

> In Chennai, we now have fully fledged and funded projects… But if you go further South to places like Salem, Coimbatore, Madhurai and Trichi, the projects are only now picking up.
>
> Computer science researcher C5, PHEI, Tamil Nadu

This trend is not necessarily unique to computer science and will be discussed further in Chapter Six. Unlike the availability of hardware and software and the ongoing investment in these resources, access to data sets is complicated terrain for computer science researchers and research leaders in the Indian context. Researchers require large volumes of data, often public data, and data from external parties to be analysed. Importantly, they require data that is *usable* in form, highly accurate and often in real-time:

> We make our predictions on data sets and implement calculations based on these. The challenge is that this data is only available on some approved websites, and even then, sometimes they're not sufficient for use when we have to conduct tests on them.
>
> Computer science researcher C8, PCU, Tamil Nadu

Access to data is not merely about a repository of information; the material must be in a form that allows computer science researcher to conduct analyses and make predictions. As with programming being a language in computer science, data provides the pathway for researchers to collaborate with industry and design products for users. Researcher C5 described how handling data is a daily and critical component of their role, as they must integrate it with other software to conduct analyses, satisfy ethical protocols to handle data sensitively and ensure the accuracy of the data set is maintained throughout the life of a research project.

Obtaining data that is sufficient in size and scale and able to be acquired in a timely manner can provide a challenge for researchers. Researchers described how some data sets are not available or require investment that is not able to be met by the department or may be difficult due to human factors (for example, participants in a research project hesitant to share data). On the other hand, some researchers including C3 that were working on small experiments, involving data sets from an interdisciplinary research endeavour or because of a collaboration with a local partner, reported positive experiences.

4.3.8 Interdisciplinarity in computer science

Interdisciplinarity was a central focus for computer science researchers and actively encouraged by their departments and institutions. Researchers in this study conceived of, practised and derived success in different ways in relation to interdisciplinary collaborations. Several computer science researchers

including C8 and C3 framed their research contributions to be in service of other disciplines, and in doing so, address "real-world" problems through improved use of technology in those other disciplines, as shown through the first example in particular:

> Computer science alone cannot do anything. We have to collaborate with other fields, to check out the drugs trials that are happening in diabetes and help simulate those trials. The main challenge for us is to understand the other fields… they (biotechnology researchers) come to us for the analysis of proteins, and we can help them with how to read values easier... We cannot be limited to our tech status.
>
> Computer science researcher C1, PHEI, Maharashtra

> It is mainly about interdisciplinarity for us...we have a project with the nanoscience department for example… our research is useful when we can translate the knowledge, we have to meet industry needs and demands.
>
> Computer science researcher C8, PCU, Tamil Nadu

The latter example offered a slightly more proactive framing, underscoring the role of computer science in co-designing the research agenda and solutions with another discipline to address those very same industry-related challenges. These and other narratives from computer science researchers affirm there is no one way to engage in interdisciplinary collaboration.

Literature points to growing consensus around the activities that constitute interdisciplinary and multidisciplinary collaboration (Alvargonzales, 2011; Morillo et al, 2003); though this practice as distinct from other types of collaboration was not always understood by researchers in this study:

> What we do is go to another department, say the Department of Electronical Engineering and say how can we be helpful to you. What are they working on where image processing and artificial intelligence can add value.
>
> Computer science researcher C3, PHEI, Tamil Nadu

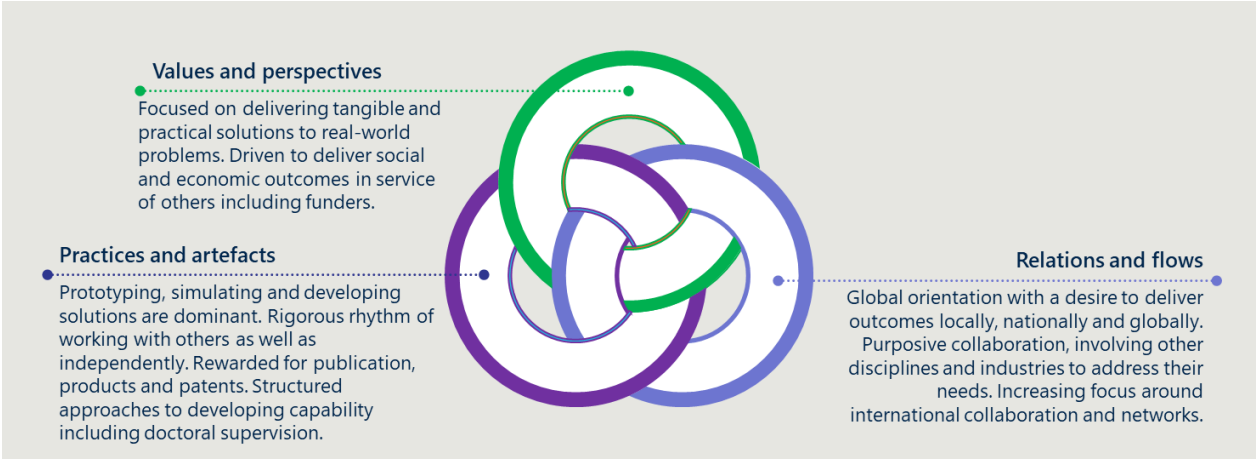
Other examples provided were about examining a subject from different perspectives or leveraging computer science methods as part of another research project. These were all fruitful exercises for researchers in the context of the problems being addressed. However, literature stresses interdisciplinarity as the integrating and interacting of theories, concepts and methods (Alvargonzales, 2011; Morillo et al, 2003). The examples detailed by participants in the study did not amount to these sophisticated approaches of cohesion, particularly in the integration of methods and practices.

Success in interdisciplinary collaboration, including within computer science is typically framed around citations, in terms of both diversity of fields and intensity of citations from various scientific communities (Zhou, Guns and Engels, 2022; Chakraborty, 2018). This is echoed in the current study and, furthermore, drives some of the choices for the disciplines that researchers collaborated with. These typically included engineering, biomedicine and other practice-based, globally focused disciplines. I heard no examples of collaborations between computer science researchers with humanities or social science disciplines, which present with different challenges in relation to ways of working (Goulden et al, 2017) but may also meaningfully contribute to the "real-world" ambition of interdisciplinary collaboration.

4.3.9 Computer science: purposive and oriented to addressing real-world challenges

Drawing on the material above, the key features of the computer science research culture in India are being motivated to bring about practical, pragmatic change *(values and perspectives)*, through prototyping, predicting and developing solutions in the form of software and products *(practices and artefact)*. The orientation of research culture in computer science is towards delivering immediate social and economic benefit and deriving value beyond publications (*norms and practices*). The computer science research culture is one where there is shared collaboration towards a goal, including with adjacent disciplines (*flows and relations*) though there are limited examples of genuine interdisciplinarity. The discipline reflects a global outlook that is simultaneously concerned with national and local agendas (*flows and relations*). The conceptual framework is applied below to computer science at Figure 4.3 and is followed by further detail on the key features.

Figure 4.3 Research culture conceptual framework, as applied to computer science



Based on the cases researched for this study, computer science research culture emphasised teamwork as a core organising principle, with individuals performing task-focused roles as well as contributing to the skills development of peers and the generation of new knowledge *(practices and artefacts)*. Overwhelmingly, computer science researchers are engaged in activities with other scholars: in national

and global contexts, in addressing research challenges with other disciplines and in translating research outputs for industry purposes through products and services.

As shown in this study, despite the *positive pressure* of peers and communal nature of the discipline, some researchers also go against these forces where they may have specific areas of research interest. The ease for researchers in this study to work on multi-country collaborations with scholars in Germany and the USA through technology and shared programming languages transcends geographical boundaries and differences in custom. Arguably, the culture of computer science research in India lends itself easier to international collaborations because programming, software and other researcher practices are universal in form; the nature of knowledge is therefore easily reproducible and accessible in other jurisdictions:

> The strength of our research culture is the core knowledge we deal with. It is mostly accessible, no matter where you are working in the country or the world… and we have our own minds and creativity to only keep adding to it
>
> Computer science researcher C8, PCU, Tamil Nadu

Similarly, while it is possible to derive financial value from research outputs such as patents, spin-offs and working with companies at a local and national level, the opportunity for these outputs offered benefits at the global scale as well given the connectivity of the financial cycle. As asserted by several researchers in this study, given the low costs associated with investing in technology, the benefits that could be reaped from nurturing a vibrant computer science discipline in India are significant:

> We are choosing to work on topics that India's future depends upon, for example, improving agricultural practices and crop predictions, this is especially important in our region (Tamil Nadu).
>
> Computer science researcher, C3, PHEI, Tamil Nadu

These findings should be read with some caution about whether the discipline is influenced by disciplinary norms alone, as some HEIs were expressly focused on commercialisation of research activity and invested heavily into these activities. This will be examined further in Chapter Five.

4.4 Historical studies

Despite some of the epistemic differences across the disciplines that comprised the historical studies cluster, there was strong alignment among researchers in relation to ideas about research cultures. Points of variation between the individual disciplines that comprised the historical studies cluster including political science, sociology, archaeology, Indian philosophy and of course, history will be discussed as relevant.

4.4.1 Motivation and initiation of research

Generally, researchers emphasised the importance of having freedom to pursue topics they were personally interested in, and where they could provide new insight to the world around them, particularly within a national or regional context. The context for initiating a research endeavour within this field was striking in its diversity:

> I take up issues based on their contemporary relevance. So, within my field, that's things like policy paralysis, governance mismanagement, issues in Indian rural governance. They then drive me to identify potential subjects for research. It's a back-and-forth process…
>
> Historical studies researcher H2, PCU, Maharashtra

> I was suggested by my guide (during PhD) to look into the Dravidian movement and about the contribution of Periyar. From then on, I examined how the current political ideology (in Tamil Nadu) gels with Periyar's ideas.
>
> Historical studies researcher H9, PCU, Tamil Nadu

> Today, more researchers are looking at micro histories, issues such as tribe, gender, caste, the whole picture is more enriching as opposed to the typical political and economic histories that were written in the earlier century.
>
> Historical studies researcher H4, PHEI, Maharashtra

However, realising these ambitions against time constraints and publishing expectations were difficult. Researchers required "extra energy to be creative," but teaching and supervision demands constrained their ability to do so. In turn, some researchers including H5 observed a "schizophrenic personality" within themselves and their peers, who produced "verbose work that is not useful".

Other researchers such as H1 observed the lack of institutional support for historical studies, which added to the pressure towards undertaking research with practical value, rather than topics that occupied their genuine motivations. Researchers in these fields were cautious in their approaches. For instance, researcher H1 described that disciplines such as archaeology can become embroiled in political

controversy which creates difficulties for researchers to access sites and communicate their findings. Despite these challenges, most researchers persisted with investigating areas that were of personal concern.

Historical studies researchers emphasised identifying a topic initially and then working to secure the funding and infrastructure to undertake the research project. Despite the provision of support available through discipline-specific funding agencies, with participants providing the examples such as the Indian Council of Historical Research, the Indian Council of Social Science Research and the Indian Philosophy Centre, many researchers described the scope of these agencies as narrow and the available funding as being extremely limited. Several participants mentioned that there was growing interest from funders based outside of India in supporting researchers working on historical studies:

> A lot of research is happening abroad on colonial Indian histories…you have projects like the Wellcome Trust, the Leverhulme Fellowship… then Harvard and Yale in the US, and even the Centre for Modern Indian Studies in Germany, who are inviting scholars to conduct research about India, while being based in Germany.
>
> Historical studies researcher H4, PHEI, Maharashtra

Researcher H9 shared their formative experiences of travelling to a UK university that was well known in their chosen field of protest literature, and in turn, drawing on these perspectives in their own engagement of protest literature within the Indian context. These perspectives challenge the characterisation of historical studies as a grouping of disciplines that are inward facing and as insular (Trautman, 2012). While often concerned with topics at the level of sub-national regions and India at large, these examples demonstrate the diverse sources from which historical studies research is initiated.

4.4.2 Scholarly practices

A core question that was posed to participants was: "What are the practices and ways of working within your discipline?". In response, universally, researchers in the historical studies discipline spoke about their experiences working in a highly independent manner. Where there was a need to engage others, this would be pursued in a planned manner. Typically, once researchers had identified areas of research, they would undertake a set of methods that helped them answer their questions in an individual manner:

> For records, we rely on the Tamil Nadu archives which contains records from 1300 BC. For those working in temple studies, they can get accessible records in a compatible form which is mostly available as a record. It is mostly an individualistic activity, unless it's a biographic study, where they will have a conversation with another individual or more.
>
> Historical studies researcher, H9, PCU, Tamil Nadu

Participants interviewed for this study described a consistent set of practices which primarily consisted of sourcing material from archives and libraries; translating, interpreting and analysing texts; making meaning from places and artefacts (in the cases of archaeology, this included the process of excavation); synthesising material to draw out wider implications (for example, understanding the dynamics of casteism in wider political decision making); and, communicating findings through a publication, presentation or other modality. These practices united scholars working across a range of sub-disciplines within this cluster (Lambert & Schoefield, 2004):

> I'm supposed to read, write, and interpret by myself. For that I don't need laboratories, I need books, I need journals, access to published materials.

Historical studies researcher, H10, PNIS, Maharashtra

A key difference between this cluster of participants and those working in biomedicine and computer was the absence of experimentation and the importance of individual perspective on an intellectual challenge. This clarification is crucial to explaining the practices within historical studies, which was posited in the following terms:

> Empirical analysis is a part of our research yes…but we are not interested in answering a question in a straightforward manner. We are not interested in answering as yes or no. We are interested in uncovering perspectives, understanding the gaps in a particular issue, and trying to contribute a view, that view can be antithetical to established views.

Historical studies researcher H2, PCU, Maharashtra

Pickstone (2007, p.515) asserts that historical models need to be dynamic and interactive, as they are ultimately concerned with encouraging critical inquiry. This was also evident for many participants in this study, including scholars in Indian philosophy, political science, literature and archaeology. Here, ideas of reinterpreting material through a wide range of perspectives were central to their ethos and norms.

4.4.3 Approaches to knowledge creation

The disciplines within the historical studies cluster were characterised by soft paradigmatic cohesion, where researchers held diverse beliefs about the theory, methods and problems they pursue (Muller, 2009; Alexiadou, Kefala & Ronnberg, 2023). Researchers continuously evolved their approaches and areas of focus, driven by external and internal influences:

> I need to move with the trends, because it is important to government, and they are interested in particular themes. Previously I was working in wholly in primary education and social systems in Tamil Nadu, now I am broadening these ideas from the regional to the national level.

Historical studies researcher H9, PCU, Tamil Nadu

Issues of government concern and shifts in geographical focus were emphasised in the above narrative. Other levers included temporality, for example, examining the impact of Dravidian ideologies in the development of national identity following Independence at key time intervals. Some researchers such as H2 worked across tangentially related fields. H2 started at "issues of gender development and public policy" but later became interested in "local governance, particularly, local governance and urban local governments". This illustrated a level of flexibility to work across a wide terrain using a common set of methods or epistemologies, in this case, political philosophy. Influential mentors and other scholars within the disciplinary cluster also had a role of in shaping the bodies of knowledge that are of interest to researchers. Most researchers in this study focused on problems pertaining to the Indian context, though this was not always the case. Sometimes they had multiple areas of focus or explored a central concept across different country contexts.

The way the disciplines within the historical studies cluster are organised within institutions created some challenges in the way researchers went about their work. Researcher H1 critiqued the "peerisation of disciplines", where a discipline such as archaeology was placed within the ancient history department, despite employing different methods and approaches in the way they conduct their research. In this case, researcher H1 also highlighted that there was less emphasis on archaeology during ancient and pre-colonial time periods because of how it was clustered with another discipline. In turn, this was also perceived to create knowledge gaps across key time intervals within archaeology. As previously discussed, there were several disciplines that formed the historical studies cluster for the purposes of this study. Similarly, these narratives highlight that researchers of different disciplines were consolidated within common department and team within HEIs.

4.4.4 Capability and development

The ongoing decline of history as a field within Indian higher education, both in relation to student demand at the undergraduate level and the overall significance of the discipline, has been previously documented (Deshpande, 2013). Unsurprisingly, this constricts the pipeline of research scholars in history and in the related disciplines included in the study. These narratives were frequently described by participants, as a reason for the low level of research output as compared with other disciplines. Researchers interviewed in this study also emphasised that prior undergraduate experiences stifled critical thinking and originality of ideas, which was seen as essential to fostering interest in research. Several participants expressed feeling either implicitly or directly discouraged to undertake research:

> I remember our classes were much more about taking down notes and then repeating these in the exams. They (teaching staff) didn't expect more than this. In fact, they would reprimand you if you were going to ask too many questions. It was seen as being…which I can only express as a

> Tamil word… Adhiga Prasangi, like you were getting ahead of yourself… I was told to not ask many questions.
>
> Historical studies researcher H1, PNIS, Maharashtra

The concept of *adhiga prasangi* as used here, referred to a perception that one was speaking boastfully on matters where they were not qualified. For researcher H1, it reinforced a lack of confidence in their abilities to undertake research and sent a clear signal that research was not important. This tension was experienced by several researchers that worked within historical studies who were neither confident nor supported by others in their endeavours:

> We absolutely have no exposure to serious research when it comes to literature research, and neither are we given any training or any specific kind of orientation… I have active interest in research in my field, but I have not tried to develop my knowledge because frankly speaking, there's no motivation to work seriously.
>
> Historical studies researcher, H3, PHEI, Tamil Nadu

Researcher H10 recounted an experience of a promising PhD supervisee who wanted to discontinue within their first six months of doctoral research because they felt "traumatised" that they couldn't cope with the demands of study. Many of the works within their field were only available in English, whereas their prior medium of instruction was Malayalam, a regional language. These disparities are explored further below and in Chapters Five and Six.

Further, the so-called best students from school and undergraduate studies were perceived to be not attracted to historical studies, opting to choose other disciplines or pursue careers outside the academy. In addition, while participants pointed to examples of courses in research methods and engaging in fieldwork, they asserted that these were insufficient and that researchers lacked a proper understanding of these concepts. These perspectives, particularly the absence of creativity, are affirmed in recent findings by Singh and Chaudhary (2018), though the disciplinary groupings do not match like for like, nor do they compare the role of creativity in their disciplines of study in relation to other disciplines. The claims made by participants in this study also reinforced the current tilt of India's National Education Policy towards improving creativity in the curriculum (MHRD, 2020b).

4.4.5 Discipline-specific collaboration

Most works in historical studies continue to be produced as single-author and large-scale collaborative projects are rare; however, an expanded view of collaboration modalities to include activities such as joint workshops and seminars had greater relevance to participants in this study (Ahnert et al, 2023; Scripps et al, 2013; Marcovich, 2018):

> Conferences and seminars… that is the way we try and connect with scholars from outside (the university) and from within India that are working in our field.
>
> Historical studies researcher, H5, PCU, Maharashtra

As described by researcher H4 and others in this study, these forums occurred mostly informally where there was no "structured approach" for these collaborations. These exchanges were not only always research-focussed; they were also opportunities to share teaching practices and involved student exchanges at postgraduate level. The quality of these exchanges was reported as being mixed. Several participants expressed that they interacted with other researchers primarily through Google Meet and Zoom, where the infrastructure was patchy at times (in part, this may also be due to the coronavirus pandemic, which was a live issue during data collection). Some researchers lacked resources and the networks to build meaningful relationships with others beyond their institution and was considered a less important priority by leaders and decision makers.

However, several participants emphasised the value of informal gathering in doing two things: providing constructive criticism on each other's work and cooperating with each other through sharing resources: it was less about initiating a joint endeavour. Researcher H4 who was examining the history of public health in Maharashtra during the colonial period shared their experiences of coming together with historians from that field at the end of every month, where they would initially present their ideas. Following this, a further discussion followed with the other historians that helped generate new insights and "locate new resources they may have missed out on". The value of this collaboration helped sharpen their ideas.

There were few examples of collaboration between the academic world and other organisations. Beyond the purposes of accessing archives of specialist institutes and government-sponsored libraries, there was a reference from researcher H1 to an example of an archaeology researcher who needed to acquire a permit from a regional government to conduct excavation. Again, this was less about collaboration to solve a research challenge, and more about an enabling administrative function.

Lowe and Phillipson (2009) underscore the importance of institutional relationships and wider funding opportunities in shaping disciplinary collaborations; in the current context, relevant agencies, notably the Indian Council of Historical Research (ICHR) and the Indian Council of Social Science Research (ICSSR), encourage interdisciplinary and international collaborations and with external organisations (ICHR, 2023; ICSSR, 2023). Despite these initiatives, there were no examples of these narratives in participant interviews.

4.4.6 Success and impact

There was a clear tension between measures of success that were deemed of significance to researchers with the metrics that were rewarded by institutions and by the Indian higher education system at large.

While participants acknowledged that publications in high-impact journals and producing highly cited works were two key indicators of performance, other examples were provided as measures of success that were more personally significant to researchers:

> I am most interested in getting the information out in the public domain. For example, when a site is being excavated, it is more likely to appear in the regional newspaper. This is important to us so there is information flowing between the research and the community.
>
> Historical studies researcher H1, PNIS, Maharashtra

> We now have the XX (deidentified for anonymity) colloquium…which is a forum where we share common themes from our work, and then we submit these to government. The government then provides finances for these ideas.
>
> Historical studies researcher, H9, PCU, Tamil Nadu

The latter example hints at a form of advisory services to governments. Researcher H5, who self-identified as an activist researcher, defined their success as being an effective advocate with "government, civil society, the political parties and elites in general" to bring about changes in policy. Some researchers within this field attributed meaningful engagement from students, for example, the completion of doctoral projects – as key success measures of knowledge creation and dissemination.

Another dominant narrative that emerged through interviews focused on producing *highly original* pieces of work:

> When you are able to say something new and different to the current problems facing the history of Philosophy and you're able to produce works in an accessible language, that's important work
>
> Historical studies researcher, H8, PNIS, Maharashtra

Building on this narrative, those that were perceived as being most successful in this discipline by the study populations were those who could demonstrate significant originality by way of relating to contemporary problems, translating works and ideas to regional languages and elevating underrepresented voices (one researcher spoke about their work of amplifying the voices of Dalit writers in Indian literature). Conversely, some researchers including H11 remarked that doctoral students were not interested in uncovering new areas because they wanted to tackle easier topics so they could complete their PhD quickly. There were concerns that institutional and system-related pressures were compromising the originality of research, particularly among emerging research scholars: "we need a liberal, competitive culture but what we have is perversely competitive".

The pressure to publish research papers and complete doctoral theses to gain employment within higher education institutions, as compared with the purpose of producing novel and original research, will be

revisited in Chapter Six. As illustrated below, these activities as measures of success created challenges within the historical studies discipline for early career researchers through to more established scholars:

> As an academic, I feel a pain within my discipline because there must be enough robustness. We can't be affording to repeat or reproduce the same questions, the same ideas, for what has been going on for the past 50 years. The narrative must change, the questions have to change. We have to ask more challenging questions, more provocative questions. That is something which gives me sleepless nights. I do my part, but there are lots of old school scholars who need to bring about this change.
>
> Historical studies researcher, H10, PNIS, Maharashtra

4.4.7 Resources, infrastructure, and ongoing development of discipline

Adequate time to conduct research, and the reciprocal translation of works in regional languages as well as in English, were two central ideas described by many historical studies researchers. Researchers emphasised that a heavy teaching workload took up more than half of their working week and restricted the time available to conduct research activities. I highlight one such example drawn from fieldwork to illustrate this further. While I was conducting an interview with researcher H5, they were interrupted both by a revolving door of students wanting to meet with them and by fellow staff in relation to administrative matters, so we had to stop and start the interview several times within a relatively short time duration. This was a typical experience of their working days, where there was no clear separation between various teaching, research and administrative activities. In such a time-constricted environment, they argued that research endeavour was the first to go.

Another researcher highlighted that the administrative tasks associated with their teaching responsibilities had grown significantly in complexity, and it was increasingly difficult to get time in the day to go to the library:

> We are overburdened with the teaching load. Imagine if I have to do 20 hours of teaching and then the admin…if I am continuously engaged in teaching responsibilities where and when will I do research?
>
> Historical studies researcher H2, PCU, Maharashtra

Taking this idea further, across several institutions, the overall volume of faculty had reduced but their teaching demands had either remained the same or expanded and there were several vacancies that needed to be filled. These issues will be a focus of Chapter Five.

Lastly, a third of researchers within this grouping mentioned their purpose, as set by their institution, should primarily be concerned with the teaching of students rather than research in an otherwise resource-constrained context.

On the other hand, the work of India's National Translation Mission (NTM) is one of the nation's most important projects in knowledge creation and dissemination. Associated challenges in the unevenness of translation initiatives across disciplines, the so-called homogenisation of translating works in Indian languages to English and encouraging the development of works in Indian languages, are well-rehearsed issues (NTM, 2023; Gridhar, 2009). For historical studies researchers, there is a sense that limited translated works inhibits them from conducting original inquiry and accessing knowledge:

> Most of these books are in English and at least 50 per cent of our crowd speak Marati or Urdu or Gujarati or sometimes even Hindi because people come from other parts of the country. Now the pejorative term used for these students is that they are from vernacular medium, but I think they are equal stakeholders in the whole process. It is our fault as well that we have not been able to create proper resources in the regional languages and there are no resources for them.
>
> Historical studies researcher, H5, PCU, Maharashtra

A lack of accessible resources in multiple languages is a barrier to understanding concepts for some historical studies researchers and invokes disparities across a most heterogenous population. Researchers described the wider impact that this has on the disciplinary culture, in being able to tackle new and different research questions. The dominant view was that the rigour and originality of works in historical studies would be greatly improved through embracing the plurality of Indian languages.

4.4.8 Interdisciplinarity in historical studies

While historical researchers undertook their scholarly activities in a largely independent manner, interdisciplinarity also occurred through the "analysis, synthesis, and harmonisation of links between disciplines" to form new knowledge (Alvargonzález, 2011). This included building ideas and providing perspective across disciplines on shared topics. For most researchers in this study, issues pertaining India's identity and development held considerable interest. Further, interdisciplinarity also takes in researchers who moved across the boundaries of disciplines that they were trained in at the undergraduate or even postgraduate levels to address their present research endeavour. For instance, one researcher (de-identified due to risk of anonymity) completed their undergraduate training in Fine Arts, followed by postgraduate training in Geology, and drew on these practices within their endeavour.

Researchers highlighted an openness to working with other disciplines but largely contained to the humanities and social sciences. There were no instances of interdisciplinary activity beyond these disciplines, where there appeared to be a level of division in ways of working:

> Mostly the engineering faculty in different institutes who I come across, they don't have any idea of humanities and social sciences, they come with radicalised ideas in their mind, which to a person working in humanities, they consider it totally differently. So sometimes there can be tensions in ideologies, maybe political, … but what I also see over the past 15 years in the South Asian scenario is, there has been much openness to interdisciplinarity within our fields...
>
> Historical studies researcher H10, PNIS, Maharashtra

A recent focus on addressing significant global challenges such as climate change and artificial intelligence and efforts such as institution-wide research symposiums have provided structured opportunities for researchers across disciplines to share ideas with each other. As described by researcher H2, specific topic areas such as governance and regional nationalism are areas in which researchers in one discipline, such as political science, drew regularly on the expertise of peers working in fields such as history and sociology.

4.4.9 Declining status of disciplines

A set of ideas that were particularly pertinent to historical studies were that several researchers openly shared their struggles in relation to workload; others either felt that their research goals were not taken seriously by their institutions or described their connections to other peers as disjointed:

> I belong to a discipline that is very highly challenged (in relation to historical studies).
>
> Historical studies researcher H10, PNIS, Maharashtra

Almost all the researchers that I spoke with lamented the insufficient support for their research endeavours at their specific institution. Where previous research has focused on the impact of political ideology and the sustained critique on disciplines such as history and political science (Appadurai, 2021; Deshpande, 2013), in the present study were more concerned by proximal stressors including vacancies not being filled, ill-prepared students, unsustainable teaching workload and lack of financial support. Ultimately, research in historical studies was considered a lesser priority within the institution as compared with other disciplines.

This created both opportunities and tensions. While on the one hand it came with flexibility for researchers to pursue inquiry as they deemed appropriate, on the other hand there was a seeming lack of support from senior leaders at the institutional level for research. The outcome of these factors meant

that for many researchers, it was a much harder proposition to dedicate time and effort to producing research despite their positive intent.

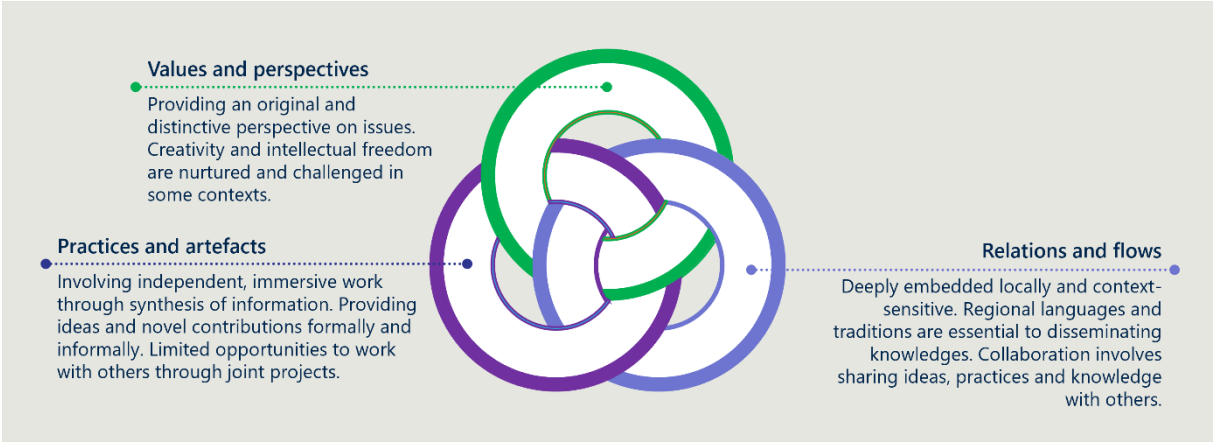
Researchers H5 and H10 among others described the discipline as being in precarious shape, invoking highly emotive terms such as the discipline's "bad state" or their "worry about the field", among similar sentiments. Researchers also remarked that if they were to work at a dedicated specialist research institute, that the culture of research would be a lot more vibrant than at a HEI:

> There are dedicated language institutes in India, which are acknowledged as being devoted to linguistics. In those places, dedicated researchers are there. I do not have the privilege to work under such institute… I have only worked at institution where engineering is the focus and getting students industry ready, and only the research works that are relevant to those works are promoted in those departments.
>
> Historical studies researcher, H3, PHEI, Tamil Nadu

4.4.10 Historical studies: originality and creativity, and facing critique

The research culture of historical studies is one of originality and intellectual freedom (*norms and perspectives*), where researchers worked in an independent manner (*practices and artefacts*) and derived meaning from immersing themselves with a range of source material. They strived to provide a distinctive perspective and interpretation of the social around them *(values and perspectives)*. The framework is applied below to historical studies at Figure 4.4, followed by further detail on the key features.

Figure 4.4 Research culture conceptual framework, as applied to historical studies



While historical studies researchers did not engage with peers in joint research projects, they collaborated through engaging with each other's works and in the generation of new ideas and knowledge *(flows and relations*). Historical studies researchers were loosely connected across the nation (*flows and relations*) but deeply embedded within local contexts. Within the institutions considered in this study, historical studies researchers were grappling with limited time and substantial teaching responsibilities, which

subsequently constrained their research capacity *(values and perspectives)*. For some researchers within this study sample, they experienced a lack of support and encouragement for their research work *(values and perspectives)*.

Historical studies researchers embraced a plurality of perspectives rather than subscribed to a singular pursuit of truth or fact. The culture of historical studies research is also one marked by tension between the personal and the institutional; this is evidenced by the types of research outputs that are valued by institutions (publication metrics) over the modalities that are important to researchers and the types of topics that are encouraged and constrained by institutions. Most but not all historical studies researchers in this study were concerned with furthering ideas and knowledges in relation to India's development as a nation including its diverse regions. As show in this study, the limited supply and mobility of historical studies researchers placed some constraints on the transmissibility of their ideas. It partially helps explain the disconnected nature of the discipline:

> Our field is highly individualistic in most cases. Except for the areas which are imposed by the government, most other areas are not really encouraged. So, we don't connect with other scholars, and students are not interested in working on new areas. They go to the old areas and explore it that way.
>
> Historical studies researcher, H9, PCU, Tamil Nadu

The role of regional languages has also been emphasised as a crucial enabler and constraint to historical research scholarship. The availability of works in multiple languages and the challenges faced by students who have completed secondary education in a regional language were some of the issues that confront the research culture of historical studies in India.

4.5 Synthesis of differences, commonalities, and linkages

As applied to the disciplines considered in this chapter, the conceptual framework of research culture is not an exhaustive description of participants' daily realities. Given the increasingly porous nature of disciplines, the key features of disciplinary research cultures should be considered more as organising principles than as strict containers. Further, through the process of mapping researcher themes to the elements of the conceptual framework, some of the nuances and deviation in researcher experiences have not been fully captured. Nevertheless, this framework is used to synthesise commonalities, differences and linkages. Below at Figure 4.5, I have summarised the discipline-specific descriptions of research culture, following which I discuss key similarities and differences in relation to elements of the conceptual framework:

Figure 4.5 Conceptual framework, summary of disciplines

Summary of disciplinary features of research culture			
Discipline	Values and perspectives	Practices and artefact	Flows and relations
Biomedicine	*Motivated by social purpose*	*Agile and iterative experimentation*	*Global orientation with local impact*
	Addressing a specific industry need or challenge	*Learning through doing*	*Collaboration of necessity induced by resources*
		Rewarded to publish, patent and produce	
		Tension between teamwork and individual success	
Computer science	*Enabling practical change and innovation to problems*	*Prototyping and development*	*Global orientation with global, national and local benefits*
		Cooperative scholarship	
	Responsiveness to industry and funder demand	*Developing technical skills*	*Purposive collaboration*
		Publish, product and patents	
		Teamwork and project delivery	
Historical studies	*Providing an original, creative and distinctive perspective*	*Independent, immersive work*	*Locally embedded, limited engagement nationally and globally*
	Advancing understanding of and about India	*Emphasis on originality of ideas*	*Collaboration through idea and resource sharing*

4.5.1 Values and perspectives

As discussed above, researchers in historical studies pointed to a variety of factors that spurred their research interest and exercised considerable freedom to pursue a topic of their personal interest. In contrast, researchers from computer science highlighted a typical desire to bring about practical changes through use of technology and biomedical researchers largely focused on improving human life. Both biomedicine and computer science researchers frequently described responding to calls from a funder.

This had several knock-on implications. Where researchers in computer science and biomedicine had defined existing schemes from which they could apply for funding support, historical studies researchers were more constrained in their options and experienced greater challenges in relation to funding and support for their research endeavour. In the case of historical studies, this is also linked with the ideas around a decline in status of the discipline/s, a lack of established infrastructure and a sense of not feeling valued by both institutions and the system at large.

Both computer science and biomedical researchers were funded to address a challenge as set by funding agency or external organisation. In some cases, this dictated the types of research activities, methods and outputs that were being produced. As will be discussed elsewhere, given the global orientation of the disciplines, biomedical and computer science researchers were motivated to produce works that could be disseminated through globally accessible means, such as journal publications, whereas it was more important for historical studies researchers to produce research outputs that would be locally and nationally relevant. In the case of historical studies, ensuring the accessibility of works in regional vernacular languages was also important.

4.5.2 Practices and artefacts

As described in Figure 4.5 and the preceding sections, biomedicine, computer science and historical studies researchers have their own distinct ways of working. Biomedical researchers in this study were much more accustomed to working in a lab-based, team environment as part of their daily realities, than those in the historical studies grouping and in computer science. They also required complex infrastructure to undertake their experimental work. This was distinct from computer science, where software was more readily available and typically at much lower cost. However, teamwork was an essential component of the realities of both biomedicine and computer science researchers. Similarly, this study affirms biomedicine and computer science as a highly organised discipline with structured rhythms and relationships.

While computer science researchers cooperated with others in a team setting, the nature of their interactions were distinct in that they were conducting simulations, developing technologies and solutions to challenges. Computer science researchers were also interacting with vast sets of data and developing products to bring about tangible improvements to human life. However, in both biomedicine and computer science research cultures, there appeared to be an overall greater awareness and acceptance of working towards patents and spin-off as research outputs, in addition to publications.

Historical studies researchers were immersed in the discovery and synthesis of material (including texts, archives, field settings) and were focused on providing explanations and generate theories. Unlike biomedicine and computer science research cultures, where there was a dominant emphasis on finding the right solution, historical studies research was animated by a culture that emphasised plurality of perspective and embraced the idea that there may be no one *right* answer. The quality, depth and distinctiveness of a perspective or an explanation was what was crucial to historical studies.

4.5.3 Flows and relations

Across computer science and biomedicine, there were several examples of joint research projects and/or use of shared equipment and international collaboration, whereas these practices were not observed within historical studies in this study. The nature of relationships within historical studies, both between scholars from the same disciplinary area and with scholars from other disciplinary areas, in the rare instances where this occurred, focused on engagement with scholarly work and through sharing feedback on each other's work. Otherwise, historical studies researchers in this study pursued an independent approach to their work.

Forming a view around interdisciplinarity in biomedicine and computer science is more complicated. While computer science researchers were engaged in addressing empirical challenges with and for other disciplines and biomedical research teams involved scholars from other disciplines, there were limited examples of deep integrations of concepts and methods in this study.

This chapter makes clear that computer science and biomedicine were disrupted by global flows in similar ways. Rapid improvements in technology and the transferability of ideas and concepts, together with mobility of humans had pushed biomedicine and computer science researchers towards a global orientation. They simultaneously addressed local and national issues of significance and were nested in a global network of researchers, metrics and ways of working. The promise of economic and social benefit derived from research outcomes which sustained the ongoing investment in resources within these disciplines. On the other hand, the fragmented character of historical studies can, in part, be explained by the limited supply of researchers spread across the country and the differences in ideology and language between regions. However, historical studies research was deeply embedded in local and regional issues, as were scholars that work within these communities who had a sophisticated perspective of these issues.

4.6 Summary

Disciplinary areas provide an important canvas through which researchers express their craft, their ambitions and their values. They are the primary medium in which researchers forge community with one another and communicate ideas, both within their discipline and increasingly beyond disciplinary boundaries, including with funders and the outside world. Within this study context, the rise of multidisciplinary and interdisciplinary research endeavours highlights the potentialities for researchers to work across epistemic borders and underscores the fluid nature of knowledge-based communities. Relationships and interactions at the institutional and system level were secondary to those which were formed at the disciplinary level, as the disciplines were researchers' primary homes from which they derive their identity.

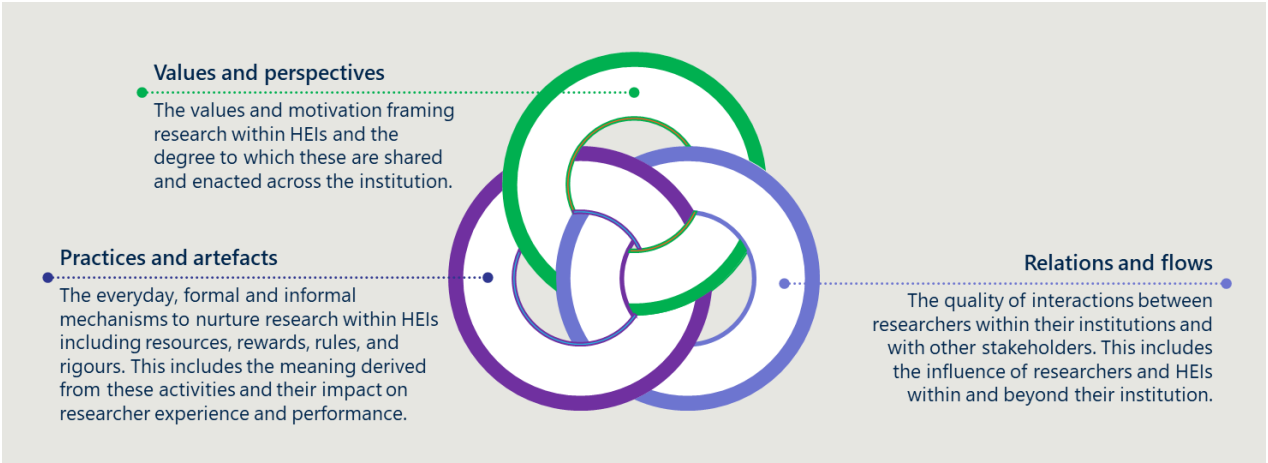
This chapter documents the key ideas of research culture that were central to biomedicine, computer science and historical studies. It shows the elements that disciplinary research environments have in common, such as the emphasis on teamwork and international collaboration in biomedicine and computer science, and their differences, such as the practices around experimentation in biomedicine versus immersive textual and theoretical work in historical studies. It also highlights how dominant disciplinary research cultures can be constraining to the ambitions of researchers and how they vary between disciplines. Nevertheless, disciplinary research cultures are not all encompassing. There are limits; institutional factors play a critical role to enabling research activity and shape research culture(s) in important ways, which will be explored in the following chapter.

5 FEATURES OF HEI RESEARCH CULTURE

5.1 Introduction

This chapter explores the experiences of research-active staff and research leaders in relation to HEI features of research culture. While there are some overlaps with ideas expressed at the level of disciplinary research cultures, the *bottom-up* themes drawn from the analysis of transcripts focus largely on institutional dynamics and interactions (Tierney, 1988; Bland and Ruffin, 1992; Patel, 2016). These include vision and significance of research, leadership and governance, recruiting and developing talent, investment and resources, output and impact, collaboration, and institution-specific concepts such as affiliated colleges in relation to PCUs. As with the previous chapter, the perspectives of researchers are triangulated with literature, material gathered through fieldwork and appraised against the conceptual framework. In turn, I have defined the research culture conceptual framework for the HEI-lens below at Figure 5.1.

Figure 5.1 Conceptual framework of research culture, as applied to HEIs



Informed by this framework, I have broadly mapped the themes emerging from the data in the following ways: vision and strategy, as well as leadership and governance aligned to *values and perspectives*; recruiting and developing talent, investment and resources, and outputs and impact were collapsed into *practices and artefacts*; and collaboration was pertinent for *flows and relations*. There were other ideas which were relevant for the *flows and relations* domain across the themes, that concerned the role of HEIs within the wider Indian context.

In this chapter, the above conceptual framework will be applied to discern the key features of HEI research culture across each of the HEI-types, which includes PNIS (section 5.2), PCUs (section 5.3), and PHEIs (section 5.4). This will be followed by a discussion of the ideas that emerge from considering the institution types together (section 5.5) such as competition and movement of talent and ideas. This section synthesises commonalities and differences between the institution types. Given the

embeddedness of Indian HEIs in the regional and national contexts, issues pertaining to the wider Indian landscape are explored throughout the chapter.

5.1.1 Description of HEI cases

The selection for the HEIs s extensively discussed in Chapter Three (section 3.4.3). Across the diversity of institutional structures and missions, the overarching criterion for selection was a sufficient concentration of research capacity and activity. Table 5.1 re-introduces the case HEIs selected for the study with respect to their key characteristics and research capacity indicators, drawing on the 2023 National Institutional Ranking Framework (Ministry of Education, 2023). The score provided for research and professional practice (RP) is a composite measure of: the combined metric for publications; the combined metric for quality of publications; IPR and patents, both published and granted; and, the footprint of projects and professional practice (Ministry of Education, 2023). As previously discussed, these measures are not without criticism but serve to anchor the analysis in metrics that are given official weight in the Indian HEI landscape.

Table 5.1 Research capacity of HEIs selected for the study

Institution type	Key characteristics of institutions	Research capacity (as measured through 2023 NIRF metrics)
Public national institutes of significance	Established and funded by Government of India; deliver specialist undergraduate and postgraduate programs; student size approximately ¬10,000.	**Indian Institute of Technology Bombay** Overall rank – 4 Research and Professional practice (RP) score – 86.14/100 No. of sponsored research projects (SRP) – 1,334 | No. of PhD students – 4,127
Public comprehensive universities	Established by central or state government; funded by state government; deliver broad-based undergraduate and postgraduate programs; Between 100k and 500k students (including affiliated colleges)	**University of Madras** Overall rank – 50, RP score – 32.9/100 Total no. SRP – 180 | No. of PhD students – 531 **University of Mumbai** Overall rank – 56, RP score – 17.82/100 Total no. SRP – 24 | No. of PhD students – 955
Private higher education institutions	Established by private body or society; and regulated by the UGC; may receive funding from the UGC; student size ranging between 5,000 – 50,000 students; varying degrees of autonomy to award degrees	**Amity University** Overall rank – 57, RP score – 47.6/100 Total no. SRP – 47 | No. of PhD students – 2,629 **SRM Institute of Science and Technology** Overall rank – 18, RP score – 47.03/100 Total no. SRP – 147 | No. of PhD students – 2,930

5.2 Public national institutes of significance

Established in 1958, IIT Bombay continues to be ranked as one of the top universities of the country (IITB, 2023b; Ministry of Education, 2023) and is the single PNIS selected for this enquiry. IITB was declared as an institution of national importance and afforded the status of a university to award its own degrees through an Act of Parliament (IITB, 1961). In 2018, the MHRD granted IITB the Institution of Eminence (IoE) status, enabling IITB to set fees for students and design its own courses (IITB, 2023c).

5.2.1 Vision and strategy for research

This PNIS' stated vision is "to be a leading global technology university that provides a transformative education to create leaders and innovators and generates new knowledge for society and industry" (IITB, 2023c). Here, research was emphasised as a central purpose of this PNIS, and strategies to support the realisation of this vision were expressed through public documents including the 2017-2022 Strategic Plan and the IoE Proposal (IITB, 2023d, 2023e), as well as institutional performance metrics through the SWOT Analysis and Annual Report documentation (IITB, 2017, 2022). The emphasis on research was also mirrored in internal documents such as the staff handbook: "to be the fountainhead of new ideas and of innovators in technology and science" (IITB, 2023f). These policies and plans characterised an environment that was deeply rooted in research and where researchers were encouraged to be committed to research activity.

Participants echoed this sentiment, but expressed that the embedding of the research agenda had gradually occurred over time:

> In the original speech by PM Nehru, he said create IIT to then create that manpower which would be tomorrow's leadership positions that would fill up industry, that is what I call IITB 1.0 and that was the first 30-odd years, to create that top class manpower. Then you move to 1985, when we create IITB 2.0. Here the reputation is already established and what we should do is go up the (educational) pyramid for Master's and higher-level qualifications. And that's also where the research started showing. Then another 25 years later, we go for IITB 3.0. By now we have research…. now we need to create that ambience where we connect to industry and entrepreneurship. That becomes the focus, and about translation, and that is the last 8-10 years. This gives us a lot of opportunity to build up strengths, we solve problems that are related to our industry, and about the creation of jobs. And this with what IIT Bombay, Delhi, Madras, the older IITs are doing already. But if you were to ask about what about the vision, then we have to go for IITB 4.0, which will take another 10-15 years, to build what is called social impact.... even though a unicorn is coming up weekly, still the overall population is hardship, poverty is still there, health, basic livelihood, how do we improve the quality. That is what we are moving towards."
>
> Research leader L1, PNIS, Maharashtra

This perspective was important for two reasons. Firstly, it suggested that the growing emphasis on research had happened alongside wider social shifts and that it entailed responding to: new demands in society, the opening of the economy and changes in the approaches required to tackle challenges facing the country. Consequently, each of the transition points of IITB had built on the experiences of the previous period. Another researcher L2 described this quite simply as "you need the bread (training students) to eat the cake (research)".

Secondly, research had become embedded through the concerted, continuous effort of its researchers and the actions of leaders, together with sustained government support. These efforts then created a virtuous cycle, where researchers participated in activities that reinforced the PNIS' vision, attracted resources for their ambitions, produced output and made the ongoing case for support from other actors in the research ecosystem, such as funders and government.

While research had grown substantially in prominence and framed the day-to-day realities of most PNIS researchers, a few participants in this study were divided as to the relative importance of research in relation to the education objectives of this PNIS. Some argued that the goal of 'IITB 1.0', to develop successful students, remained as pressing an objective as it was 60 years ago:

> Quality education remains the focus. What we need to do is expand this focus to include world class research.
>
> Research leader L2, PNIS, Maharashtra

Others pointed to tension between education and research priorities, driven by different incentives:

> We are big on undergraduate teaching, and we get paid for teaching. But we get promoted for research, so if you don't do research, then you are impacted. There is that push and pull.
>
> Biomedical researcher B8, PNIS, Maharashtra

And some argued that the importance placed on research varied by both discipline and the perceived importance to the institution:

> Let's zoom back here, the main focus within our Department (Humanities and Social Sciences) is not on research, it is about marshalling students and guiding at the MPhil and PhD level.
>
> Historical studies researcher H12, PNIS, Maharashtra

Another researcher (B8) characterised the research culture at this PNIS as an "engineering-based research culture", where the focus was on developing applications and products. Disciplines or areas that engaged in blue-sky or theoretical research were sometimes met with confusion by peers in a climate that was increasingly concerned with deploying technologies to problems. Others interpreted the vision broadly

and reflected that it gave them sufficient flexibility to tailor the vision in individual or discipline-specific terms. It is not the purpose of this study to resolve these differences in emphases; however, the relative importance placed on research at this PNIS vis-a-vis other institution types is of more relevance. An early career computer-science researcher described it in the following terms:

> Earlier (at a public comprehensive university), research was about 60 per cent of my works. But here at IITB, research is 80 per cent of our focus, with limited time for relaxation…our passion and our professionalism is spent on research.
>
> Computer science early career researcher C6, PNIS, Maharashtra

The sentiment of research as a serious institutional priority, and as an endeavour that required substantial investment, was deeply felt by researchers at various stages of their career and across disciplines. It was especially important to PhD students and early career scholars whose primary focus concerned the completion of their doctoral research projects, development of research outputs (e.g. research publications, patents) and establishing their credibility as active researchers in their fields:

> Research is everything here. If you are good at research, then management prefers you….and it is key to building my own career here.
>
> Computer science early career researcher C6, PNIS, Maharashtra

5.2.2 Leadership and governance

Formal leadership structures to enable research were key to realising this PNIS' research ambitions. For instance, the accountabilities of the Dean, R&D and Associate Dean, R&D, the two senior-leaders charged with direction and policy-setting for research activities at this PNIS, are stated in specific terms such as:

- Enabling the creation and maintenance of an environment, including infrastructure, equipment and support staff for conducting research at a high level in the institute.
- Providing support for researchers to liaise with potential funding source and for collaboration with other researchers within and outside the institute.
- Enabling exploitation of research done at the Institute, including licensing and commercialisation to address problems of industry and society.
- Providing administrative support for conducting research, including human resource and financial management, procurement (IITB, 2023g).

Roles such as the Dean, R&D and Associate Dean, R&D were institution wide positions, complemented by similar posts at the faculty and department-level. These roles were recognised by those interviewed in this study as examples of the significant emphasis placed by this PNIS on research activities. Over and

above the formalised structures however, other researchers highlighted that it was the informal practices, including the personal motivation and agency of researchers to pursue their research ambitions that had a greater impact on their productivity and research undertaking:

> There is complete flexibility and freedom for a professor in the sense that the Institute can only lay out certain norms and it is up to the faculty member to decide if they want to follow that, or just do what they want to do. We have faculty members who look out for opportunities for funding, even if means for that funding there needs a focus on the rural economy, or that professor may not have worked in that area specifically towards that application, but there are quite a few professors who are willing to use their expertise... But then you also have a large number of researchers who are happy with their own approach, they publish a large number of publications in high-quality journals...
>
> Research leader L2, PNIS, Maharashtra

The considerable degree of independence and freedom was considered a strength of this PNIS, and highly valued by its researcher community:

> Every department is autonomous here, every HoD has their own policy committee. The best thing about IIT is we are given decentralised power and responsibility, and that is what I see from a global perspective.
>
> Research leader L4, PNIS, Maharashtra

By encouraging these autonomous ways of working, research leaders emphasised that they focused on their most important objectives, which included purchasing machinery and infrastructure that could not be sourced by individual disciplines and departments, the provision of scholarships for government-funded scholars and early career fellows, and the provision of seed funding. However, despite encouraging such autonomy and freedom, there were some conflicting views on its impact on local practices:

> We have one research culture across the institution. The silos are coming down…and the cultures have become similar. Culture from person to person is different and their thinking is different.
>
> Research leader L4, PNIS, Maharashtra

Others such as researcher H1 disagreed, characterising the culture in humanities and social sciences (encompassing historical studies) as somewhat different from other parts of the institution. While they shared a common ambition with their computer science and biomedicine peers (as interviewed in this study) to produce high quality research, there was a recognition that the scale of their research activity was more contained and as previously described, their teaching commitments took precedence.

Taken together, the data indicates that there were rigorous, embedded formal and informal structures to enact the PNIS' research agenda, and that in turn, this fostered dominant ways of working, behaviours and emphases across the institution. The high degree of autonomy within the institution still left room for individual researchers to tailor and pursue their own research agendas and for some disciplinary practices to subvert institution-wide norms. But the variation from dominant ways of working was offset by the overall investment in research by the PNIS and the success it had achieved as an institution, which is discussed later in this section.

5.2.3 Recruiting and developing talent

The extremely competitive, national-entry admission processes at this PNIS at both the undergraduate and postgraduate levels are well documented (Jayaram, 2011; National Testing Agency, 2023). Several participants in this study including research leader L2 pointed to these rigorous selection mechanisms as contributing to the sufficient volume of top resources that were available in the form of early career scholars and PhD candidates. As shown in Figure 5.1 at the outset of this chapter, this institution has the highest volume of PhD scholars as compared with all the HEIs involved in this study, and as a proportion of its overall student intake. Processes for faculty selection were also stringent and contributed to the calibre of the PNIS (Jayaram, 2011), which was reinforced by participants in this study.

The Government of India empowered this PNIS with greater flexibility to recruit skilled researchers. For example, they could freely appoint foreign nationals. Yet simultaneously, this institution faced challenges in relation to filling vacancies within specific disciplines and criticisms for failing to advance participation of historically disadvantaged groups, known in this context as reservation (Paliwal, 2023; Subramanium, 2019). However, as signposted during fieldwork, there are efforts to address these imbalances.

Early career researchers and those in significant positions of leadership expressed that once students and faculty had been recruited to the PNIS, there was substantial emphasis on informal practices to nurture community among researchers. It was why, for example, the institution was a largely residential environment:

> Because we're a residential school, and this is very important, almost all the students stay on campus, and almost all the Professors do as well. This is why we are so different, so that means I am used to my neighbour being from a different state, different language but knowing what they are working on and sharing ideas... In fact, that is quite unique in India, where my neighbour is completely different to me, and we are used to this here…it's inherent practice here.
>
> Research leader L4, PNIS, Maharashtra

Another early career researcher C6 described the practical benefits of this model. In addition to a salary and a grant for their project, they were provided with discounted housing at the PNIS, which created additional time and incentives to work on campus with their peers.

Relatedly, several researchers also emphasised the flat hierarchy ethos that the PNIS embodies:

> I might be biased but from the beginning of my research and teaching career I could feel that I could talk to any professor. This flat hierarchy helps you develop and learn, and it means we can nurture a new faculty member quickly.
>
> Research leader L2, PNIS, Maharashtra

These institutional norms need to be reconciled against discipline-specific practices and individual dispositions, which were addressed in Chapter Four. There were also differences in the emphasis placed on research, that varied by age of participants and tenure at the institution:

> If I had to pick teaching or research, I would pick research every time. This is different to senior colleagues who prioritise teaching…If you speak with colleagues in their late 50s, they wouldn't put as much importance on research. This is not the same for us younger colleagues and those that are coming up. Science is not static.
>
> Computer science researcher C2, PNIS, Maharashtra

There was a recognition that while research was a priority for most at the institution, the productivity of staff who had been employed by the PNIS for a significant period was not treated the same way (or subject to the same expectations) as compared with younger staff, early career researchers and those newly appointed to the PNIS, even if formal policy stated otherwise. Other researchers highlighted that the role of these senior staff shifted to focus more on teaching and mentoring junior colleagues, in particularly doctoral students and early career scholars. In this context, I understood senior staff to be those who had been employed by the PNIS for many years rather than those in positions of leadership.

5.2.4 Investment and resources

Since its inception, this PNIS has been among the most well-resourced educational institutions in India, financially and in the reputation that it has enjoyed within Indian society (Subramanium, 2019). Subramanium (2019) characterises this as the "exceptionalism" of the PNIS model, which was actively encouraged by successive governments, evidenced by the patronage of prime ministers and presidents at graduation ceremonies through to the increased levels of financial and recruitment autonomy enjoyed by the institution. Subramanium (2019) further argues this exceptionalism has become internalised, which has significant implications for the way researchers in this study conceive of and undertake their work.

Firstly, as observed below, most researchers in this study were aware of their privileged position as an institution and the benefits this afforded:

> As one of the famous in the country, and by that, I mean, being one of the IoE directly under the Ministry of Education, we have a lot of funding options and have from time to time, we're part of international collaborations between governments, between places…so for example, through that, there's lot of scholarships…
>
> Historical studies researcher H10, PNIS, Maharashtra

Through the IoE scheme, the Government of India provided substantial funding for the provision and maintenance of research infrastructure, which had contributed to the overall growth in sponsored projects and consultancy projects initiated by the PNIS as shown below in Table 5.2 (IITB, 2023c). Research leader L3 within this PNIS highlighted that a significant proportion of the 750 faculty at this PNIS were working on a funded project between 1-2 cores and noted the contribution of technical staff to the maintenance of research infrastructure and administration. As of 2022, the PNIS employed approximately 60 staff for these purposes.

Table 5.2 New projects initiated between 2020 and 2021 (IITB, 2022)

Financial Year	**Sponsored projects**		**Consultancy Projects**	
	Number	*Sanctioned outlay (Rupees in crores) **	*Number*	*Projects outlay (Rupees in crores) **
2020-21	246	297.68	776	111.39
2021-22	242	220.29	648	79.95
2022-23	280	330.66	776	111.39
*: includes GST for Indian party / clients 1 Indian crore is equal 10,000,000				

However, as described below, a contrasting idea that flows from this scenario is the recognition that in comparison to leading scientific institutions in East Asia and the West, this PNIS was yet to realise its full potential for society. Resourcing is a relative strength in comparison to other Indian HEIs but remains a key barrier in relation to comparators in China and Singapore:

> Now it (research) is expensive. And yes, places like IIT Bombay are doing wonderfully level but IITB are one small place in a country of 1.3 billion. We need 100 such IIT Bombays, and ISCs (Indian Institutes of Science) and so on. That's where we can have the education plus the impact, but we're not able to come to that level… look at what is the budget of IIT Bombay to something like Tsinghua or NUS (National University of Singapore. Tsinghua is around $3 USD billion, ours is $150 million. So, you have to take that all into perspective.
>
> Research leader L1, PNIS, Maharashtra

There was a strong feeling – particularly among research leaders at this PNIS – of the gap between on one hand the ambitions of the institution and the expectations from government and wider society and on the other the available resources to undertake research activity, despite its documented success. Some researchers and research leaders within this PNIS were self-reflective of the critiques about reservation policy at the institution, and the challenges faced by some students from disadvantaged backgrounds. This also negatively impacted those early in their research careers. Researcher B8 stated that several research scholars they worked with in their laboratory did not receive government stipends on time and that their overall stipend package fell short of their needs. In other examples, researchers including H8 and C6 shared the precarious financial situation of scholars' families or those in early career posts, where undertaking further training in research was seen as a detraction from earning income in difficult family contexts.

5.2.5 Output and impact

The mixed outcomes of this PNIS' research productivity had been a focus of earlier research (Banshal, et al, 2017; Kumar, Singh & Ranjan, 2018) and can be crudely simplified to a twin-picture of year-on-year growth in publications but lagging global peers on several indicators including patents and product development. Data gathered through interviews and fieldwork show a deep awareness of these trends but a shared ambition to increase performance against those indicators particularly in relation to practical impact in relation to communities.

Notwithstanding differences in disciplinary norms as discussed in the Chapter Four, most participants described undergoing rigorous annual appraisal processes, where promotion and salary increments were tied to publishing in high-quality journals. They described how the results of all researchers within specific departments were aggregated to provide a consolidated measure of performance, which was monitored routinely by the institution's senior management. Words such as "relevant", "robust" and "reputation" were features of many participants' responses and characterised the PNIS' approach to appraisal of research output and impact. Despite the high expectations of researchers to be productive, most maintained that the ethos of the PNIS favoured research quality over quantity, which is discussed further below:

> While we have soft pressure to publish, it is a lot higher in the state universities than at IITB. There, the pressure to publish is higher but the capacity is lower. The space between these two things is what often gives effect to predatory journals.
>
> Historical studies researcher H12, PNIS, Maharashtra

Unsurprisingly, given the PNIS' position as a national IoE, there was an outward focus on international benchmarking. But as described below, some participants highlighted that this orientation for global success needed to be tempered with careful consideration of the local context:

> There are positives on both sides. The good thing about international benchmarking is that it does not allow us to shift the goal posts as we go along, it really allows one to maintain exacting standards. For me personally, I want to be publishing in international conferences and publications, and I don't want to let go of that. That said, the problems we should be working on need not be international. I am much happier and more fulfilled when working on problems that are locally relevant and that's why I came back (from overseas) to work on them. It doesn't have to be a dichotomy.
>
> Computer science researcher C2, PNIS, Maharashtra

Others provided a more critical view, where they expressed that the PNIS at times could be divorced from its local context despite being the recipient of significant government support. This meant that in turn, the research did not benefit the communities and industries in which the PNIS is encased and where there were significant experiences of economic and social hardship.

Separately, many researchers were supportive of the institution's emphasis on productive development and of its engineering-led culture, whereby researchers were encouraged to develop low-cost technologies that could be useful within the Indian context. For instance, Ola Cabs, an Indian-based rideshare company was developed by two former students from this PNIS (Abrar, 2018). The thrust of researchers including C2 at this PNIS was to "find the balance" between metrics that rewarded individual and institutional success at a global level and exercising practical and policy-oriented impact within the local context.

5.2.6 Collaboration

The most recent annual report of this PNIS points out several highlights in relation to collaborations with industry: "378 Indian and international industries approached IIT Bombay for partnership through collaborative R&D projects. 205 meetings, virtual and physical, coordinated through the Industrial Research Consultancy Centre" (IITB, 2022). The report comprehensively documented R&D related agreements with industry partners, other HEIs, governments at a national and international level and the support provided to 10 researchers for setting up a company or new venture over the course of 2022 (IITB, 2022). Actors within the institution insisted that creating these links had been the result of significant, hard-fought efforts, largely led by individual researchers. There was a need for further, substantive progress at an institution-wide or department-wide level:

> The biggest challenge we face was the trust deficit between academia and industry. Industry still looks westwards but now things are changing, there are more and more industry-academia collaborations, and they want more and more applied research. But can we connect basic research with applied? They need to take time to learn from each other. We also would like our professors to spend more time with industry, to go there and work for 15-days or a month. We will spend money and travel to focus on industry-led placements.
>
> Research leader L4, PNIS, Maharashtra

Researchers emphasised the need to market their work to industry, and for researchers to develop confidence in their own work. Research leader L4 expanded on the above, emphasising that researchers needed to grow at "talking about themselves and their work" and to become advocates of their ideas. At this PNIS, there was reward and recognition for those researchers who positioned their inquiry as being relevant or interesting to industry. The outcomes of these collaborations were not just commercial; these activities were all aimed at fulfilling the social impact vision of this PNIS, as previously discussed.

At the individual level, researchers were encouraged to undertake exchanges, fellowships and training at overseas institutions; most researchers at this PNIS had already undertaken some form of formal training outside of India. Formal structures, such as the Dean, International Relations formalised the relationship-building activities of the PNIS with corresponding incentive structures for researchers engaged in global collaborations. Many participants in this study highlighted the extensive activities to build collaborative partnerships with industry, at a national and international context. For early career researcher C6, collaborations with industry were non-negotiable as their multi-year project was directly funded by a partner. Working with others in the same discipline in global contexts was also non-negotiable as was a growing focus on interdisciplinary endeavours:

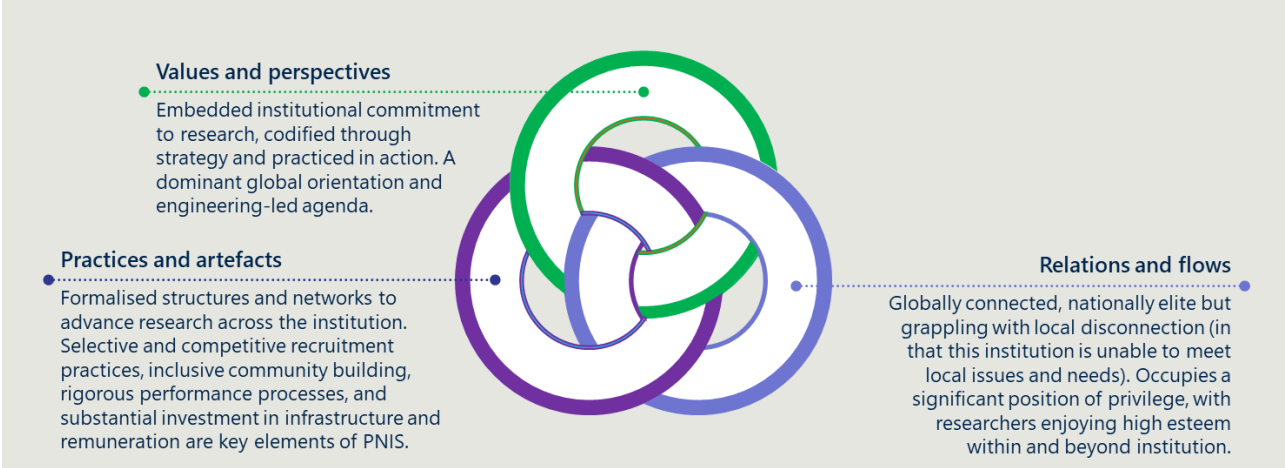
> We need to work with others who are doing experiments in wet labs, globally and regionally. We can generate deeper insights through sharing our practices.
>
> Computer science early career researcher C6, PNIS, Maharashtra

Relationships with national and regional governments were less of a focus, apart from addressing local level challenges through research projects. Researchers and research-leaders embraced the level of autonomy they enjoyed from government. By virtue of the institution's status as a PNIS and as an IoE, researchers reported greater freedom to collaborate on projects with a variety of partners with little government scrutiny compared with other HEIs.

5.2.7 PNIS research culture: engineering-led, with an explicit global, elite orientation

As shaped by the above ideas, the key features of research culture at this PNIS were: a deeply embedded commitment to undertaking world-leading research, particularly among engineering and technology disciplines (*values and perspectives*); a research workforce that had been competitively selected and developed through immersive community-building and rigorous performance appraisal practices (*practices and artefacts*); a research community that overall enjoyed influence among the wider scholarly community and Indian society with deepening industry-linkages (*flows and relations*); and an expressly stated global institutional outlook, even if it came with local dilemmas (*flows and relations*). The framework is applied below to the public national institute of significance at Figure 5.2, followed by further analysis of its key features.

Figure 5.2 Research culture conceptual framework, applied to PNIS



The capabilities of research students and faculty were among the most central features of this PNIS' research culture (*practices and artefacts*). In the case of faculty, several participants highlighted the significant proportion of researchers who undertook research training outside of India:

> We have a huge number of faculty have done their post docs outside of India. Many of them have completed this in the US but some in the UK and even in the Germany. This means we already have our own contacts and networks (for the purposes of collaborations), and this is really encouraged by the institution. Whether one has funding for these is a separate issue, but this is very much important.
>
> Biomedical researcher B8, PNIS, Maharashtra

Faculty were perceived to be of higher standing and quality when they had completed overseas training, which helped them stand out in the already selective recruitment processes employed at this PNIS. On the other hand, the national entrance examination for the admissions of students ensured that the PNIS attracted the highest calibre of student talent across the country, of which a significant majority go on to undertake doctoral studies and research careers.

The outwardly global outlook of the institution was reinforced by institutional and government policy settings that made it easier for this type of institution to attract research talent, build global collaborations and commercialise research outputs. However, as previously discussed, there were divided perspectives on whether the institution was concerned with delivering or deriving value from research activities at a local level. Given the dominant focus on engineering and technology disciplines, there was overt encouragement for the development of low-cost products that could be disseminated to the Indian market at large, but there was less emphasis on developing solutions and services for the regional Maharashtra context (*values and perspectives*; *flows and relations*).

The PNIS' global character was embedded to its legislative and regulatory purposes and formed a core part of its performance appraisal at an institutional level (IITB, 2023b; IITB, 2023f). The rapid mobility of research talent both within and beyond India, the intense concentration of resources and the increasing availability of technology were the key underpinnings of this institution's research culture. In turn, it has also shaped the imagination of researchers that worked within the institution in conceiving of the PNIS as an elite, global institution.

5.3 Public comprehensive universities

The University of Madras was established in 1857 following the Wood's Education Despatch, but plans for its inception dated back as early as 1839 (University of Madras, 2023a). It was set up as an examining institution in the tradition of the University of London (University of Madras, 1884). Established the same year, the University of Mumbai similarly focused its activity on conducting examinations in its early years (University of Mumbai, 2023b) and research came into focus from 1904 (Tikekar, 2006).

5.3.1 Vision and strategy for research

Research and new discoveries are among the purposes of both PCUs. For instance, the University of Madras' vision is framed as aiming to "contribute to the advancement of knowledge through research, publication, and disseminations" and the focus of its most recent strategic plan is solely framed around research, development and innovation (University of Madras, 2023a, 2021). The expressly stated goals of the strategic plan are to: pursue national and international agency funded research; conduct theme-based research; establish an entrepreneurship and career hub to inculcate entrepreneurial values among students; and develop Memorandums of Understanding (MoUs) with international and national institutes (University of Madras, 2021). The absence of goals around education and other activities of the institution in the strategic plan further cemented research as a stated priority for this PCU.

As canvassed through fieldwork, there is also recognition of Madras' research ambition by key government and policy actors outside the university. At the 2023 Convocation for graduates, the President of India explicitly focused on research at the PCU:

> The University of Madras has promoted a culture of research…I would urge the university to invest more in cutting-edge research, encourage inter-disciplinary studies, and promote international collaborations. Embracing emerging technologies as an institution, attracts global talent. University of Madras should be at the forefront of finding learning-based solutions to the problems being faced by the nation and the world at large.
>
> Murmu (2023)

This is a significant evolution from ideals expressed about the institution in its inception years, where the focus was on the acquisition of knowledge by and for individual benefit:

> Has the insight you have obtained into several branches of knowledge, created in your hearts a reverence for learning, and a desire to add to our knowledge, day by day and year by year, and to expand your best energies in the pursuit of truth?
>
> W.R. Cornish, in the Annual Convocation Address (1884)

The University of Mumbai (then Bombay) has charted a similar journey; in the 1917 Convocation Address, the emphasis firmly concerned the advancement of the individual and furthering the goals of the empire regime:

> The aims and purpose of university education must be to create a habit of mind which would last through life, based on correct ideas of freedom, justice, wisdom and to create a capacity of discipline and sacrifice…self-reverence, self-knowledge, self-control…these alone lead life to sovereign power.
>
> Freeman-Thomas, (1917) as cited in Dongerkery (1957)

Whereas research was firmly included among the goals of this institution as laid out in its most recent vision statement:

> To undertake research in frontier and emerging areas to advance knowledge and through innovation turn it into intellectual property and entrepreneurship to accelerate growth.
>
> University of Mumbai (2023b)

Despite the growing prominence of the research agenda over the last century, and as expressed through the ambitions of these institutions, participants across both PCUs in this study framed their research endeavour as one of many important priorities, where they felt they had limited time available to devote to the research tasks. Moreover, participants expressed tension in reconciling the old and new paradigms expressed above. For instance, even though research was professed as being of central importance, several participants in this study painted a much more critical assessment of the lived experience:

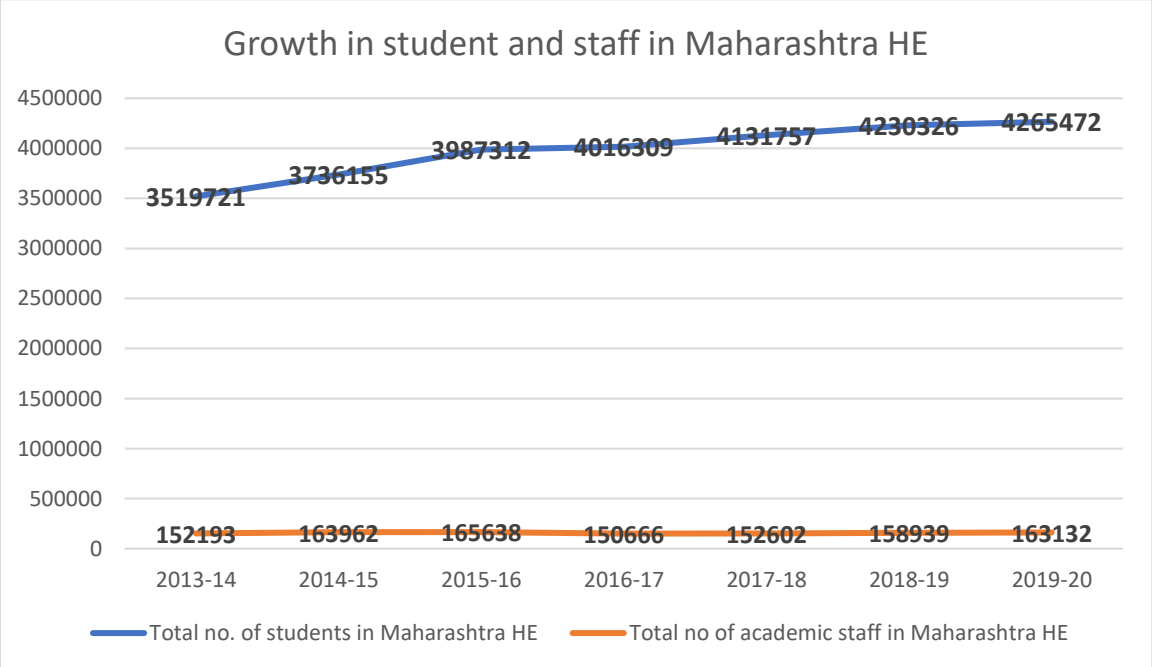
> The university is encouraging research, but they don't have the support mechanisms or processes to properly deliver on their research ambitions…so then research becomes about the individual faculty and their interest. But even when we as faculty get money to do research, there is reluctance to give it support.
>
> Biomedical researcher B3, PCU, Tamil Nadu

> Research is important (to the institution) to a certain extent, yes, but it changes from person to person, and that is not only in science but the social sciences as well. Research plays an important role in the careers or researchers, but things have changed, because of privatisation, commercialisation and change in focus for students.
>
> Historical studies researcher H5, PCU, Maharashtra

> I am unhappy to say this, but we really do not have a good culture. What is happening with public institutions like ours is that we are overburdened with our teaching load. We have multiple courses to teach, and our workload is really hampering the research culture.
>
> Historical studies researcher H2, PCU, Maharashtra

Commonly cited constraints were limited infrastructure and the demands of workloads. Flowing from this, a central issue was the overall growth in student volume, and with it the expanded number of classes that required staff time in preparation, instruction and assessment. These considerations primarily shaped the working lives of researchers. This meant they fulfilled their research obligations only after their teaching duties were complete. Several researchers emphasised that while there had been significant growth in student enrolment within their respective institutions, staff growth had not kept pace with this expansion, resulting in added workload and student demands. Figure 5.3 supports these narratives, demonstrating that in the period between 2013-14 to 2019-20, student growth in Maharashtra HEIs had increased by approximately 20 per cent as compared with staff growth at 5 per cent (Ministry of Education, 2021).

Figure 5.3 Growth in student and staff in Maharashtra higher education, 2013-14 to 2019-20 (Ministry of Education, 2021)



More generally, many researchers in this study quizzed whether the research ambitions of their institution went beyond performative statements. Researchers including H2 and B3 described a palpable disconnect between the vision of the institutions' senior management, as expected by government, with the on-the-ground realities for researchers. While most researchers acknowledged that research had grown in importance over time and that there was greater investment in infrastructure and equipment, those such as computer science researcher C8 situated these developments in context of other drivers and pressures at their PCU:

> We need to generate money. See that is the concept of a state university, it's partly aided by the state government but the other part is our duty and responsibility…previously it was the other way, it was 20: 80, with 20 for teaching, 80 for research till 1990. Then after which due to financial constraints, we need to admit more, we need to get the students and generate money.
>
> Computer science researcher C8, PCU, Tamil Nadu

Even if there is shared agreement about the significance of research to career development as well as the wider contribution to nation-building, the aspirations of individual researchers are continuously negotiated against the wider financial constraints, particularly the significant education purposes of a PCU. The implications of these competing goals are consequential to the daily realities of researchers.

5.3.2 Leadership and governance

In triangulating the material gathered through fieldwork and participant interviews, the formalised structures to enact an institution-wide research strategy and the implications of these approaches differed considerably between the PCUs. At the University of Mumbai, there was no identifiable senior leader with responsibility for research activities nor was there a designated area of the institution that coordinated research programmes such as internal grants and researcher development, apart from a Research Administration and Promotion Cell (University of Mumbai, 2024a). Research activities did not appear to be as formalised or embedded as is the case with other HEIs in this study and more widely. More generally, literature had criticised the University of Mumbai's "coterie culture…(where) undemocratic and ad-hoc decision making has become the norm in the university's governance" in relation to other university activities (Paranjape, 2017).

In contrast, the University of Madras had appointed an identifiable Dean (Research) and Dean (Industrial Consultancy) as members of the institution's leadership team and established a University Industry Community Interaction Centre in 1997 with the objective to:

> Coordinate research and development projects between University Departments and Industries in product / process development, technology transfer and encourage industry-academia partnership through MOUs, and consultancy services.
>
> University of Madras, 2023b

This PCU has also enacted a research policy that delegates responsibilities and accountabilities related to research activities to various departments and faculties within the institution.

Notwithstanding the varying degrees of formalised, institution-wide networks to advance research, participants at both PCUs pointed to examples of inconsistent leadership practices, which impeded the quality of research work that was undertaken:

> The university authority has a lot of other things they deal with, they will only say that "we are encouraging research". But this university, despite it being the oldest university in South India and that probably has some effect on the world stage, here we have so many administrative issues. For example, not sending proper closure documents to the funding agency, things like that, it stops us from going to those funding agencies again and putting forward applications.
>
> Biomedical researcher B3, PCU, Tamil Nadu

Other examples that were provided by participants included difficulties in purchasing journal articles or equipment because it required multiple layers of approval, different parts of the institution that worked in siloed practices, and a lack of responsiveness from senior colleagues to requests for grant and funding applications. These tasks were considered foundational to research activities but lacked a cohesive approach across the institution and ineffective leadership from senior officers.

Across both PCUs, several researchers including H5 distinguished the role of leaders at the level of academic departments from those that assumed institution wide leadership responsibilities. Earlier work has established that institutional factors have a stronger effect on some aspects of culture, including commitment to scholarship, governance and valuing professional autonomy, than departmental practices (Lee, 2007). However, participants in this study explained the influential role of heads of department and decision-making processes at the level of academic departments as being more important than university-wide leaders and practices:

> The university provides us with funds for every academic year, for furniture and fixtures, for seminars and conferences, so on and so forth. But on the basis of that, we decide as a department, how to do things. So every year we have a budget for library, conferences, visiting faculties, and we in a *democratic manner* sit together and decide… if I want to have a lecture series, he may want to have a conference. Someone else may want a travel grant. So we decide those things accordingly among ourselves and spend them.
>
> Historical studies researcher head of department H5, PCU, Maharashtra

> We can have influence within the Department, we can encourage faculties to submit proposals, apply for grants and help them to see the world stage, to work world issues. If they are working on healthcare, they have to find the cause of these issues…but when it comes to influencing university authorities, we can do a little bit but not that much.

Biomedical researcher B3, PCU, Tamil Nadu

Leadership and governance in the context of advancing research, including the role of academic autonomy, are experienced in vastly different ways across the PCUs in this study. There were no discernible patterns by way of seniority, discipline or role. However, the academic departments appeared to play a more influential role in some contexts. This may be in response to the lack of formalised, institution-wide structures for research in one of the PCUs and/or the perceived deficiencies in the implementation activities of these structures, which was observed at both institutions.

5.3.3 Recruiting and developing talent

Across both PCUs, there were significant challenges that related to individuals' willingness to pursue a career in research and, in turn, to the overall volume of researchers as well as their skills and capabilities. Moreover, these issues were deeply nested within the wider economic and social contexts associated with being based in India. The following perspectives from an early career researcher, and subsequently, a head of department perspective illustrates the complex nature of these challenges:

> If we don't have fellowships while doing these things (doing PhD) … the Indian family needs a source of income. If we go to a job and earn an income, then they'll think, ok there's a source of income. But for PhDs this is not always there. So, my fellowship is really helpful.

Biomedical early career researcher B6, PCU, Tamil Nadu

> *(in response to a follow-up question about why doctoral and Masters students are not pursuing research careers)* It would be the economical situation. those who are coming to the government institutions, they are coming from poor backgrounds, almost 90 per cent are coming from poor backgrounds. Their parents are probably not helping them, not encouraging them to do research. Unless the student has their own spark and wants to do research that is based on their encounter with their senior people somewhere or for the village people or see someone somewhere settled in a great job with research or if they see a post-doctoral fellow settled abroad. Those people really want to advance their research. But 90 per cent of our students want to get into small jobs, with minimal salary, and they want to settle. They are not writing the eligibility exams for the central government to get more salary, and it's a lack of enthusiasm. We try to encourage them but in whatever we try do, somewhere it is missing.

Biomedical researcher and head of department B3, PCU, Tamil Nadu

The affordability of public institutions is a major drawcard for Indian students (Mathews, 2017), which is heightened in the context of PCUs that charge among the lowest fees of all HEIs in India and

accommodate the bulk of the student population. As described by another researcher H5, the annual tuition fees for a two-year course at the University of Mumbai is 20,000 rupees as compared with a nearby private university who charge between 1,000,000 – 1,200,000 rupees for the same programme. But literature has also previously discussed the fact that students from disadvantaged socio-economic groups, first-generation learners, those belonging to rural backgrounds and those from historically disadvantaged caste groups do not progress beyond the undergraduate level to research training (National University of Education Planning and Administration - NUEPA, 2017). Given the concentration of students from these backgrounds in PCUs, the above narratives highlight a two-fold conundrum. Firstly, the largest volume of potential researchers are enrolled at PCUs. Secondly, without adequate financial support and encouragement, they are the most likely to exit these institutions to pursue non-research careers. As exemplified above, and below, financial constraints are not the only factors contributing to a limited talent pipeline in these PCUs. Participants lamented the absence of focus on research in the undergraduate curriculum:

> There is not much undergraduate research in India…we don't promote, we don't have the structures in those Indian universities where I am familiar. Not many universities take serious effort to inculcate the love and liking and interest for research among their students, particularly at the undergraduate level.
>
> Historical studies researcher and head of department H6, PCU, Maharashtra

These issues have been rehearsed elsewhere by Sengupta (2019) and are a persistent criticism of the Indian higher education system at large, with previous reviews focusing on the reduced role of PCUs as primarily "centres that teach and examine masses" (Pal et al, 2009, p.17). There are also assertions that with the rise of private universities and elite public institutions, those students that are research-inclined, and early career research staff are more attracted to resource-rich HEIs:

> Nothing is done to make our environment as staff comfortable to want to do research here as…this is not the same as being in a IIT Bombay or in a private institution.
>
> Historical studies researcher H2, PCU, Maharashtra

> There was a time where we were the real caterers of information, new knowledge, so on and so forth. But now we have many challenges. For instance, the neighbouring building delivers distance education… we also have private universities in our state who are providing education to the top-notch, intellectual students in the society. So, there is a possibility that some students who are very intelligent and rich would prefer to not come to our universities because they find our universities comparatively downmarket. We don't have that great an infrastructure to

> provide, laptops, 24-hour wi-fi…. beyond a point, we are not able to attract people as we were able to say 10 years ago.
>
> Historical studies researcher and head of department H5, PCU, Maharashtra

The idea of PCUs as downmarket and not being the institution of choice for research-inclined staff and students was echoed by several others in the study. In relation to developing the capabilities of researchers at these PCUs, both institutions summarised a range of initiatives as evidenced in their institutional self- and peer-assessment as part of the NAAC review process signposted during fieldwork (University of Mumbai, 2021; University of Madras, 2023c). The University of Mumbai (2021) documented the provision of seed funding, international fellowships, extracurricular activities such as blood donation camps, women's empowerment activities, cleanliness drives, and "incentives to teachers who receive state/national/international level recognition awards in the field of research" (p.7). The University of Madras self-report (2023d) emphasised access to institutional resources through the campus libraries, its efforts around plagiarism training, the support structures in place through a dedicated Dean, Research Office, and Research Project Scheme Offices that deliver seminars and workshops on concepts such as research methodology, as well as best researcher awards and salary incentives for those that published in a high-impact journal.

While the sample population in this study is too small and disparate to draw out conclusive differences between the two PCUs, almost all researchers in the University of Madras referred to mechanisms at both the level of department and at the institution that were in place to develop their capabilities. In contrast, those at the University of Mumbai were largely familiar with departmental supports alone.

5.3.4 Investment and resources

Throughout this study, it was as though it was implicitly understood that PCUs had limited resources compared to other Indian HEIs and that researchers in these environments were required to work within these constraints in the undertaking of research. It was part and parcel of being a researcher at a PCU, though there were mixed views on whether institutions were experiencing a state of decline as discussed in literature (Altbach and Mathews, 2019; Altbach, 2014):

> The kind of research culture University of Mumbai had probably 50 years back is not the same as now, and that is because of the consistent decline in support, particularly in terms of financial support.
>
> Historical studies researcher H2, PCU, Maharashtra

Financial challenges among PCUs in both states are well documented (Varghese, 2021; MHRD, 2023). For instance, the state higher education plan for Maharashtra identifies funding as a major challenge,

highlighting “infrastructure facilities are affected due to slow processes in the availability of funds” (MHRD, 2023, p.132). Yet as will be explored in further detail in Chapter Six, there is also a recognition that the financial capacity of regional government has not kept pace with financing an expanding higher education system and in educating the masses (Varghese, 2021).

Elsewhere in Tamil Nadu, I was able to visit one of the campuses of the University of Madras during fieldwork. I observed that the main building was in significant decline with limited refurbishment in recent years. The building was densely populated with students, staff and housed several laboratories. These challenges are not unique to the PCUs in Maharashtra and Tamil Nadu. Many public universities in other Indian subnational regions have experienced severe financial constraints and deficit budgets (Kaur & Singh Bhatt, 2020). These problems adversely impact researchers irrespective of discipline and particularly disable those most early in their careers, who are least equipped to overcome these issues due to their own limited personal financial capacity as discussed in section 5.3.3. PCU researchers in this study relied heavily on others to support them in their day-to-day activities and research tasks:

> If I need an article, I need to search it and send it to my supervisor who then downloads it for me. But in some institutes, they will give a log in to the research scholar and whenever I have time, I will download it. But here, if I need any paper that has subscribers to it, then I have to rely on my supervisor who sends it to me in 2 – 3 days.
>
> Computer science early career researcher C10, PCU, Tamil Nadu

The early career researchers in this study overtly expressed gratitude for their institution’s provision of resources, notably around laptops and access to books, which they otherwise would not have been able to afford. These comments should be considered within the wider economic context of PCU student demographics. While the dominant narrative was one of resource-fragility, some researchers at the University of Madras that required high-end scientific instrumentation highlighted that their institution has made recent improvements to facilities or otherwise established cooperative, resource sharing agreements with other similar institutions:

> They do have very good facilities here, only the workspace is limited, but we have a multidisciplinary research unit that has all the high-tech instruments for our research. And that way we don’t have to go outside to other institutions or do outsourcing…
>
> Biomedical early career researcher B6, PCU, Tamil Nadu

> It is far better than when comparing 10-15 years ago, and it will be helpful for us if it were improved further than it is now. For example, before we will not have much exposure to chemicals or consumables, you could not use micro fuel chips because they would wash it and re-use it. But now, we are using these, and we throw them out. Since it is a government funded

> university, this would not have been possible earlier. We also have labs now and we need to build more, good, sophisticated labs.
>
> Biomedical researcher B9, PCU, Tamil Nadu

Researcher B9's comments in relation to improvements in facilities over time are reinforced by researcher and head of department B3, who also highlights that facilities have improved over the past three decades, enabling researchers to conduct large-scale experiments with other departments and institutions. However, they caution that these facilities must be preserved for core research as such research is limited in supply, and the facilities should not be commercialised for profit gain by their PCU. Separately, documentation gathered through fieldwork highlights the comprehensiveness of the University of Madras' library, referred to as "Mother Library of all South India" (University of Madras, 2023e). As previously discussed in Chapter Four, there appeared to be some disciplinary variations in experiences of resource-investment, where those disciplines that publish more frequently and that are perceived to play a direct role in generating economic growth benefiting from the limited funds available to PCUs and others, such as historical studies, further de-prioritised in these institutions. Institutional differences between the PCUs would be largely speculative given the sampling composition.

5.3.5 Output and impact

Recent scientometric analyses of both PCUs point to gains in research productivity. In the case of the University of Madras, citation performance has improved considerably between 2009 and 2018 (Santhakumar, Kaliyaperumal & Louies, 2020). The University of Mumbai has established a strong profile in the discipline of engineering (Chaturbhuj & Batcha, 2021). Despite their shared histories, there are key differences between the institution. For instance, researchers at the University of Madras have a higher volume of published outputs with local and national partners and the University of Mumbai experienced a trend of decreased domestic collaborative outputs and increased international collaborative outputs between 2001 to 2019 (Santhakumar, Kaliyaperumal & Louies, 2020; Chaturbhuj & Batcha, 2021). Institutional evaluations have reiterated the performance indicators set out at the outset of this chapter, notably the NIRF rankings and sponsored research projects, and have shown an orientation towards global rankings such as the Quacquarelli Symonds indicators for citation per faculty (University of Mumbai, 2021; University of Madras, 2023d).

Where the literature emphasises scientometric performance as a measure of research productivity and institutional documents emphasise ranking metrics and generation of revenue from research projects, several participants in this study distinguished between the personal dimensions of success and institutional drivers:

> *(in relation to success)* Is proving my idea computationally. So I had an idea, I work towards that idea and if I prove that idea works, then that is actually my success. But others, they measure my success by my publications…others being colleagues, the institution, my profile getting validated, my H-index, my I-index. We work on the idea and prove that idea computationally, but that idea is validated and approved, only if I publish the idea, which no other scientist in other countries will do. They actually work towards a product and that product is validated by only that government agency and that product will be patented and used for society. But here (in India), we concentrate more on publications and very less on patents.
>
> Computer science researcher C8, PCU, Tamil Nadu

The PCUs' focus on publication output is also mirrored in the experiences of early career researchers:

> For me being successful is completion of my PhD within the three years, and the university is the same but with a good number of publications. As per the norms I have to complete with two journal articles, but they expect at least four or five journal articles.
>
> Computer science early career researcher C10, PCU, Tamil Nadu

> The only indicators are having the productive time for research and publications, this is for me and my institution. If I have a paper in good impact factor journal, then that might be a great thing for my university and for me. If I invest my productive time… then there will be the gift of papers, I hope.
>
> Biomedical researcher B9, PCU, Tamil Nadu

As illustrated by researchers C10 and B9, increasing publication output was perceived to be both advantageous to an individual's career trajectory and a means of garnering esteem to the institution. These researchers were keen to impress peers and senior staff and, as expressed in the interviews, producing publications was the clearest way to ensure their career progression.

On the other hand, researchers in senior positions expressed a substantial degree of cynicism about PCUs' focus on publications. Researcher B3 emphasised that research had become synonymous with publications, which had led to a great deal of repetition and a lack of focus on the usefulness and translation of research problems to daily human life. They warned that this narrow approach was of use to neither research funders nor the wider Indian society. Another researcher characterised the focus on publications in even more harsh terms:

> There is a lot of *universalisation of mediocrity*, in the sense, I may read a lot but there may be somebody who is attending three or four good for nothing conferences, but he or she gets those certificates. And those certificates have marks, while counting that person's academic

> performance index. But nobody asks me how much do I know about my subject (from attending conferences) and when I'm being interviewed for my placement, for selection for a job, for a particular post. What is generally given more importance, is how much have you produced on paper, how much are you on marks. Therefore, at least from 2010 onwards, a sizeable chunk of faculty members around me have started to going for conferences than reading something, and we have like mushrooming of journals, and getting an ISBN book is easy. It is easy to set up these journals as it costs 2,000 rupees per person and if 10 people came together, then it becomes the first and last journals. But this happens and it is happening at such a mega scale, and the people that are meant to be controlling it (mushrooming of journals) are the people contributing to it.
>
> Historical studies researcher H5, PCU, Maharashtra

From this study, it has emerged that there is an isomorphic tendency towards maximising publication output in the PCUs even if individual researchers have a diversified conception of success. The dominance of publications offered several benefits to the career development of researchers and was the accepted modality of practice within many disciplines. But, as highlighted by researcher H5, it was also a cause for serious concern in relation to the quality and originality of ideas that were being disseminated through publications. Disciplinary factors directed the focus of research activity towards a local, national or international orientation, though there was a growing desire for internationally collaborative work given its positive effect on publication metrics (Santhakumar, Kaliyaperumal & Louies, 2020).

5.3.6 Collaboration

These findings need to be considered in the context of limited bibliographic information at both PCUs, including in relation to the disciplines of interest for this study. Based on a review of publications in natural science and health-science disciplines,[3] there is a majority proportion of domestic collaboration at both the University of Madras (57.5 per cent) and the University of Mumbai (64.4 per cent).

In relation to international collaboration, the University of Madras was largely engaged in building networks within the disciplines of Chemistry, Crystallography and Pharmacology, whereas the University of Mumbai had a stronger presence in Engineering and Computer Science (Batcha, 2018; Hussain et al, 2021). More generally, examples of recent institution to institution collaboration with other HEIs included the University of Madras establishing MoUs with the University of Passau in Germany to conduct research in media and journalism, Kelo University in Japan to undertake research collaborations in coastal resilience and disaster risk reduction and the University of Melbourne (Sujatha, 2022; India Japan Laboratory, 2022; Teri, 2022). The University of Mumbai pursued US-based collaborations with the

[3] Based on the affiliation information of primary research articles published within 145 natural-science and health-science journals (identified based by reputation and validated by a subsequent survey of global researchers) – Nature, 2023a

University of Illinois and St. Louis University (HT Correspondent, 2023). It is established that collaborative research with international partners has more citation impact than otherwise for PCUs (Hussain et al, 2021). Both institutions publicised their collaborative activities with various national and local actors including: government agencies, notably the Indian Council of Medical Research; other HEIs; and, others through entrepreneurial activities (University of Mumbai, 2021; University of Madras, 2023d).

Despite the growing focus on international collaboration, most participants in the study emphasised locally and nationally focused projects, where disciplinary norms and networks dictated the orientation of their collaborative works:

> Initially, we had a collaboration with Apollo Hospitals, from them we collect samples. They will also be involved in giving patient's history and their data. If we don't collaborate with them, then we won't get the sample or data. Another one is the collaboration we have with IITM (a PNIS based in Tamil Nadu) to learn some techniques and use their facility. But they also use our animal facility because they don't have animal facility. We have a give and take policy with them…it is important to improve the quality of our research.
>
> Biomedical researcher B9, PCU, Tamil Nadu

> It is local in nature, definitely. For instance, we invite people from across Indian institutions, from DU (Delhi University), JNU (Jawaharlal Nehru University based in Delhi), Jamia Milia (university based in Delhi). We also have intrastate collaboration, with University of Pune, University of Kohlapur, and our own university has MoUs with some foreign university. So our colleagues, when they invite scholars from different parts of the world or when we have the Consul-Generals from different countries, and similarly we receive invitations to our department. We invite people to our department from other institutions…but these MoUs are focused on student exchange and teacher exchange, joint research they are comparatively less.
>
> Historical studies researcher H5, PCU, Maharashtra

Computer science researcher C8 spoke about their sponsored research project with a national government agency, where they had been provided with equipment and infrastructure for research activity. In turn, they were required to provide regular progress updates about their project and make presentations to various government and industry bodies. As discussed in Chapter Four, discipline-specific norms and the autonomy of individual researchers shaped the nature of collaboration activities.

These examples underscored the comparatively influential and enduring role of national and local actors as collaborating partners for researchers at PCUs, despite the stated ambitions for international collaborations. Further, though participants from PCUs discussed examples of research projects with these partners, they framed collaboration in a more diffused sense, including through use of shared

equipment, student and staff exchange, and capacity building. Equally, these narratives highlighted the limits of collaborative activity initiated at the institutional level in relation to research, for instance MoUs with other HEIs were more focused on the mobility of students than joint research projects.

5.3.7 Role and contribution of affiliated colleges

Despite the significance of affiliated and autonomous colleges in relation to PCUs, this study did not focus on the experience of scholars working in those contexts. As discussed in Chapter Three, the primary purpose of these HEIs concerned the education provision of undergraduate education and further they operated with limited academic freedom, given that they rely on the affiliating universities to design curriculum and award degrees among other activities (Pradhan, 2018; Jalote, 2021). Although research was not expected in these colleges, some institutions promoted research activities (Varghese & Malik, 2019). The growing contribution of these colleges formed the narrative of some participants in this study, including those with direct experience conducting research within an autonomous college:

> There was no research activity when I joined but by the end of the time, there was a tectonic shift. They said, as institution are going to be assessed by NAAC ranking, it should have the weight of the research. Privately we were already publishing papers and going to conferences, but there was a sudden shift in those six years from teaching to the hybrid of teaching and research. We are compelled to do research by the granting agencies, but there is still not much time for it.
>
> Historical studies researcher H9, Tamil Nadu

Expanding on this narrative, Loyola College as one such example of an autonomous institution in Tamil Nadu; it espoused a research vision and strategy, fostered a community of research scholars and had established a research park (Loyola College, 2024). This institution was recognised as a scientific and industrial research organisation by the Department of Scientific and Industrial Research (Loyola College, 2024). Other researchers emphasised the disparities in relation to language barriers and a lack of exposure to research skills in their undergraduate curriculum that were experienced by large groups of students who were taught in affiliated colleges:

> University of Mumbai is three universities in one, it's that huge. We have more than 700 affiliated colleges. The Department that I work in is specifically a postgraduate department, but University of Mumbai has many undergraduate colleges. And there is a stark rural – urban divide here. Many colleges are situated in rural areas. And when you compare how the colleges from the rural areas compete and perform with the urban areas, there is a stark difference. Colleges in the rural areas, the educational medium of instruction is not English, it is in the vernacular languages.
>
> Historical studies researcher H2, PCU, Maharashtra

5.3.8 PCU research cultures: Nationally focused and resource-constrained, with differing leadership and disciplinary practices

The PCUs in this study shared some features of research culture including a disjointed commitment to research, specifically the gap between a stated ambition for research excellence and inconsistent practices at a local level (*values and perspectives*), and an open and inclusive talent pool (*practices and artefacts*). Both PCUs simultaneously straddled global, national and local agendas but they are most closely rooted in national activities (*flows and relations*).

However, there were some key differences between the two HEIs including varying degrees of formalised leadership structures to enable research activity (*practices and artefacts*), patterns of collaboration (*flows and relations*) and resourcing capacity (*practices and artefacts*). Both institutions were nonetheless hampered by insufficient overall investment in research. The framework is applied to the University of Madras at Figure 5.4 and University of Mumbai at Figure 5.5 respectively, followed by a discussion of specific features.

Figure 5.4 Research culture conceptual framework, applied to the University of Madras

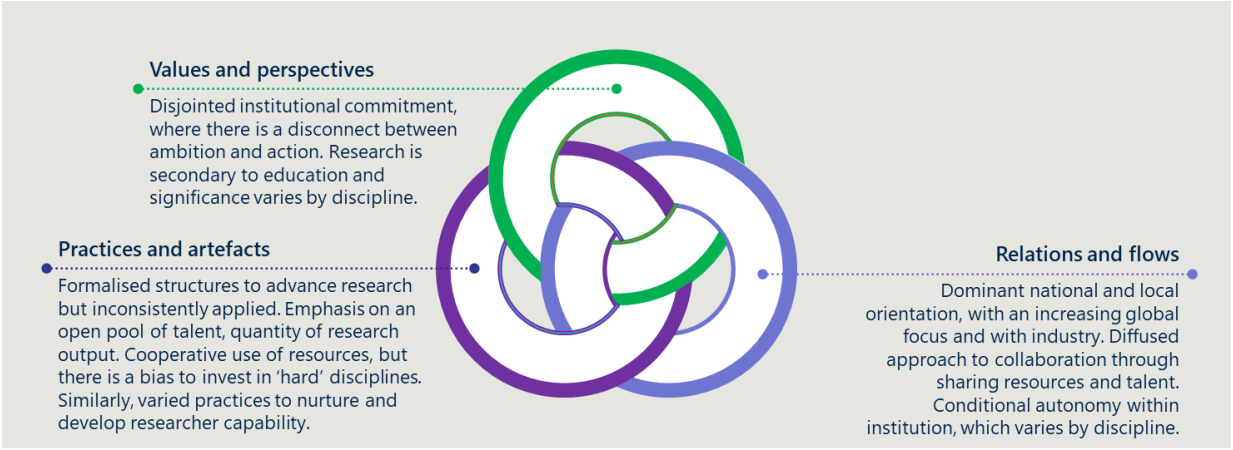
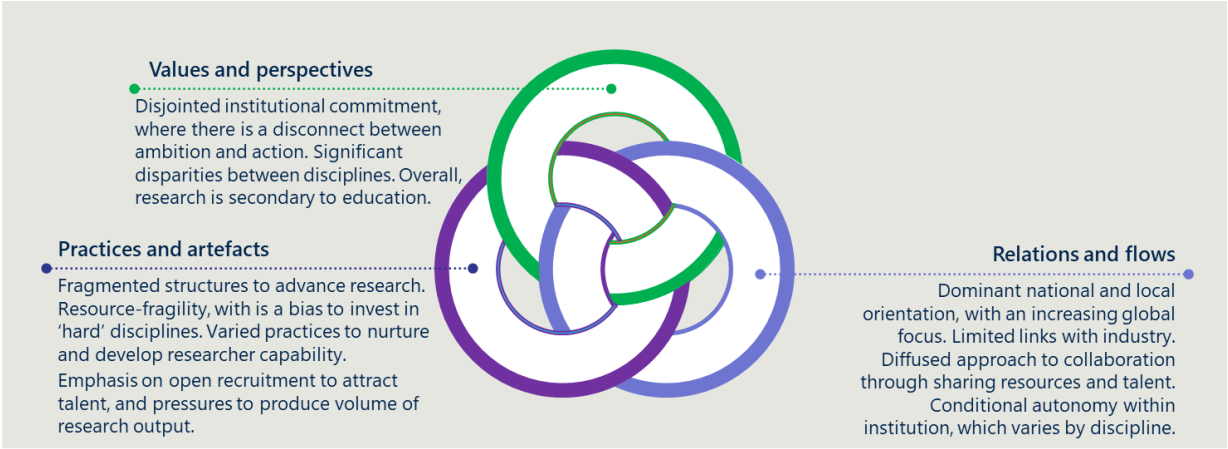


Figure 5.5 Research culture conceptual framework, applied to the University of Mumbai



The volume, outlook and capabilities of the talent pool was a key shared feature of both PCUs. Both had a large student population, but most students were neither inclined to pursue research careers nor were they exposed to serious research practices (*practices and artefacts*). Equally, research staff reported feeling burdened with teaching responsibilities and other demands; the constraint of resources was a significant barrier to undertaking research activity. Leadership and governance structures varied significantly between the University of Madras and the University of Mumbai, where the former was characterised by formal structures to enable research and latter was disjointed. At both universities, the role of departmental heads was determinative in shaping research ambitions, positively and negatively (*practices and artefacts*).

Across both institutions, there was a clear disconnect between institutional expectations and performance metrics that rewarded producing publications versus individual researchers' ideas of success. Researchers were often concerned with practical impact to communities and the development of technologies and products (*practices and artefacts*). The major difficulty for both PCUs was the lack of resources and investment with which to forge these collaborations (*flows and relations*). Where the University of Madras had concentrated resource investment within specific disciplines and in the pooling of resources with other HEIs, a wider sense of decline was observed through participant interviews and fieldwork at the University of Mumbai. Some researchers at both universities were from resource-constrained backgrounds, which impacted on their day-to-day tasks. The isomorphic tendencies towards publication output and partnering with international collaborators was also a shared feature of both PCUs (*flows and relations*).

Most students and staff attended or worked in PCUs that were nested in their regional contexts because the students or staff were concerned with family and income pressures. Leaving these localities for the purposes of research careers had limited appeal. Students were also engaged in their studies for the shortest duration possible so they could enter the job market and support their families rather than pursue further research training. On the other hand, staff pursued careers at these institutions, not because of their research profile but because of the proximity to family and communities. Research was a bonus, not their primary motivation. These dynamics were further complicated by the sprawling nature of the affiliated collages of both PCUs spread across the region of Tamil Nadu and Maharashtra respectively, as compared to other institution types that were largely situated in a central hub or metropolis.

Despite differences between the two institutions, both the PCUs were overall resource-constrained by way of research infrastructure and systems that made them a less attractive destination for those most research-oriented individuals. Participants frequently shared narratives of a research culture of mediocrity and fragility and, despite the best intent and some progress, the prevailing idea was of an institution where research and researchers lack importance:

> Yes the University of Madras is a 'mother university,' thereby it really plays a vital role…it has produced the so-called distinguished scientists and researchers…in the core sciences, we have really renowned scientists but one thing about us is like we celebrate sportsperson and movie personalities, we don't even give 10 per cent importance to our existing scientists and researchers. If that is done, then even the young minds will get inspired.
>
> Computer science researcher C8, PCU, Tamil Nadu

These ideas will be further developed in Chapters Six and Seven, which explore the role of wider system related factors including attitudes towards science and the implications for PCUs.

5.4 Private higher education institutions

SRM Institute of Science and Technology in Tamil Nadu and Amity University (Mumbai) in Maharashtra were established in 1985 and 2005 respectively and are the two PHEIs identified for the study. Given the sampling composition, the material in this section leans more heavily on researchers from SRM than those at Amity University.

5.4.1 Vision and strategy for research

Both PHEIs in this study emphasised research as an important objective as expressed through material gathered through fieldwork and interviews. But there were clear disciplinary differences in how these institution-wide ambitions were translated and enacted on by individual researchers. As described below, Amity University (2024a) framed its commitment to research in terms of addressing social problems and linking this with its education agenda:

> At Amity, we believe that education must inspire innovation. It must find solutions for pressing issues affecting humanity, at large. That's why, at Amity, the faculty, research scholars and students are carrying out path-breaking research across diverse disciplines.

On the other hand, SRM (2024a) discusses its research commitment in relation to areas most relevant to its capabilities as an institution with a concentration of hard-pure and hard-applied disciplines:

> Committed to fostering and furthering research excellence, especially focused on emerging areas of great potential like Nanotechnology, Bioengineering, Energy, Environment, Materials, and embedded systems among others.

Both institutions visibly asserted their NIRF credentials, promoted their centres of research excellence in concentrated areas, published their live-projects and showcased researchers' work. However, the lived experience of researchers highlighted a dual-sided narrative of vision and encouragement for research; within the so-called pure sciences, participants expressed a degree of high support and motivation, and participants in the humanities and social sciences described this in terms of indifference and limited encouragement.

Further, as shown below, a crucial variable that distinguished these two camps of researchers related to the volume of teaching responsibilities that they were required to fulfil:

> With Amity, they highlight themselves as a university with research and innovation, but you don't see a lot of actual encouragement for research. I am overburdened with reaching and there is very little given for funding support. The support from the institution is not very constructive.
>
> Historical studies researcher H4, PHEI, Maharashtra

> According to me, Amity is a research-driven university where they support us a lot towards research. They motivate us to submit research proposals to the different organisations who support research. They give us the opportunity for collaboration, for instance with the Samsung project, where faculty and students worked together in groups of sis. These kind of motivations are there from every higher authority. Here we motivate everyone to do research, not just limited to PhDs and staff."
>
> Computer science researcher C1, PHEI, Maharashtra

The latter narrative from computer science researcher C1 at the PHEI in Maharashtra, reinforced by others in this discipline and in biomedicine, detailed a range of professional practices that were embedded at the institution. These included fortnightly research project meetings, opportunities for secondments to industry and internships for students, undertaking compulsory literature review papers and mini-research projects in the undergraduate curriculum, as various ways in which the institution supported and coordinated research activities. Notwithstanding much stronger representation from computer science and biomedicine researchers at the PHEI in Tamil Nadu, the differences along disciplinary lines were made further stark in this institution:

> SRM is giving 90 per cent attention to research. Almost 100 per cent. Here in the institution, every department, every school is working on scientific investigation, and management is spending huge, huge money for creating infrastructure. For example, the worth of the School of Bio-engineering is more than 3 crores (30,000,000 INR) because research is now at the heart of SRM. Without it we cannot survive, I cannot survive…we are now called to do research, quality research…and it has to match international standards.
>
> Biomedical researcher B5, PHEI, Tamil Nadu

> It is quite different in case of other disciplines in our institute…our area, our department comes at the bottom of the entire list, so we are being paid less attention…we are not core in this sense, we are a service.
>
> Historical studies researcher H3, PHEI, Tamil Nadu

It was unclear whether the terms core and allied or support were colloquially understood terms or formally designated by this institution. In any case, those disciplines that were deemed as core were described by researcher H3 as being able to collaborate with other universities, undertake sponsored research projects and receive exposure. As for those in allied disciplines, as was the case with historical studies researcher H3, they lamented that their roles and responsibilities were constricted. They were not satisfied with their experience in relation to research. Here, multiple cultures and experiences existed within the one institution.

5.4.2 Leadership and governance

Overwhelmingly, researchers in this study across both PHEIs attributed to formal leadership structures the acceleration of their individual research endeavour and identified several benefits of having systemised networks within their institutions. At both institutions, there were designated senior leaders with responsibility for research strategies and an identifiable area of the university that coordinated research activities such as awards, administering policies and assessing grants, among others.

Institution-wide structures were reinforced at the level of the academic departments, which as expressed below, helped drive momentum towards securing grants and new collaborations for several researchers:

> We have the Assistant Professor, Associate Professors, Professors, Dean Research Sciences and Dean Research Non-Sciences, and above that Vice-Chancellors, Chancellors, and everyone. Basically that's the hierarchy for research that has been set up. And then we have our Department head, who keeps on asking us what grants have you applied for? The whole Amity faculty receive mails from the head office to say these grant applications are open, and then certain people are nominated for this work, and would be tagged as suitable for these applications, be it national or international, and they have regular meetings with all of us. And if we are interested in these works, suppose I want to collaborate, they will help us. And across the country, not just in Mumbai, we have people who are given these roles to help us at Amity with these tasks including retired scientists from the DST, DRBO and so on so that we can be successful.
>
> Biomedical researcher B4, PHEI, Maharashtra

Several researchers valued the practical support provided by these structures, through assistance with grant applications, while others responded positively to the encouragement and motivation from senior peers at the institution. There was an overall sense of urgency and pressure around producing higher quality, higher standard of work. Elsewhere at the PHEI in Tamil Nadu, the Directorate of Research facilitated stronger links with bodies such as Springer through a joint conference on publishing practices, as well as internally focused activities. Ultimately, the value of these leadership structures was amplified by the capacity of resources at the institution to directly support researcher ambitions, as well as the provision of expert guidance to help researchers with aspects of their role. Despite these formalised processes and the high expectations of individual researchers, most participants experienced a high degree of independence to go about their work:

> We have the freedom in our department to collaborate effectively and freely. In departments with a higher number of staff, there are some obstacles, but the freedom really comes from who is heading the department.
>
> Biomedical researcher B7, PHEI, Tamil Nadu

Notwithstanding the differences between the disciplines as discussed in section 5.4.1, most participants in this study described their experiences of leadership and governance as positively contributing towards their research productivity. Several researchers including B7 emphasised how specific areas or actors within the institution provided them with guidance on tasks such as techniques to improve writing journal articles, which directly helped them to publish an article in a high-profile journal with an international collaborator in Waterloo, Canada. For most participants in this study, there was strong alignment between their personal ambitions as researchers to produce high quality work with that of the institution's direction and activities of those in leadership positions.

5.4.3 Recruiting and developing talent

Previous works are divided in their assessment of PHEIs' capacity to recruit and nurture talent; on one hand, there have been concerns about inconsistent pay scales between institutions (Angom, 2015) and incentive structures that were uncompetitive on the global stage (Altbach & Mathews, 2019), yet others highlighted that the more recently established institutions have become a preferred choice for high-potential students and that there has been an aggressive focus on attracting foreign talent (Mathews, 2019). As shown below, participants across both institutions reinforced these diverse critiques, which pointed to factors that demonstrably disadvantaged those from historical disciplines.

> Even the recruitment process, it's not very impressive. The pay scales that they offer are not that impressive. There's no clear strategy in so far as hiring talent is concerned… at least within the liberal arts side of the college.
>
> Historical studies researcher H4, PHEI, Maharashtra

> They motivate us to do faculty development programmes every semester and we have that opportunity to upgrade our knowledge…to find out what is the recent field here. Compared to X (name of previous institution), I have exponentially more opportunities here.
>
> Biomedical researcher B7, PHEI, Tamil Nadu

Researchers had heterogeneous experiences within the Maharashtra based PHEI. For instance, computer science researcher C9 emphasised the positive norms of the institution, where they felt encouraged to participate in collaborative projects. Yet historical studies researcher H7 lamented that the "best minds are not coming to Amity…there are no fellowships, no scholarships, the students that come here have the money". The institution's emphasis on engineering and technology may partially explain the current situation. Investment and effort were dedicated intensively towards attracting research talent in these fields, at the expense of historical studies where the emphasis was on graduating students for employment.

This PHEI is outwardly ambitious about recruiting highly skilled researchers across a range of disciplinary areas, from aerospace engineering to international business and machine learning (Amity, 2024b). They are explicitly positioning themselves as a destination of choice for prospective researchers across a comprehensive portfolio of disciplines.

Disciplinary differences were also evident in the way researchers who were based in the Tamil Nadu PHEI were recruited and developed:

> Not all the students that come to us are A+ students, some students are D. The A+ student come here to study and learn, but the Ds want to enjoy life. We have to deal with both, particularly to reroute the Ds to the right path.
>
> Computer science researcher C4, PHEI Tamil Nadu

> We are attracting faculty from all over India and all over the world. We have international faculty. We have faculty from all states, from Kashmir to Kanyakumari, with all backgrounds. And so our real strength is our faculty, and our students are also from all over India, and we have NRI (non-resident of India) students also.
>
> Biomedical researcher B5, PHEI, Tamil Nadu,

However, many more participants at this institution recognised and were enthusiastic about the institution's policy on incentives (monetary and non-monetary benefits). The policy sets out the ways that various incentives were applied to motivate researchers; for instance, researchers with external funded projects received two per cent of the grant (SRM, 2023a). This institution had formalised a hierarchy of incentives for researchers who received state, national and international recognitions through to those who were recognised for their works at an academic conference (SRM, 2023a).

HEI-wide policies such as these underscored the relatively systematic approach to developing talent at this institution, which countered variation at the departmental-level. More importantly, it highlighted the fact that the overall resource capacity of this institution was stronger than the Maharashtra PHEI. The annual operational expenditure for salaries (teaching and non-teaching) offered one proxy of this assessment. Amity spent 220,436,697 rupees in 2021-22 as compared with SRM which spent 5.901,000 000 rupees in the same year (Amity, 2023b, SRM, 2023b). Differences in resourcing are further examined below in section 5.4.4. Elsewhere, computer science researcher C9 stated that PHEIs had greater flexibility in setting remuneration as compared with government institutions, which had created mixed outcomes for attracting and nurturing research talent. This flexibility had enabled the institution to recruit talented researchers, but participants in the study also lamented that many more researchers at other PHEIs and other types of institutions were not adequately rewarded for their efforts.

Across both institutions, it was evident that those researchers in the historical studies disciplines experienced a materially lesser level of support and encouragement towards undertaking research:

> We do not receive a lot of work and there are no complaints. But this does not equal happiness… different research cultures [sic] exist within the one organisation.
>
> Historical studies researcher H3, PHEI, Tamil Nadu

> In many PhD Vivas… I have seen students submitting their vivas and that 'research culture' is missing, by that I mean, their research mindset. They have many other jobs to do outside in the work and they just come here to pay money and get a degree… At Amity, the stick is very good but not the carrots.
>
> Historical studies researcher H7, PHEI, Maharashtra

Two participants discussed their caring and family responsibilities in relation to whether they felt equipped to undertake research:

> We are ready to research, we have many tools and software and so on, but I also need to consider my family situation in terms of time. I have to manage my family; I have two children who are both doing their '+2' (final years of high school) and so I need to concentrate on their studies, while continuing my research as well as discussing and guiding scholars, with their own research interests.
>
> Computer science researcher C7, PHEI, Tamil Nadu

Other researchers emphasised needing to provide for their families through earning an income. However, beyond economic factors, this study did not meaningfully explore the personal circumstances of researchers. Reflections such as these in the data were limited.

5.4.4 Investment and resources

On key indicators, there was a significant resourcing gap between the PHEI based in Maharashtra and the PHEI in Tamil Nadu, where the latter had benefited from sustained investment in its infrastructure and was much larger in scale. For instance, as at 2022-23, Amity University Mumbai employed 302 staff as compared with SRM which employed 3,624 academic staff (Amity, 2023a; SRM, 2023b). In turn, the total number of sponsored projects undertaken by Amity in 2021-22 amounted to five with four funding agencies as compared with 87 sponsored projects with 21 funding agencies at SRM (Amity, 2023a; SRM, 2023b). The physical manifestation of these differences between the institutions were palpable.

For instance, during fieldwork, I was able to visit SRM campuses which was vibrant and modern. In turn, many of the researchers that were interviewed for the present study were impressed with the

comprehensiveness and quality of the research infrastructure that were available to them. During my fieldwork period, I also observed there were several buildings that were being erected, including research laboratories and faculty residences, which was another example of the continuous flow of investment into SRM. Other researchers including biomedical researcher B1 spoke about the financial measures provided by this institution that went over and above the expected level of support for researchers:

> Typically for every external competitive project funding, 15 per cent of funds is typically taken up by the university but SRM doesn't take that money…it is reinvested in the project.
>
> Biomedical researcher B1, PHEI, Tamil Nadu

Unsurprisingly, the comparatively more affluent position of the PHEI in Tamil Nadu afforded many more opportunities for its researchers, across the various stages of their career lifecycle:

> There are faculty abroad programmes where they (SRM) support us with charges and travel, as well as conference fees. These days, College spends a lot of money on patenting. We also have funding for innovative proposals of up to five lakhs. Nowadays, College is focused on quality research than quantity research which means the focus (for researcher) is looking at the current trend in each field as that will get supported.
>
> Biomedical researcher B7, PHEI, Tamil Nadu

> SRM is a good place for me to conduct research. Here I am provided with a generous subsidy for my tuition fees. And the institution has other mechanisms to assist with me paying my tuition fees, such as fee payment instalments.
>
> Computer science early career researcher C11, PHEI, Tamil Nadu

As observed through fieldwork, SRM funded a range of central research laboratories and facilities including the Interdisciplinary Institute of Indian System of Medicine, Nanotechnology Research Centre, Centre for Advanced Concrete Research, Medical Research Centre and Earthquake Research Cell, among others (SRM, 2024b).

Several researchers emphasised interdisciplinary funding initiatives such as the Selective Excellence Research Initiative, which prioritised those researchers who were not recipients of external funding. This initiative focused on supporting the development of early career researchers and as explored by biomedical researcher B1, these initiatives encouraged cross-discipline collaboration and further bolstered the areas where the institution already had strengths.

While many of these resources and supports were available to all researchers at SRM, again participants from historical studies identified disparities in their experience:

> Institution does not say no if you have a solid idea. SRM will support me if I have a great idea. But the point is getting through the process. How will the idea come to me if I have not had the exposure? We do not have the exposure to come up with serious research project…and this makes for a gap.
>
> Historical studies research H3, PHEI, Tamil Nadu

This narrative also underscores the importance of non-financial resources, such as visible role models and communities of practice. As identified by this study, biomedicine and computer science researchers were able to reap the benefits of institution-wide resources more fully in a way that those in historical studies were unable to realise.

While Amity was also ambitious about its growth to double year-on-year, both in revenue and student intake (Agarwal, 2009), participants in this study acknowledged the relative youth of the institution as one of the reasons that investment and quality of resources had lagged:

> Presently, since it's a new campus… our overall grant applications are less, and total number of grants are less, even though Amity has supported us a lot with instruments without going in for these grant applications. But still several high-end scientific instrumentation, we do not have. That is why we are dependent on the other campuses (of Amity). Our pure research facilities are presently less as the campus is new.
>
> Biomedical researcher B4, PHEI, Maharashtra

Given that Amity University Mumbai was part of a wider network of campuses, this participant also highlighted they were able to network across other sites to utilise shared research infrastructure. Researchers referred to Amity's position and influence in terms such as "budding" and "emerging" where it was felt they were not as competitive as their peers at PNISs. From their perspective, these factors created a virtuous cycle where researchers at PHEIs were less successful in grant applications because funders preferred to award researchers working at a PNIS and government agencies favoured public institutions. In turn, this makes the PHEIs less able to invest in infrastructure and so the cycle is maintained.

5.4.5 Output and impact

The rapid growth in publications and increased performance in citation measures at the Tamil Nadu based PHEI is well known and publicised. At a less rapid rate, the Maharashtra based PHEI also demonstrated a general upward trend in relation to overall research output (Nature, 2023a). Amity University Mumbai was part of the network of Amity campuses and the research output was typically aggregated. Even so, SRM outperformed Amity on most rankings, including for instance the Nature Research Leaders: Leading

Institutions Index, which placed SRM at 28th position as compared with Amity at 97th in 2023 (Nature, 2023b). The lived realities of researchers at SRM reflected a scenario where there were more consistently enforced norms about research success, and which informed the reward structures and activities. At Amity, by contrast, there were more diverse sets of understandings and drivers about success and lower levels of resourcing. The below narratives reflected contrasting perspectives:

> For papers that are published with Scopus or in an indexed journal, we receive between 2000 to 20000 per month. And certain journals are indexed at 'premium,' such as Nature publications. For these, we get cash and a medal, and it can also be considered for internal promotion.
>
> Biomedical researcher B1, PHEI, Tamil Nadu

> Here the stick is very good, but not the carrot. We have to submit two research papers a year…but we should have quality time to do the research we need to.
>
> Historical studies researcher H7, PHEI, Maharashtra

It should be noted that other researchers at Amity, such as computer science researcher C1, pointed to the importance of publishing in Scopus-indexed journals, filing patents and securing government funded research projects. However, the distinction was in how they characterised Amity's orientation for success as "targets are being set now". At SRM, there was a much more established relationship between success metrics and reward structures and the concentration of resources for researchers to realise their success aspirations.

Researchers at SRM including biomedical researcher B2 also spoke about the overall drive of the institution to publish in global platforms, to share works at international conferences and to foster those practices among both early career researchers and established faculty members:

> When we choose journals, we choose from the SCI list. SCI journal is like a global list that we have. If you see my work, one of my papers is published in a five-impact factor journal. So it's basically a global journal. Most of my other journals are global, and this is what others are motivated to do.
>
> Biomedical researcher B2, PHEI, Tamil Nadu

As will be discussed below in section 5.4.6, even if researchers undertook projects with local partners, they were encouraged to publish in globally reputable journals. Several other researchers at this institution described institutional features, such as dedicated centres for intellectual property rights and a startup centre where the institution directed resources to scale up researcher innovations, as enabling and reinforcing the outputs desired by researchers and the institution at large.

During fieldwork, I observed posters within an academic building for a 'student research showcase' to demonstrate their emerging ideas and researchers shared with me several examples of patents that were being filed. As made clear throughout the interviews, there was a linear relationship between concentration of resources to undertake research, the codified measures of success and an incentive structure that rewarded researcher effort at SRM. The disciplinary differences discussed earlier also constrained and enabled conceptions of success across both institutions.

5.4.6 Collaboration

As was the case in relation to publication outputs and incentive mechanisms, at the Tamil Nadu based PHEI, collaboration activities, and in particular interdisciplinary collaboration, were explicitly encouraged through the institution's reward mechanisms:

> In our faculty appraisal forms, we have so many criteria out of 100 that we are assessed. But we are given may points to international collaborations…if we do international collaboration in research, we are given 15 points…based on that we are very eager to achieve. Previously I was unaware of how to do international collaboration, and through faculty appraisal forms now I have come to know.
>
> Biomedical researcher B7, PHEI, Tamil Nadu

> If there are competitors in that particular scheme (Selective Excellence Scheme), priority will be given for interdisciplinary research. So, all internal funding, priority is given to interdisciplinary research. If I have a Co-PI in my department or from another department, the Co-PI from the other department is preferred for the funding. This encourages multidisciplinary, interdisciplinary research. They also encourage collaboration with other institutes from within SRM, we collaborate with medical colleges, dental colleges and of course, we also collaborate with foreign universities.
>
> Biomedical researcher B1, PHEI, Tamil Nadu

Despite the institutional drive for interdisciplinary collaboration, in response to a follow up question about whether these efforts were researcher-led or more systemic, the role of the individual, as well as disciplinary norms as described in the previous chapter, was emphasised as being primary:

> It (interdisciplinary collaboration) starts with the researcher and then we tie them to the SRM institution, but we start lab to lab, which is quite easy and faster also…here the strength is we can all collaborate with laboratories for multidisciplinary and interdisciplinary research.
>
> Biomedical researcher B1, PHEI, Tamil Nadu

Building on the person-to-person collaboration activities and lab to lab interactions, the other central idea that emerged from interviews with this PHEI related to efforts to build globally focused cooperations through MoUs and institutional partnerships. However, these engagements extended beyond research activities to encompass international accreditation of degrees and mobility of students and faculty. It underscored the interconnected nature of research to the other activities undertaken by the PHEI.

> SRM is an internationally recognised university. SRM is tied up globe with almost all top universities. We have MoU is Harvard, MOU with Stanford, with NASA and top 40 US universities. SRM is not a local or a regional university, it is working on par with global. Most of our departments are ABET accreditation (American Board of Engineering). This is a very prestigious recognition and a point in how UGC is grading us ranking. Our students, after they graduate, only 10 per cent of students are going for job. 80 per cent of students are going for higher studies either here in the UK, US, or Australia. Our students you can see are all over the world, especially at the top universities.
>
> Biomedical researcher B5, PHEI, Tamil Nadu

The narratives from this institution point to a deep concentration of internationally focused collaborative activity, which contradicts earlier works that have critiqued the limited capacity of Indian PHEIs to forge international partnerships (British Council, 2014; Khwaja & Javed, 2023; Srivastava, 2014). The characterisation has been that Indian PHEIs are starting from a 'low base' of research activity and where private institutions have additional barriers to work through such as paying increased costs towards research projects and regulatory hurdles to secure approval to be able to work on research projects (Srivastava, 2023). In the case of the Tamil Nadu PHEI, the levels of resourcing at the institutional level were a key determinant in shaping the character of its collaboration dynamics.

On the other hand, as with sections 5.4.4 and 5.4.5, the Maharashtra-based PHEI more closely reflected the situation as described by Srivastava (2014). Researchers in this study emphasised that the Amity brand was still evolving, which impacted its reach internationally and in forging connections with industry partners:

> As we are now, we have issues around confidence with industry…we need to establish our reputation and are gaining our confidence.
>
> Computer science researcher C1, PHEI, Maharashtra

Despite being networked with campuses in other parts of India including Lucknow, Noida and Jaipur, which as discussed above facilitated cooperation in relation to infrastructure and equipment, the ambition for this institution was also largely geared towards global collaborations. This was the subject of some critique, primarily from historical studies researchers at this institution:

> It seems like institutions enjoy being much more centralised that liberal spaces of education. I think there is bit of a colonial mindset here… we haven't reorganised ourselves to local demands and the context. So we are divorced from the local needs.
>
> Historical studies researcher H4, PHEI, Maharashtra

5.4.7 PHEI research cultures: diverse realities, mediated by resources

From analysis of the participant data, there were differences in research cultures between the PHEIs as well as within the institutions. Nevertheless, both institutions reflected a dominant emphasis on enabling research performance within the pure sciences (*values and perspectives*) and had formalised leadership structures to direct and support research activities (*practices and artefacts*). Both institutions also shared a global and national orientation (*flows and relations*).

Flowing on from this, within each PHEI, there were a range of research subcultures that emerged from the intersection with disciplinary cultures. For instance, a culture of resource-investment, aspiration and established rituals in computer sciences and biomedicine, and of resource-neglect and indifference in historical studies (*values and perspectives*). The variations in disciplinary cultures discussed in Chapter Four was most pronounced in the PHEIs, given the systematic, new-management approach to building research cultures in these newer, more modern institutions. Across both institutions, the research cultures were characterised by sustained investment in infrastructure, particularly within specific disciplines. The conceptual framework is applied to SRM at Figure 5.6 and Amity University Mumbai at Figure 5.7 and is followed by a discussion of specific features.

Figure 5.6 Research culture conceptual framework, applied to SRM

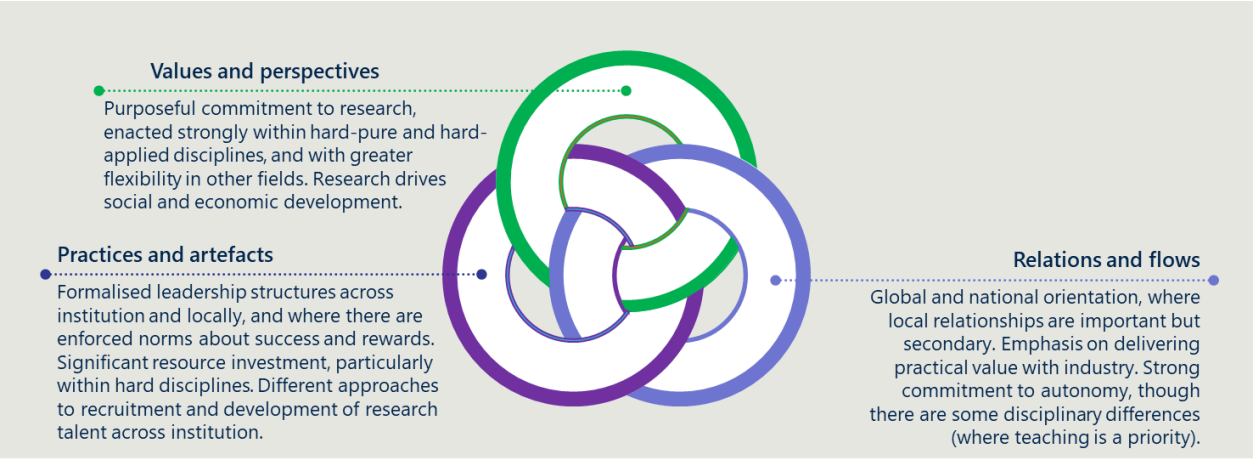
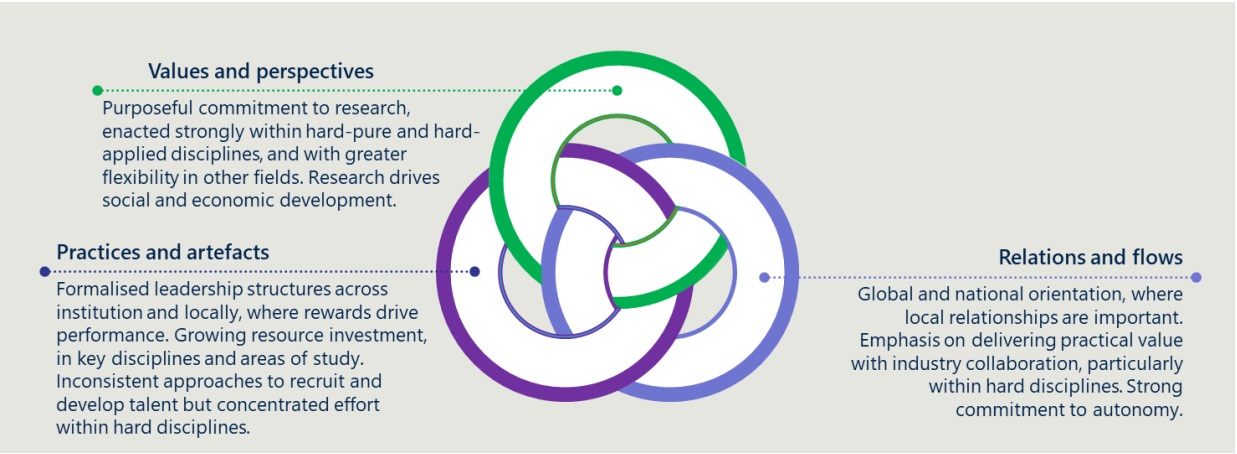


Figure 5.7 Conceptual framework, as applied to Amity University Mumbai



The idea of research subcultures was most evident in the volume and orientation of researchers; PHEIs were seen as highly attractive by and strongly supportive of researchers in biomedicine and computer science. There was a concerted effort to recruit researchers beyond regional boundaries, as was evidenced through advertising campaigns. Many researchers in these fields were motivated by peers and those in positions of research leadership to be productive. They had specific reward structures that incentivised research output. For instance, at the Tamil Nadu based PHEI, there was a specific research-focused mode of employment:

> Within the department, we have two categories of staff; Associate Professor, Assistant Professor and Research Associate Professor and Research Assistant Professor. Research Professors have a 50:50 split between teaching and research, and there is more emphasis on their post doctoral performance and publication. Whereas, in the general category, they will give more importance to being a teacher, where they do 70 per cent teaching and 30 per cent on research.
>
> Biomedical researcher B5, PHEI, Tamil Nadu

Such structures were not evident in historical studies. Across both institutions, those participants reported that their primary purpose was teaching and described PHEIs as not a conducive setting for research. Scale and communities of practice was a key determinant here. As discussed previously, biomedical and computer science researchers described a rapid growth in faculty size, whereas those in historical studies were among a handful within their institution. In the case of Amity, researchers from different disciplinary areas were clustered together with a loose identity between them.

The overall resource capacity was a key differentiator between the PHEIs. SRM was able to invest significant amounts of funds in its physical infrastructure and research facilities and was able to competitively remunerate its research talent. Whereas Amity was more concentrated in its deployment of resources, further sharpening the disparities between disciplines.

Interdisciplinarity was likewise a dominant idea at SRM. Reward structures and incentives encouraged researchers to work across disciplines. There was also a growing desire and capacity to collaborate with international partners and researchers. Most researchers spoke positively about the levels of resourcing that were able to be directed towards collaborative activities, which went beyond pooling resources and equipment. At Amity, researchers were motivated to deliver 'real-time' solutions, produce patents and work closely with industry, particularly within the disciplines where there was resource investment.

While there had been sustained and growing investment in research activity within PHEIs, it had been largely concentrated in those disciplines where there was promise of commercialisation from developing products and technologies and that more readily facilitated international collaboration and networks. Therefore, the biomedicine and computer science disciplines tended to be among those favoured areas. Researchers in these disciplines were more prepared to move around the country for the promise of rewarding careers; this is distinct from those in historical studies, who were from the nearby localities.

5.5 Synthesis of commonalities, differences and intersections

As discussed in Chapter Four, research culture within Indian HEIs varied greatly by disciplinary values and ways of working. However, this chapter makes clear that the institutional dimensions of research culture profoundly enable and disable researchers' ambitions and in relation to normative ideals about research performance. Of all the features discussed at the institutional level of research culture, the volume of resources and the recruitment and development of researcher's capabilities emerged as important and distinguishing features.

I have further distilled the key features of research culture(s) from the individual case HEIs to discern commonalities and differences between the three major institution-types. The aggregated summary is shown below in Table 5.8. Following a discussion of commonalities and differences, I also briefly highlight cross-cutting issues that presented themselves at the intersection of institutional dynamics.

Figure 5.8 Summary of HEI features of research culture

Summary of HEI features of research culture			
Institution type	**Values and perspectives**	**Practices and artefacts**	**Flows and relations**
Publicly funded national institutes of significance	***Embedded institutional commitment***	***Formalised leadership and networks***	***Global outlook, nationally elite***
	World-class aspirations	***Selective talent pipeline***	***High degree of autonomy and empowerment***
	Strong emphasis on engineering	***Inclusive community building practices***	***Deepening links with industry***
		Emphasis on high performance and rigour	***Position of privilege and influence within and beyond institution***
		Resource-rich	
Publicly funded comprehensive universities	***Disjointed institutional commitment, emphasis on teaching***	***Fragmented leadership***	***Regionally and nationally focused, pockets of global engagement***
		Open talent pipeline	
		Mixed approaches to capacity and community building	***Conditional autonomy and empowerment***
	Contribution to regional growth		***Loose industry engagement***
		Emphasis on quantity and productivity	***Diffused approach to collaboration, through sharing resources and talent***
		Resource-fragile	
Private higher education institutions	***Dual-split ambitions,*** *by disciplines*	***Formalised leadership***	***Global orientation, with a focus on national influence***
		Disciplinary varied talent pool	
	Contribution to national development	***Systematic approach to capacity development***	***High degree of autonomy***
		Enforced norms on quality, impact and innovation	***Emphasis on interdisciplinary and industry collaborations***
		Resource-investment	***Differences in collaboration by disciplines***

5.5.1 Values and perspectives

From the available data, there are dominant archetypes that characterised each of the institution types though the agency of individual researchers and disciplinary norms played a partially disruptive role in

relation to research values and perspectives. PNIS researchers were encased within a culture that was hyper-focused about research, where the values and perspectives were deeply embedded. While there was an institution-wide ambition for high levels of research output and performance, this was most pronounced and encouraged within the applied disciplines. Although PCUs were increasingly focused on research activity, as evidenced through the institutional strategies (including strategic plans and institutional values) and leadership expectations, the lived experience of researchers indicated a more disjointed approach. Here, research was one of several priorities. The PHEIs in the study were caught in the middle; biomedical and computer science researchers described a culture where research ambitions were front and centre but those in historical studies typically reported research was less of a priority to their institution and, in turn, to their day-to-day realities.

The implications of these dominant, institutional values and perspectives were three-fold. Firstly, they reinforced or subverted researchers' individual aspirations. For instance, at the PNIS, it was altogether possible for researchers to be networked with collaborators globally and there were many role models of researchers who were highly productive and successful in their fields. In contrast, PCU researchers generally expressed a sense of not feeling valued and supported for their research undertakings and they had limited access to global networks. Secondly, as will be discussed next in practices and artefacts (section 5.5.2), the difference in values and perspectives sustained the volume and quality of researcher talent that was found within each of these institution types. Thirdly, it was determinative of the level of resources both financial and non-financial that was able to be invested in sustaining research activities. Institutional values and perspectives appeared to be largely enduring, but as shown through the PNIS where there had been deliberate and sustained interventions to shift towards a greater focus in research, there was always potential for change and transformation over time. It was not entirely fixed.

5.5.2 Practices and artefacts

Flowing on from the *values and perspectives* discussed above, there were more differences than similarities in researchers' professional practices and engagement with artefacts across HEI types. At the PNIS, there was a greater proportion of doctoral research students among the total student population and an emphasis on producing high quality research outputs. The selection of students through a nationally competitive exam and the recruitment of faculty with overseas training and qualifications were two further inputs into a largely highly motivated and self-initiating researcher talent base.

PCUs comprised a much larger student population, but a significantly fewer went on to undertake doctoral studies and research careers. As compared with the professional practices at the PNIS and at the PHEIs, researchers at PCUs framed success and performance metrics in terms of quantity, through producing large volumes of research output, and described some examples of problematic research practices including publishing articles in predatory journals for performative purposes. Researchers at

PCUs faced the tall order of needing to be productive, amid a working environment that was resource constrained. As evidenced through fieldwork, there were demonstrable differences between the PNIS and the PHEIs and the PCUs. At PNIS and PHEIs, new research facilities were being built, early career researchers received generous stipends and accommodation support, and systematic strategies to nurture community were implemented. There was much less available by way of support and remuneration for researchers at PCUs.

Whereas the differences in overall levels of resourcing and the profile of researcher talent were most stark between the PHEI and PCU, with latter in a more precarious position. The PHEIs were distinct in that they were simultaneously resource-rich and resource-poor, according to disciplinary area, and had a more diverse talent profile within the one institution. PHEIs were both highly attractive to those researchers in biomedicine and computer science disciplines, with a significant scale of researcher communities in these knowledge domains, and were, at the same time, much less conducive for those working in historical studies who reported their primary purpose was teaching. Interestingly, however, there were targeted initiatives at both PHEIs and PNIS to facilitate interdisciplinary practices, particularly where they led to practical solutions and products developed alongside industry. This is discussed further below. It should be stressed that disciplinary differences in values and practices were observed across all institution types.

5.5.3 Flows and relations

This study has important findings about the quality and strength of inter-researcher relations within each specific institution, as well as the relations forged between HEIs with industry. PNIS researchers practised norms around autonomy, whereas PCU and PHEI researchers have inconsistent experiences in relation to autonomy and feelings of empowerment. Further, in recent years, PHEI and PNIS researchers emphasised enjoying growing influence and reputation with government, industry and scholars from Global North and Western countries. At the latter, government-sponsored schemes such as the IoE scheme enabled researchers to access even further levels of resourcing; at the former, the PHEIs in this study had established a succession of MoUs and partnerships with industry actors.

Though the purpose and effectiveness of these MoUs and partnerships varied in quality. Disciplinary differences were sharply evident at the PHEIs, with researchers in biomedicine and computer science more closely networked with each other and with other scholars outside the institution, while it was clear that researchers at the PNIS enjoyed the highest level of reputation at a national and global stage. This sustained their virtuous cycle of research performance, ongoing supply of research talent and comparatively higher concentration of resource and investment, though, as acknowledged by PNIS researchers in this study, their level of resourcing was comparatively less than in leading Western and East Asian HEIs.

Conversely, PCU researchers provided a mixed perspective about the dynamics of inter-researcher relations and a much more critical assessment of the relations between their HEIs and wider society, which had become more constrained in recent years. The combination of declining government support for research activities and substantial growth in students had meant that their standing in generating new and novel knowledge had declined in status in the eyes of industry and the wider society. For some researchers, the pressures of teaching in a resource-constrained setting had contributed to looser and more fragile collaborations with others, yet for others, their established disciplinary practices and ways of working had mitigated the wider institutional factors. For many, the most persistent barrier remained the lack of resources and investment to facilitate inter-researcher collaboration, both within and beyond the institution, which had exacerbated the sense of decline in quality and reputation in research culture. Beyond some examples of ad hoc pooling of resources and infrastructure, there was little by way of collaboration and relations between each of the institution types.

PHEIs and PNIS were also shaped by cultural flows in some similar ways, towards a global outlook. Building on findings from Chapter Four, the PNIS in this study was dominated by pure-applied disciplines that were heavily nested in global networks of researchers, metrics and ways of working. Added to this were the significantly higher levels of resourcing and a conception the institution as an elite national institution. This created the foundation for a research culture, where there was rapid mobility of research talent within and beyond India and sustained investment in resources. This institution worked outside of regional boundaries in terms of talent, resourcing and collaborations. Its orientation was firmly one where the global was more significant than the local, but it also retained a strong national identity. On the other hand, driven by the potential for commercialisation of research activities and the global outlook of biomedicine and computer science disciplines, PHEIs had explicitly prioritised the nurturing and growth of those disciplines. As previously discussed, the flows for historical studies researchers that worked at PHEIs operated differently. They were rooted in a local and, to some extent, national orientation. Researchers at PHEIs were shaped by multiple realities, but the general direction of travel was globally focused.

In sharp contrast, the PCU flows operated differently. Despite some examples of internationally focused practices by way of collaborations, these institutions were occupied with regional and national agendas. As highlighted in this study, the most important driver of these flows was the character of students and faculty who were deeply connected to their regional context and agendas. These institutions primarily existed to serve localised, regional needs in relation to research. Notwithstanding the diverse flows that encased and shaped the research culture of these institutions, two cross-cutting ideas emerged across these institutions.

5.5.4 Increasing regulatory burden

Researchers across all institution types emphasised the growing pain of regulation set out by the UGC. For instance, historical studies researcher H5 at a PCU lamented the minimum requirements of all HEI academic staff to hold PhD qualifications which had contributed to a reduction in the quality of new doctoral works. Elsewhere, biomedical researcher B8 at a PNIS critiqued the UGC as inefficient at dispensing stipends for early career scholars and noted the significant bureaucracy involved in approving and initiating research projects. Others discussed the difficulties associated with the UGC standards on teaching hours, which constrained their ability to undertake research activities. While the impact of these challenges was felt most sharply at PCUs given their relatively lesser resource-position, regulation was an issue observed across PCUs, PHEIs and at the PNIS. These issues are discussed in the context of system-related features of research culture in Chapter Six.

5.5.5 Role of research leaders

Of those research leaders that participated in this study, it was clear that the major driver of their own performance and that of their department, research group or institution at large concerned a sustained uplift in research performance:

> Research is now considered a very important thing…for me the main purpose of my job as XX of this institution is to be recognised by peers for our research. There is much satisfaction in this and where it needs focus.
>
> Research leader L1, PNIS, Maharashtra

Notwithstanding the factors previously discussed, those in positions of leadership at PCUs shared in this ambition and emphasised the importance of working through key barriers to invigorating research culture at their institution:

> Research is the base…it is and should be the foundation of our university. We are following Western parameters but not sharing the same spirit.
>
> Research leader H6, PCU, Maharashtra

While research leaders were enabled and disabled by different levers that have been previously discussed and this impacted both how their vision was realised and the degree to which research was an important priority for their peers, the point here is that there was an acknowledgment of research as a key priority for leaders across institution type. It was increasingly connected with their own performance and objectives as a leader within Indian HEIs.

5.6 Summary

Where disciplinary features of research culture are the processes by which researchers communicate ideas and frame their daily scholarly practices, HEI factors mediate the capacity and performance of researchers in a much more direct sense. As this chapter has highlighted, they can either expand the sense of possibility for researchers or frustrate the realisation of their hopes and agendas. For these reasons, HEI features of research culture provide a sense of comparison against normative ideals concerning productivity and quality.

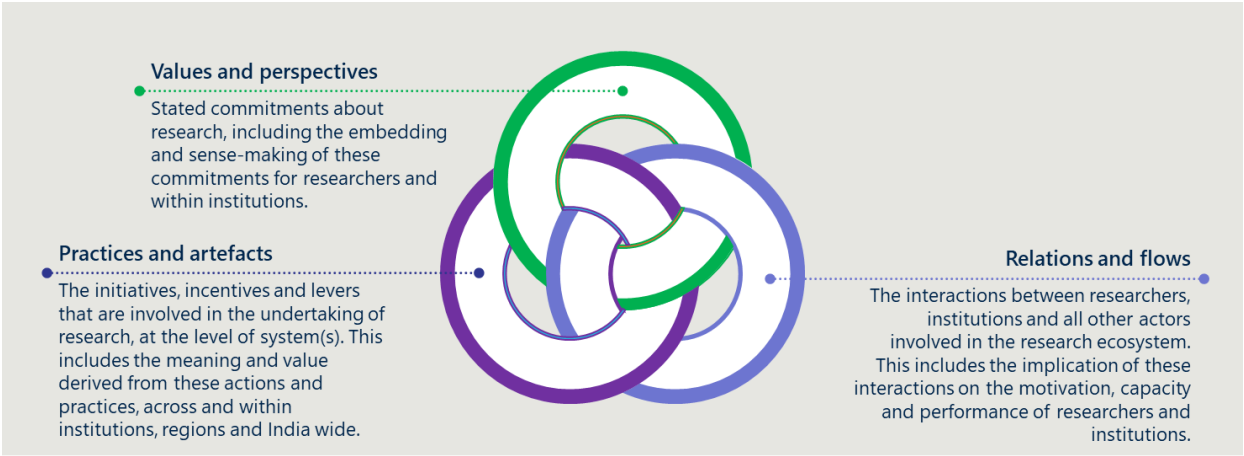
This chapter documents the key ideas of research culture that are central to a selection of PCUs, PHEIs, and PNIS in two regions. It is not reflective of the full spectrum of institutional diversity in India, though it provides important insight into the major institutional types. It shows the areas where HEIs have features in common such as the increasingly global nature of research ambitions, but predominantly it highlights the features that are different between PHEIs, PCUs and the PNIS. Next, I will consider the regional and national-system related features of research culture, which frame key ideas at the level of the entire Indian research ecosystem.

6 FEATURES OF RESEARCH CULTURE IN REGIONAL AND NATIONAL SYSTEMS

6.1 Introduction

This chapter illuminates the insights of researchers, research-leaders and, importantly, actors involved in the wider research ecosystem at the regional and national levels in India. It presents the rich perspectives of participants, augmenting their narratives with fieldwork material and literature. In the context of this study, the research system encompasses the policy directions, regulatory frameworks, institutions, key actors, funding and key initiatives that shape the undertaking of research in HEIs. The chapter discusses core themes of vision and ambition, policy implementation, resources and investment, collaboration, and wider socio-economic features that are specific to the Tamil Nadu and Maharashtra regions such as language and identity. This is followed by a discussion of these and other features through the national India-wide lens, including autonomy, colonialism and the relationship with the wider education ecosystem. There are some interrelationships with features discussed at the level of HEIs in Chapter Five but fewer at the level of disciplines in Chapter Four. As with the previous two findings chapters, I revisit the conceptual framework throughout this chapter to draw out the key insights for system-level research culture within Indian higher education and discuss implications arising from them. I apply a system-level lens in Figure 6.1 to the research culture conceptual framework that was introduced in Chapter Two.

Figure 6.1 Conceptual framework of research culture, as applied to systems



The system-level lens provides a filter to sort the data that has been inductively analysed. The 'bottom-up' ideas that were generated through interviews have been mapped onto the conceptual framework in the following ways: vision and ambition are mapped to *values and perspectives*; policy implementation and resources and funding corresponded to *practices and artefacts*; collaboration is aligned to *relations and flows*; and socio-economic factors were mapped to *values and perspectives* as well as *relations and flows*, where appropriate.

6.1.1 Research and the relationship between national and regional systems

This chapter explores research culture at the level of both regional and national systems, as the governance and financing of higher education are the joint responsibility of the Union government (otherwise known as the central government) and the provincial governments (also known as the state governments). Srivastava and Chattopadhyay (2022) describe the governance of higher education as Union-heavy, in that the central government plays a commanding role in the shape and direction of higher education. The UGC has the overarching objective of maintaining standards in teaching, examination and research within higher education institutions. All central public universities and public national institutes of importance are funded by the central government, which represents 20 per cent of all HEIs in the country (Srivastava and Chattopadhyay, 2022). However, state governments are the primary funder for state PCUs, which enrol the largest share of the student population.

As discussed extensively in Chapter Three, sub-national regions in India vary considerably in relation to their economic capacity, social traditions and political ideologies. In this study, I have identified HEIs in the Maharashtra and Tamil Nadu regions given their overall research capacity and the differences between them. Table 6.1 re-introduces Maharashtra and Tamil Nadu with respect to research capacity indicators, as gathered through a range of sources and comprising the Annual Report of Intellectual Property 2022-23 by the Government of India, the India Innovation Index by NITI Aayog (the policy think tank of the Government of India) and the AISHE 2022. The indicators used include: the number of annual patent applications filed, the total expenditure by governments on R&D and the consolidated ranking in relation to the National Innovation Index. As previously discussed, these measures are not without criticism.

Table 6.1 Research capacity of regions and India

Regional/ national	Key characteristics of HEI system	Research capacity
Tamil Nadu	Comprises 59 state universities, 2,639 colleges, 200 central and state research universities, two central universities and seven institutes of national importance (2022)	• Ranking in National Innovation Index, 2022 – 5 • Patent applications filed, 2021-22 – 5262 • Expenditure on R&D, 2021-22 – 609.72 crore INR
Maharashtra	Comprises 44 state universities (of which 19 are deemed universities), one central university, eight institutes of national importance, 4,494 colleges (2022)	• Ranking in National Innovation Index, 2022 – 4 • Patent applications filed, 2021-22 – 4566 • Expenditure on R&D, 2021-22 – 663.42 crore INR
National	Comprises 1,168 Universities/University level Institutions, 45,473 Colleges and 12,002 Stand Alone Institutions (AISHE 2021-22)	• Patent applications filed, 2023 – 82,811 • Gross expenditure on R&D, 2021 – 12,73,810 crore INR

The chapter discusses participants' views of system-level features of research culture within Maharashtra (section 6.2) and Tamil Nadu (section 6.3) and at the national level (section 6.4). This will be followed by a summary of key ideas (section 6.5). Throughout this chapter, there will be a focus on India's wider social context given the inextricable links between features of research culture at the system level and the ambitions of the country at large.

6.2 Maharashtra

Participant insights were highly consistent in relation to the key themes discussed below at the level of the Maharashtra region, despite variations across disciplines and institutions.

6.2.1 Vision and ambition for research

Participants in this study articulated that the Maharashtra government and regional policy actors did not play a meaningful role in establishing or nurturing research activities:

> Day by day, what is happening because of neo-liberalisation in developing countries, and the cutting back of state funding, rolling back of the welfare state, in a state like ours, they are not interested in supporting these universities and public institutions…
>
> Historical studies researcher H2, PCU, Maharashtra

> The state government plays little or no role in shaping research culture here. Of course, they have an education minister but more or less, they are looking at implementing the policies that are passed at the central level. They don't make any significant interventions. So mostly if we're applying for grants, or for any kind of support for research, we are applying for institutions based in New Delhi which are centrally operated institutions and not state operated institutions.
>
> Historical studies researcher H4, PHEI, Maharashtra

> I don't myself deal with the state government often…the IITs are free from that. The (state) government doesn't tell us what we should be doing. That is probably why I don't think about them so much. Maybe in the local colleges they might be some annoyance, but I am not aware of anything for my institution.
>
> Computer science researcher C2, PNIS, Maharashtra

Some researchers noted that although there might be policy documents and manifestos concerning research ambitions, most bureaucrats and elected officials did not appear to understand the role of research in universities. The idea that it was not the formal role nor responsibility of state governments to shape research culture was reflected more broadly in the words of computer science researcher C9 below:

> We deal with regulatory bodies (of regional governments) for land acquisition – but, for research, individual universities should follow the norms, and individual university determines what is quality.
>
> Computer science researcher C9, PHEI, Maharashtra

These perspectives were shared widely by researchers that participated in the study, particularly those who worked at the University of Mumbai (a PCU established and regulated by the government of Maharashtra). The disjointed expectations around research stood in stark contrast to the stringent teaching requirements previously discussed in Chapters Four and Five. However, countering these dominant narratives, two participants in the study described the contribution of Rajiv Gandhi Science and Technology Commission (a funding and policy agency of the Government of Maharashtra), and the state-level implementation of the Rashtriya Uchchatar Shiksha Abhiyan (RUSA) scheme towards enabling research activity, which are discussed below under policy implementation (section 6.2.2). Even these participants framed these initiatives as exceptions to the rule, in that the Maharashtra government typically did not engage with or support research endeavours, either directly or indirectly.

Computer science researcher C1 described the prevailing attitude that was formed towards research by actors by government and industry:

> They don't believe academicians can do wonders. They believe that IITs can do but not the other institutions. Taking their confidence is a really big task. They need to motivate this younger generation…how to do research in a positive way? How to grab and make the most of those opportunities? How to positively impact society?
>
> Computer science researcher C1, PHEI, Maharashtra

While these views were shared by several participants, others argued that attitudes towards research could not be divorced from the wider socio-economic context of the region and India more widely. These perspectives are interrogated later in this chapter:

> Here (*in reference to Maharashtra*), we respect knowledge, education, science, and it is considered a very important thing…. but research culture cannot be answered in isolation. School education and other sectors need redoing. We have to empower people through quality education and people to get out of poverty.
>
> Computer science research leader L1, PNIS, Maharashtra

Beyond a strong sense of feeling constrained to undertake research at the scale desired, as described by historical studies researcher H7, "taking a universal or generalised view is very difficult", given the plurality of institutional structures and their varied resourcing capacity to undertake research. The ideas conveyed here would be most consistent with the experience of researchers at state-funded PCUs and state private universities.

6.2.2 Policy implementation of research initiatives

Despite the limited focus on research at the regional level, the study identified some examples of Maharashtra-wide initiatives to advance and amplify research. As identified through fieldwork, the Higher and Technical Education Department of the Government of Maharashtra has set out an explicit directive to establish R&D Cells within PCUs:

> Maharashtra mandates the establishment of R&D cells in all higher education institutions, following the guidelines set by the UGC in 2023. These cells promote research, innovation and knowledge creation among students and faculty members, fostering a research-oriented culture. By encouraging research and development activities, Maharashtra aims to drive innovation and contribute to advancement in various fields of study.
>
> Higher and Technical Education Department, Government of Maharashtra (2023a)

Other initiatives included establishing Cluster Universities, where multiple autonomous colleges were brought under a common resourcing structure and the implementation of the RUSA scheme to "enhance the overall quality and effectiveness of higher education in Maharashtra" and bolster research capacity (Government of Maharashtra, 2023b). The latter was a centrally funded scheme that was awarded to state governments based on an evaluation of state higher education plans. As discussed in interviews with policy actors, the implementation of this scheme provided insight into the changing research management practices at the level of the Maharashtra region:

> State governments were not typically key actors in research, they are more concerned with facilitating economic development through increasing participation. However, RUSA had specific questions, such as how to improve training? How to improve research? And they were trying to create competition. But as a centrally imposed model, with too much centralisation of authority (by the central government), we asked 'why should we listen to you?' Initially the committee that oversaw the scheme did not work, the Chair who was the HRD Minister at the time (Human Resource Development) hardly met…but then people changed, key people were transferred and we had an influential state-level bureaucrat who drove a bottom-up process to get ideas in, we also established a panel of bureaucrats and two-three academics who would go around universities drumming up support and a lot of this was followed by funding proposals …had it not been for her, it was solely her ability as a talented and aware bureaucrat, we would've not had the bottom-up approach...
>
> Research policy and system actor R1, Maharashtra

The above participant was a policy actor who was closely involved in the implementation of the RUSA scheme in Maharashtra. Their narrative highlighted several key ideas including democratising funding and research proposal processes, establishing clear roles and responsibilities between state and central levels

of government, and the value of effective bureaucrats in translating policy ideas to action. On the latter point, this participant also highlighted the volatile nature of bureaucratic capacity, which could dramatically change person-to-person:

> The next bureaucrat who was heading this up, they were only concerned with transfer (to attain this position) and receiving capacity from the centre and did little to push research. Whereas the previous secretary had charisma and the capacity to drum up a big difference, they set up six Centres of Excellence in public universities.
>
> Research policy and system actor R1, Maharashtra

Bureaucratic norms, specifically the unwritten rules that guided public officials and their actions, can have significant outcomes (Mangla, 2015). Mangla (2015) contrasts the culture of bureaucracy in Himachal Pradesh, characterised by a deliberative model of governance that promoted collective action with the legalistic approach of Uttarakhand that focused on strict, uniform application of policies. However, as the present study shows, these norms were dynamic and should be considered alongside overall available resources, wider socio-economic factors and the influence of national government policy within the Maharashtra context. Other scholars have completely derided the RUSA scheme, labelling it as a national failure, arguing that only a portion of the funds was disbursed to higher education institutions (Chattopadhyay & Srivastava, 2022).

Another key apparatus to embed research activity in Maharashtra concerns the Rajiv Gandhi Science and Technology Commission which was established to undertake the following:

> Be an agent for change, development or advancement through inputs of science and technology; to function as the prime mover of stimulating horizontal interaction between the universities, research and development institutions and any other industries or institutions for developing and upgrading science and technology.
>
> (Government of Maharashtra, 2023c)

Although few stakeholders were aware of the Commission, those that knew about its existence recognised that this was a valuable element of the research ecosystem in Maharashtra:

> They (the Commission) have funding mechanisms to fund faculty projects, particularly for rural Maharashtra. For instance, at the border with Gujarat, there are lots of sugar industries. And there a researcher has developed a method of jaggery without the use of chemicals. It focuses on local issues and undertake more relevant research to state.
>
> Research leader L2, PNIS, Maharashtra

The remit of this entity extended beyond higher education and concerned the promotion of science and technology within the schooling system and other contexts (Government of Maharashtra, 2023c). Participants also argued that the scale of the Commission was not on par with the scale of the funding schemes that were formulated and made available through central government agencies. As observed by research leader L2, "this is not a science department of Government" and most research projects that were supported through the Commission had a specific, ad hoc purpose. Others reinforced that the bulk of investment in research activities took place through central government departments, which are discussed in section 6.4.

6.2.3 Regional government resources and funding

Disparities in investment between HEIs in urban versus rural areas and an overall sense of decline in state funded PCUs emerged as dominant themes related to resources in the Maharashtra regional context, as was discussed extensively in Chapter Five. Additionally, Chapter Five highlighted the limited capacity to conduct research of many autonomous institutions that were affiliated with state-funded PCUs (section 5.3.7). Over and above these perspectives, participants illustrated the serious implications of the resource challenge and the ways it impacted individuals and institutions across Maharashtra:

> In many cases, I have seen that things are in bad shape. There are no regulations, particularly no financial regulations from time to time. I know there are state universities here and in many parts of India where the teachers do not get their salaries on time or for many months. But there are few that do it well. You have that same pattern in central funded universities too…many are in shambles. They are still not doing what they are expected to.
>
> Historical studies researcher H11, PNIS, Maharashtra

> Unfortunately, there is not an equivalent of the DST in the state government. State governments don't really have a department that funds research but depending on the requirement. Let's say, that the Resources ministry wishes to address a water shortage problem in a set of villages, then they might approach us with a specific request. They don't really have a funding mechanism per say, but where they have a need, they can fund us to help.
>
> Research leader L2, PNIS, Maharashtra

Given the overall funding constraints within the system and where academic staff are not remunerated in a timely fashion, research is considered an ancillary activity and not core business. While the focus here was on the Maharashtra context, it is not unique to the experience of this region alone:

> I really doubt there are differences (between state governments). Overall, though, states are counterproductive to building a research culture because state universities and states which

> intervene with central universities where it occurs, do emphasis expanding access. There is a pressure on admitting large numbers of students. There is a pressure to comply with regulation quite a bit. And there is pressure to ensure every bit of funding is accounted for. State governments' influence on state universities is within an extremely tight system and it is all teaching oriented. And as a result, it is very counterproductive to building a research culture. Wherever the private universities within states have a lot of autonomy to teach and do what they want as long as they meet minimum standards… But if they don't, they are also on a constant radar.
>
> Research policy and system actor R2, Maharashtra

> State governments have a role to play in research by providing adequate resources. The most important problem is there is not enough. Our wages and salaries constitute a majority of their budget. So, we don't have access to books or materials (required to do research). The government should support more for research but financial support we are getting is inadequate. The allocation of state funding is utterly poor.
>
> Research policy and system actor R3, central institution

These perspectives confirm the view of most researchers in this study that state institutions were largely incentivised to deliver on the education ambitions of a regional government. Even if research was conveyed as a priority in official documents, there simply was not the dedicated funding infrastructure for research-related equipment and materials. Chattopadhyay and Panigrahi (2022) show that the growth in state expenditure on higher education has been low and has not kept pace with the demand of higher education. They concentrate on the composition of this expenditure, where nearly 80 per cent of funds is expended on operational and maintenance related items such as salaries and only 10 – 15 per cent on capital expenses to invest on research infrastructure and equipment (Chattopadhyay and Panigrahi, 2022). As discussed in Chapter Five, this was particularly felt in the quality of research environment and provision of infrastructure within PCUs. However, as described above by participant R3, this did not mean that state-level governments could not perform a more proactive role in enabling research activities. Rather, it was that the challenge of limited funds and restrictive bureaucratic processes which impeded the ambitions of actors in the system (Panigrahi, 2018).

Within this constrained paradigm, some participants expressed concern about the level of scepticism that was directed towards higher education by wider sections of society. Participants highlighted that actors in wider society including government questioned the overall value of higher education to deliver public good; this is explored below (at section 6.2.6, in relation to the socio-economic context of Maharashtra):

> Many people and even some bureaucrats feel that teachers get paid too much for work they do. There is a lot of discussion about how much are we paying for teaching, and as a result, they lose

their stake and interest in research. A major component of the system is outdated, corrupt and irrelevant.

Historical studies researcher H5, PCU, Maharashtra

6.2.4 Collaboration

As established at the outset of this Chapter, higher education is a joint responsibility of state and the central governments (Constitution of India, 1950). Srivastava and Chattopadhyay (2022) highlight the imbalances in governmental functions, power, and access to financial resources at both vertical (centre-states) and horizontal (between states) directions, and which have already been discussed by participants in relation to funding and overall policy implementation above.

Further, at the level of the regional system, there were initiatives that initiated and funded research activities between institutions. For instance, the Department of Technical and Higher Education had established a partnership with the University of Birmingham in the United Kingdom and three public state universities to establish a specialist research and innovation hub to use artificial intelligence in healthcare and agriculture (University of Birmingham, 2024). Through this project, the Department had initiated a Maharashtra Responsible Research and Innovation taskforce to monitor research activity in the region within this field and scale up innovative projects (University of Birmingham, 2024).

There was also a focus on enabling collaboration between institutions, through schemes such as the previously mentioned Empowered Autonomous Cluster Institutions in key districts including in Aurangabad, Amravati and Nagpur (Government of Maharashtra, 2023d). These initiatives were aimed at lifting the overall quality of research through resource-sharing, multidisciplinary learning and exchanging best practices (Government of Maharashtra, 2023d). In a similar vein, the regional government had initiated thematic collaborative projects such as establishing the Maharashtra Drone Mission to pilot R&D projects initiated by HEIs and industry with various government departments and sectors (Government of Maharashtra, 2023d). And crucially, there were collaborative activities that directly build the capacity of researchers and students. For instance, the Rajiv Gandhi Science and Technology Commission facilitated a scheme to "spread project activity and extend research culture to smaller institutions, through projects of short duration and that are linked to local resources, skills, problems and development needs" (Government of Maharashtra, 2023c).

Participants interviewed in this study identified gaps in collaboration, exacerbated by a lack of resources and infrastructure to sustain collaborative activities. There were disparities in collaboration particularly in rural and remote contexts. Several participants highlighted that opportunities for collaboration were largely concentrated within Mumbai as the capital city of Maharashtra or in the neighbouring urban district:

> There is the rural and urban divide in places such as the Konkan coast, where there are satellite campuses of the University of Bombay. Here the infrastructure is not well connected, which kind of shapes the research that happens and the quality of the professors.
>
> Historical studies researcher H4, PCU, Maharashtra

Other participants highlighted the need for the regional government to directly build the capacity and confidence of researchers, through improved funding and exposure of research opportunities. Given the institutional pressures that have already been discussed, these perspectives emphasised an additional onus on the wider government apparatus to facilitate engagement with research:

> Firstly, when research proposals or calls are coming up, they (Government) can help us think about how to write proposals or projects, they need to give some guidance to us, to the young people, they need to interact with us, pass on the information and motivate this young generation on how to do the research and what are the opportunities which they can grab and which would benefit our society.
>
> Computer science researcher C1, PHEI, Maharashtra

6.2.5 Socio-economic context

In addition to features of the formal research system, this study concentrated on regional identity and languages in relation to researchers' working practices. These are explored in turn, drawing on participant perspectives and relevant literature.

6.2.5.1 Regional languages and English

Despite the pluralist notion of India based on a multilingual and multicultural identity, from time to time, language was deployed to reinforce regional patriotism and nativist sentiments in Maharashtra (Verma, 2011). Political parties advocated that those living in Maharashtra ought to know Marathi, and outsiders must integrate themselves with the dominant linguistic practices (Verma, 2011). This played out in the undertaking of research practices in varied ways, creating distinct opportunities and tensions. For instance, as described below, proficiency in Marathi expanded the possibility of researchers to work with rural and remote communities and conduct on-the-ground fieldwork:

> I stayed in many places in India, and I observed very carefully the research culture in the mindset of people and the 'anthropological states' of human beings. And what I found unique in Maharashtra is about language. If you don't know Marathi, then it is impossible to have ground-level research in Maharashtra. I went to remote places and saw that people can't understand

> Hindi. So you have to learn Marathi. Understanding the language is very useful and that is if you want to do ground-level research on any topic in Maharashtra.
>
> Historical studies researcher H7, PHEI, Maharashtra

On the other hand, knowing only Marathi could constrain the progression and ambitions of researchers given that funding applications and research processes were largely in English. While literacy rates in Maharashtra were among the highest of all Indian states, the disparities were most sharply felt by those in rural and remote contexts. As discussed below, language can widen inequalities and in turn, can negatively distort research culture:

> Research culture in urban areas is very different to the interior parts of the country. Cities like Mumbai, Bangalore, Calcutta have much more developed research culture than smaller cities in Maharashtra like Nashek and Nagpur etc. Language plays a very important role. People who end up studying in vernacular languages, they tend to be at the losing end of the selection process, the application process at these funding agencies. Because the research proposal is also evaluated on your language skills. There are limited options to apply. Because most of the applications are expected to be in English and there's very little encouragement for these applications to be in native languages. So there definitely is a regional bias that exists depending on whether you are urban or rural, and that affects the research culture.
>
> Historical studies researcher H4, PHEI, Maharashtra

Further, as discussed in Chapter Five, linguistic disparities were also mediated by the type of institution within a regional context and the academic community found within these institutions. For instance, within an elite PNIS, staff and students were far more likely to be confident in English as well as their vernacular language. Given these institutions were national in scope, they attracted talent beyond the regional boundaries of Maharashtra and were therefore expected to transcend the dominant linguistic traditions of the region:

> If I was to move from Maharashtra to Kerala, this takes time and change to learn the language, learn the food and so on. But here (in IITB) we are very well versed in dealing with the different languages and cultures. It is an inherent part and practice of our culture. People from various states are coming here.
>
> Research leader L3, PNIS, Maharashtra

6.2.5.2 Identity: fusion and tension

The confluence of rapid urbanisation, a revival of nativist sentiment, persistent poverty in large parts of the region and a tendency to vacillate between the sociopolitical dynamics of the neighbouring North and

South regions makes it hard to paint Maharashtra with one coherent identity (International Institute of Population Sciences, 2021; Yadav, 2024; Kulkarni, 2014). Kulkarni (2014) describes Maharashtra as experiencing a disjuncture between civil society, with its embrace of cosmopolitan modernity and political society as an arena for parochial political agendas to play out.

As one example, urbanisation has widened inequalities in both cities and regions, placing disproportionate pressure on the millions of people living in informal settlements and slums in Mumbai who lack adequate housing. At the same time, it has also contributed to internal displacement of people living in villages and towns who are moving to cities for employment, and growing Hinduisation that has resulted in discrimination of these displaced communities (Yadav, 2024; International Institute of Population Sciences, 2021). In such a disrupted context, researchers would reflect the different life experiences within the Maharashtra region as well as between regions. The below examples highlight the stark contrast between life in Maharashtra with another region:

> I have only been a few times to Mumbai city due to Corona, but I have already felt that life is quite fast here, very fast. When we compare it with Chennai, it is three times faster here. And when you compare it to a village in Tamil Nadu or another city, I think it is like six times faster here. People do not have time to focus on some of the humanitarian aspects, they are more focused on making money and job-oriented. They do not have their own personal time, with themselves, with their family, or with God. That is missing here. Everything is superficial here.
>
> Computer science early career researcher C6, PNIS, Maharashtra

This narrative needs to be considered in respect of the researcher's institution as a leading PNIS, which, as discussed in Chapter Five, was highly ambitious, globally oriented and rigorous in its performance expectations. As observed through fieldwork, this PNIS was located an hour away from the central business district of Mumbai in a self-contained campus with abundant greenery, banks, shopping centres and restaurants. However, it was framed by the commercial and cosmopolitan life of wider Mumbai, including its fast pace and intensity as described above. Yet even within this well-funded, elite institution, where a much greater proportion of students was likely to come from affluent backgrounds (as compared with PCUs), it was still possible to see the wider contradictions in Maharashtra's social life and demography play out on campus:

> I've worked in many countries and seen the Indian system up close as well. I mean our students are very talented but some come from economic backgrounds where you don't imagine that they come from. As one example, I have a research student who worked with me last semester who types his 5,000-word essay on his phone. And he has done that for three of his papers. And the simple reason is because he cannot afford his laptop. He comes from a background where 30,000 rupees is a big deal. These are not the challenges we imagine on an everyday basis.

Historical studies researcher H11, PHEI, Maharashtra

As discussed in Chapter Five, these disparities were felt even more acutely in PCUs and PHEIs. Researchers often described Maharashtra's intellectual character in comparative terms with another region. In turn, the imagery they formed was one where each region was a distinct community of its own (Deshpande, 2007). For instance, one researcher described the distinctive intellectual curiosity of this region:

> Here, they are also very cultured people, very educated people. If I compare with Haryana (another state) or Delhi or UP, I found that the people of Maharashtra, the Indigenous people of Maharashtra, they're having a kind of 'education mindedness.' If they are doing research, they are doing it wholeheartedly. And they are spending much time doing this research. They are also supporting Dalit research, where there is wonderful research happening.

Historical studies researcher H7, PHEI, Maharashtra

And despite the stranglehold of caste and the restrictions placed upon women in rural Maharashtra, the position of women researchers was described in more positive terms than the experience of those in Northern states such as Uttar Pradesh:

> I found unlike North Indian people, women here are very empowered. I've seen quite a number of women researchers who are allowed to go anywhere, who are allowed to go outside for seminars, and outside their human area. In Haryana, in UP they are having a lot less exposure.

Historical studies researcher H7, PHEI, Maharashtra

Given the small sample size for this study, that only six of 18 researchers in Maharashtra were female and that gender was not a key focus for this research, this is an area worthy of further exploration.

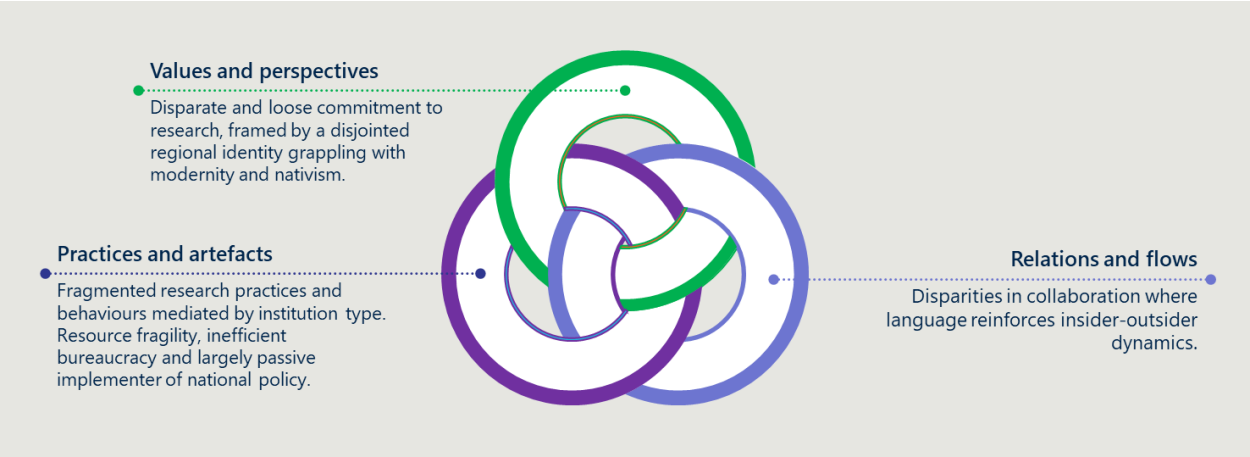
6.2.6 Maharashtra research culture: pockets of excellence and fragmented outcomes

Drawing on participant data and fieldwork observations, and recognising significant institutional and disciplinary diversity, the research culture in Maharashtra as a region is best perceived as a loose and disparate commitment to research (*values and perspectives*), where there were some examples of effective 'bottom-up' research practices in an otherwise fragmented set of activities and behaviours (*practices and artefacts*).

As shown below in Figure 6.2, research culture in Maharashtra was largely one of resource-fragility with inefficient administrative processes (*practices and artefacts*), with significant rural-urban disparities (*flows and relations*). This region was encased in a wider socio-economic context, where there were dominant ideas around tensions between urbanisation and nativism (*values and perspectives*) and where

the Marathi language created an insider-outsider dynamic for researchers and the communities they work with (*flows and relations*). These tensions were exacerbated in state-funded PCUs, where the regional dimension was a primary force but less material to the realities of researchers within PHEIs and PNIs.

Figure 6.2 Research culture conceptual framework, applied to Maharashtra



In turn, the importance of research was not settled. For most, over time, research had become less and less prominent within the region given the imperative to recruit more students and address rural-urban disparities. This has reduced the role of the regional research system to one of a passive, ad hoc actor (*values and perspectives*) that engages with institutions on an as-needs-basis.

Where the regional system engaged in research activities, it was largely to deliver on the ambitions of central government initiatives such as RUSA. Here, effective bureaucrats could exercise agency to some degree – their leadership and mobilisation of resources could drive changes to institutional research practices – but this should not be overstated, particularly as there were limited examples of this at work in the region. Further, for actors undertaking research in a PNIS, the role of the region did not determine their overall growing output and success.

6.3 Tamil Nadu

Among those that participated in the study, key ideas in relation to research ambition and vision held wide appeal. On the other hand, there were more disparate views on issues such as resources and collaboration which was mediated by type of institution and discipline. Wherever appropriate, participant perspectives were triangulated with literature and material gathered through fieldwork to provide rigour and explanation for the interview data. Literature was much more readily accessible for Tamil Nadu, where government websites were routinely updated, and resources were available in English and Tamil.

6.3.1 Vision and ambition for research

As with the experience of researchers in Maharashtra, participants from Tamil Nadu also largely framed the ambition of this regional system in relation to research as limited and minimal. Biomedical researcher B9 characterised their role as "I know they (Government of Tamil Nadu) support research at some level, but I am not exposed to how". Others echoed similar sentiments, pointing to examples such as the paucity of funds, the disparities experienced by institutions and researchers in rural settings and the primary focus on growing student enrolment in institutions. Moreover, participants expressed that, as the regional system expanded and massified over the past two decades, the commitment of the regional government towards research had diminished during that same time. As described below, research was higher on the agenda for policymakers and leaders, even in pre-colonial Tamil Nadu and immediately after the British Empire, compared with the here and now:

> The Tamil Nadu government can play a much bigger role in reshaping scientific inquiry. But it is simply impossible to do this as they are concerned with degree producing institutions… but the state used to support research a lot more. Even the Mysore Maharajas commissioned research on the elephant environment, but now they only talk about paying salary and pension. How can they produce a research culture with such limited scope?
>
> Research policy and system actor R4, central institution

Notwithstanding these critiques, there is a comprehensive system-level framework to advance science and research in the region as codified in the Tamil Nadu State Council for Higher Education Act (Government of Tamil Nadu, 1992). The Act sets out several purposes in relation to research:

> Coordinate research funding at national and international level for promotion of scientific research in the universities (r);
>
> Set up a State Centre for Scientific Research and to coordinate the research activities (u);
>
> Administer and release research funds, if any, received from national and international funding
>
> Government of Tamil Nadu (1992)

In relation to the second objective of a dedicated centre to coordinate research activities, the region established the Tamil Nadu State Council for Science and Technology (TNSCCT) as well as the Tamil Nadu Science and Technology Centre. The purpose of the former was to "identify areas for the applications of science and technology to the development needs, objectives and goals of Tamil Nadu, and in particular, to the prevailing condition of backwardness, rural unemployment and poverty" (TNSCCT, 2024); whereas the latter was an outreach centre that worked towards raising awareness of science and research among the general community and for students and faculty across the wider education ecosystem. The TNSCCT delivered a range of schemes aimed at building the capacity of researchers directly through fellowships and travel grants as well as through institutions in the form of funding for research projects. There were also specific areas of focus on supporting applications for product and patent development and in forging industry partnerships (TNSCCT, 2024). Despite the stated breadth and ambitions of the TNSCCT, researchers were mixed about its effectiveness. Some felt that the purpose of the TNSCCT were too narrow:

> The theme of the Council changes year-to-year and is specific to the Government's priorities. If you focus on their particular ideologies, it goes to those colleges. But we need diverse areas of supporting and doing research.
>
> Historical studies researcher H10, PCU, Tamil Nadu

Others were more sympathetic to the financial parameters of this body and argued that the state had to invest in areas which were considered significant to their context. By and large, the interventions of the TNSCCT were described as positive, even if limited in scale and impact as is discussed in the following section (section 6.3.2). There was also the Tamil Nadu State Council for Higher Education (2024), which was charged with delivering schemes such as research grants and minor research projects to build the capacity and profile of researchers in the region. Further to these governance mechanisms, the Tamil Nadu Government had a standalone Research and Development Policy to double research and development expenditure from the government, higher education institutions and private sector by 2030 (Government of Tamil Nadu, 2022).

Ultimately though, as was the case with Maharashtra, there was only so much by way of direct value and impact that was attributed to the ambition and policy direction from the Tamil Nadu government. The more determinative factor was the concentration of well-funded, high-quality institutions, and the interactions within these settings:

> Research culture is not the same everywhere in India but the reason for that is the nature of the higher education institutions situated within states, variation is not more from the state government's point of view. Because the role of the state government's input into higher education is quite minimalistic compared to school education. The role of the state government

> is concerned funding and governance…. But why states would be at variance with one another is because of the quality of higher education institutions within them. For example, Tamil Nadu which has IITM and high-quality private university like SRM, these universities wherever they are in the country…they are the ones driving it.
>
> Research policy and system actor R5, government department

Indeed, in the most recent round of NIRF rankings, Tamil Nadu's Anna University was the highest ranked state government funded university and 18 other institutions in the region were in the top 100, including a PNIS (NIRF, 2024). In part, these metrics reinforce the above narrative that the resourcing capacity and motivation of those individual institutions played the more crucial role in the volume and significance of research activity.

6.3.2 Policy implementation of research initiatives

Overwhelmingly, participants in this study had limited visibility and understanding of the activities at the level of a regional system to advance research. Participants showed little understanding of the role of the regional government in supporting researchers and institutions:

> I do not think research is supported by the Tamil Nadu government, they do not recognise the people who are doing good works. In Tamil Nadu, the politics is there and they (politicians) are not that much educated. They do not have much knowledge in research and what it can do.
>
> Biomedical researcher B7, PHEI, Tamil Nadu

> If more researchers are encouraged and supported, then we can see a growth in infrastructure and the economy. For example, our state is facing one of the worst floods and this is not helped by roads which have not been laid out in a proper fashion. Research could help us come up with better ways of designing roads and here, researchers have a great many ideas. But the government are very slow, even in processing papers (applications), there is more they could do.
>
> Biomedical early career researcher C10. PCU, Tamil Nadu

As illuminated in the above narrative, the lack of awareness about specific programmes and incentives initiated by the regional government had contributed to a perception that there is a lack of funding and therefore, a lack of interest from policymakers to harness research in addressing wider societal challenges. Consistent with the experience of researchers in Maharashtra, there was a cyclical relationship between a lack of perceived interest and a lack of available resources and a lack of identifiable activities and programmes to give effect to a culture of research. These patterns have been noticed elsewhere in other Indian subregions (Altbach and Mathews, 2019).

The Tamil Nadu regional government was renowned for its excellent delivery of public services and had made significant strides in relation to primary health care and rural health capacity, in large part due to reforms that encouraged decentralisation and bottom-up planning (Parthasarathi & Sinha, 2016). Bottom-up planning and bolstering the capacity of local officials and the administrative network was also a feature of the successful implementation of the Mahatma Gandhi National Rural Employment Guarantee scheme (Natesan and Marathe, 2021). Further, Pillai & Obasanjo (2023) point to political alignment between the central government and the regional political party as a factor in rolling out a public health insurance programme, Ayusman Bharat, and the wider pace of industrialisation.

However, most participants stated that there had been mixed success in relation to advancing research through formal policies and initiatives. As at 2024-25, the Tamil Nadu government had undertaken several initiatives to build industry-aligned research parks in Chennai, Madurai and Coimbatore and through the RUSA scheme, developed research projects and entrepreneurial hubs within six PCUs (Government of Tamil Nadu, 2024). The TNSSCT had established research projects in sectors such as agriculture, biology, medicine and environment, among other industries. The challenge was that these initiatives had not sufficiently penetrated across the wider higher education ecosystem in Tamil Nadu, which may explain the sense of inactivity that was perceived by participants. As described below, the lack of visibility around initiatives and support could present as a barrier for those wanting to pursue research careers:

> I have not given much thought to their role but though I think there is quite a bit of encouragement (from the state government), but the projection is not sufficient. There are many schemes, but the general research population is not aware of it. Only once when I got started did I learn about so many other schemes that are relevant. Information is not publicly available. They need to advertise more to create that awareness.
>
> Biomedical researcher B2, PHEI, Tamil Nadu

From the interviews conducted in the study, there was little else that was shared about research schemes and whether these were carried out in a bottom-up manner.

6.3.3 Regional government resources and funding

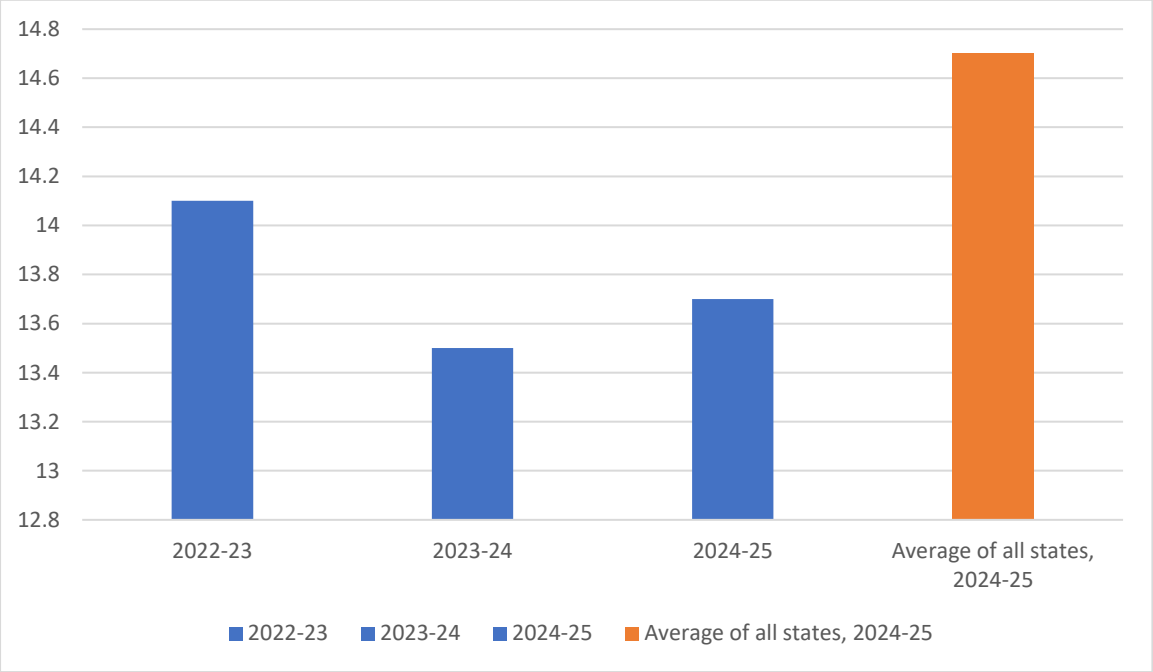
The economic position of Tamil Nadu was a point of significant advantage and worth discussion. The Gross State Domestic Product of Tamil Nadu had grown year-on-year between 2019 and 2023 as had receipts from tax revenue (PRS Legislative Research, 2024). The services sector, followed by manufacturing and agriculture had also grown year-on-year (PRS Legislative Research, 2024). As observed by Dreze and Sen (2016), Tamil Nadu's rapid and inclusive growth had ensured high levels of per capita income while reducing poverty to its lowest levels. As discussed earlier, these developments had

provided generally favourable conditions for the region's HEIs, which had increased their capacity to invest in scientific projects and infrastructure. In turn, these factors also contributed to the overall performance and quality of the region's HEIs. This was also true for Maharashtra, albeit to a slightly lesser extent, as reinforced below:

> Tamil Nadu and Maharashtra are industrially well advanced. They have some of the best institutions within them and this enables them to be among the most well-performing of states in relation to their research environment and overall academic cultures.
>
> Research policy and system actor R5, government department

Tamil Nadu had the highest gross enrolment rate in higher education of all states, yet the proportion of Tamil Nadu's overall expenditure on education was consistently lower than the average allocation for education (including schooling and technical education) by state governments (PRS Legislative Research, 2024). This is shown below in Figure 6.3. Building a knowledge-based economy, particularly through investing in research projects and innovation clusters is also a central theme of successive annual budgets.

Figure 6.3 Percentage of total Government of Tamil Nadu expenditure on education (PRS Legislative Research, 2024)



Notwithstanding the wider economic context for Tamil Nadu and recent developments in higher education, for many researchers that participated in this study, particularly those in biomedical and computer science disciplines, their attention was directed towards securing funding from central government agencies rather than sources within Tamil Nadu:

> Mostly we approach sponsored projects from central government agencies and departments such as DST and DBT. Though there are bodies in state government that support projects, they concentrate mainly on affiliated colleges and developing those teachers. Because those teachers don't even have a chance in competing with researchers from other institutions and states.
>
> Computer science researcher C8, PCU, Tamil Nadu

> State funding mainly goes to government institutions because that is their priority. Say that 80 per cent goes to government, 20 per cent goes to private. Whereas if you go to the national level, that is open competition. National level goes to IITs, NITs and other premier institutions, and equally gives importance to private institutions. We don't get anything funding wise from state government, but we get other privileges and leverages, such as transportation.
>
> Biomedicine researcher B5, PHEI, Tamil Nadu

Both these perspectives framed the contribution of the regional system to developing the research capabilities of PCUs and affiliated government colleges. Other researchers highlighted that the scale of funding that they required for research projects and infrastructure, particularly where it involved multi-year initiatives, was better met by central government agencies as well as through industry collaborations. A review of the budget documentation of the last three years confirmed that most funding schemes as well as the Government of Tamil Nadu's implementation of the RUSA scheme were directed towards a handful of PCUs and affiliated colleges (Government of Tamil Nadu, 2024b). Given the proliferation of affiliated colleges and PCUs in Tamil Nadu and the modest investment made by the regional government, this further reinforces the notion that research was less of a priority at the level of Tamil Nadu. In contrast, the Tamil Nadu government invested substantial amounts of funding to providing monthly financial assistance to increasing participation of female students from economically disadvantaged backgrounds in higher education and upgrading classrooms and infrastructure within polytechnic and arts and science colleges among other activities (Government of Tamil Nadu, 2024b).

6.3.4 Collaboration

Participants interviewed in this study described a range of collaborations including with international actors, other regional governments and industry. At a system-level, the Department of Higher Education of Tamil Nadu had initiated several collaborations including the previously mentioned industry-research parks in collaboration with the Tamil Nadu Industrial Development Corporation Limited (TIDCO) to support research scholars, as well as support for the start-up and small enterprise sector to scale up their projects (Government of Tamil Nadu, 2024a). There was also the Tamil Nadu Technology Hub (iTNT), which was funded by the Government of Tamil Nadu and was the country's first deep tech innovation network to connect researchers, industry and HEIs (ITNT, 2024).

In relation to co-authored publications, Batcha's (2018) analysis of the top six universities in Tamil Nadu between 2000 and 2017 concluded that the USA remained a preferred partner for institutions and there were growing links with South Korea. However, this is very much mediated by the research area of specialisation which was largely concentrated around chemistry and material sciences. Participants also emphasised the importance of contextualising global and national research agendas to local priorities, which drove the collaboration between researchers and other actors:

> Post-Covid in the present scenario, new energy and fuel is the big talk and so is climate change…but every state needs to adapt these issues to our region in terms of science and research priorities and within our overall funding.
>
> Biomedicine researcher B5, PHEI, Tamil Nadu

Flowing on from this narrative, in the case of Tamil Nadu, these priorities were translated to addressing the Grand Challenges set out in the region's R&D Policy which included clean energy, sustainable and advanced manufacturing, digital and data economy, and future mobility (Government of Tamil Nadu, 2022). Consequently, these were also the areas which feature as priorities for the government's investment, such as the industry-research parks and other collaborative initiatives such as the Tamil Nadu Artificial Intelligence Mission (Government of Tamil Nadu, 2024b). While these initiatives could and did drive collaboration in these specific fields, there were mixed perspectives about a regional government's influence in driving research collaboration. For instance, the narrative below highlights the specific instances where the Department of Higher Education or higher education council could influence international collaborations:

> Academic institutions drive the research agenda. The state government's role in determining what this could be is quite minimalistic unless those higher education councils have a clear agenda to take things forward. Say for instance, there are changing international relations at a national level and if there are good bilateral relations with another country, they may want to encourage research with those partners or if there are not good relations, then you might not want to encourage those researchers because it could be inimical of a particular government or state. But except for that, higher education is largely left to those institutions as they are autonomous from government.
>
> Research policy and system actor R5, government department

Institutional capacity and autonomy, the area of specialisation, the alignment of institutional research priorities to wider government agendas and the capacity of a regional government to fund these collaborative activities were all factors which contributed to the dynamics of collaboration, within and beyond the Tamil Nadu context.

6.3.5 Socio-economic features

This section discusses ideas that were pertinent to the wider Tamil Nadu socio-economic context. These include language, identity and the development of an inclusive growth agenda, with reference to research culture.

6.3.5.1 Language

Drawing on the last available census data, the 2011 Language Atlas of Tamil Nadu reports that 96.2 per cent of the state could speak Tamil as either their mother tongue or as their first or second subsidiary language (Registrar General and Census Commissioner of India, 2024). Meanwhile, English is spoken by 18.4 per cent of the population in Tamil Nadu (Registrar General and Census Commissioner of India, 2024). Notwithstanding the widespread penetration of Tamil, it was also the case that from 2012-13, the Government of Tamil Nadu introduced English as a medium of instruction in its government schools. The overall proportion of school students being taught in English as their medium of instruction increased from 42.2 per cent in 2014-15 to 57.6 per cent in 2019-20 (Unified District Information System, 2021). Tamil Nadu secondary school students who were educated in the Central Board School Curriculum were required to learn up to three languages, of which most undertake Tamil and English. Proficiency in both languages was deemed important.

As distinct from researchers based in Maharashtra, Tamil Nadu-based participants in this study expressed the importance of undertaking research activities in English as well as in Tamil, with the latter considered less significant in certain scholarly contexts. In part, this may reflect the dominance of the biomedicine and computer science researchers within this grouping and the global orientation of these disciplines. Nevertheless, where proficiency of Marathi contributed to an insider-outsider dynamic, here it was assumed that English would be a necessary means of scholarly communication and Tamil was a useful addition. Researchers were keen that Tamil did not serve as a barrier to interactions between them and with funders and partners:

> In Southern parts of India, especially in Tamil Nadu, the Tamil language is not going to give any hindrance to scientific research. In fact, Tamil science is already proven to be 3,000-4,000 years old. Language here is not a barrier. For those people that are not good in English, they have the flexibility to read in their own mother tongue. For example, the Department of Tamil at SRM are doing an important project to translate the engineering curriculum into Tamil. So, language is not going to be a problem for us.
>
> Biomedical researcher B5, PHEI, Tamil Nadu

Irrespective of institution type, there was a firm commitment to translation initiatives, providing research scholars and students with additional language coaching, and more generally, fostering an embrace of

linguistic pluralism. There was a recognition that researchers needed to work in English to be able to publish in globally reputable journals and undertake international collaboration where this was important to their disciplines. Yet simultaneously, Tamil was needed in day-to-day scholarly interactions and to uncover knowledge that was not readily available in English. However, as previously explored in Chapter Four, for those researchers working in historical studies, their scholarship activities also required them to work in regional languages. For these researchers, Tamil was as central, if not more so, as fluency in English:

> It is also distinct in the social sciences because you have a lot more being done in the regional languages, you have publications in it but you also have conferences in which people present in Tamil. So there's a lot happening in these regional languages which doesn't always translate in English. And it almost remains too different to be able to translate.
>
> Historical studies researcher H1, PHEI, Maharashtra (discussing experiences in Tamil Nadu)

6.3.5.2 Identity: populism and attitudes towards science

The advancement of the poor and of the lower castes and a politics shaped by welfare interventions, have shaped much of Tamil Nadu's post-Independence history (Subramanian, 2002; Narayan, 2018). From the 1950s, the rise of Dravidian politics forged a distinct ethnonationalism in the region, bringing with it increasing political participation, a pluralist civic and democratic life and economic liberalisation (Wyatt, 2013; Narayan, 2018). The massification of the higher education system and the growth in enrolment of students from economically disadvantaged and scheduled caste / scheduled tribe backgrounds has occurred in association with these wider developments.

Tamil Nadu's political ideology is characterised by populism, which has been central to the region's governance, and where there is a deeply intertwined relationship between Tamil Nadu's film industry and political parties (Gerritsen, 2014). Populist, person-centred politics has enabled the success of long-ruling politicians, who are not just entertainers but as described by Dickey (1993, p.3) have served the role of "saviours of the oppressed, protectors of the poor, messiahs of the malnourished and deities of downtrodden". As evident throughout fieldwork, their role is expansive in the region with a physical presence that is visible on roads and public spaces as it is emotional and psychological in the role they play to "inform the audience, educate the spectator, address various social problems" (Dickey, 1993). However, for some participants in this study, it has also created an environment that is not favourable for scientists and researchers.

As a stark contrast to the privileged position and influence occupied by politicians in the imagination of the Tamil Nadu polity, there is a sense that researchers and scientists are not afforded the desired level of respect and recognition:

> We celebrate sports people, the movie personalities but we don't give even 10 per cent importance or publicity towards the existing scientists and researchers. So if that will be done then actually the young minds will get inspired to propose their ideas and think critically. It will definitely inspire lots of people for research. But we lack such inspirations.
>
> Computer science researcher C8, PCU, Tamil Nadu

> The media especially in Tamil Nadu are focused on the entertainment industry. There is a takeover of the film industry in our lives. Whereas newspapers don't focus on issues of research or researchers and there is no awareness of the situation.
>
> Biomedical research and head of department B3, PCU, Maharashtra

> Over here, people are not fond of research. There is not a high level of awareness or importance given to it in our societies like other fields. We are still being pulled back into societal and our family obligations.
>
> Biomedical researcher B2, PHEI, Tamil Nadu

As a society, Tamil Nadu is highly oriented towards notions of pluralism and egalitarianism (Narayan, 2018; Wyatt, 2013). Creative and artistic works have flourished in the region, and it is the birthplace of leading public intellectuals including Thiruvalluvur and Periyar. Yet, as highlighted by the above narratives, the forces that have shaped the key ideologies of the region appear to insufficiently recognise and reward research endeavours. And moreover, these dynamics have not effectively integrated the pursuit of research and efforts of researchers into the wider social and economic aspirations of the region.

6.3.5.3 Inclusive growth and participation

Flowing on from the above, another central idea that emerged through interviews, and that can be expanded upon through literature, was that of inclusion in the region. Across the nation and indeed globally, Tamil Nadu is highly regarded for having achieved economic growth while simultaneously driving significant progress on social outcomes in areas such as health and education (Joshi and McGrath, 2015; Akileswaran and Graziadei, 2020). Key features of Tamil Nadu's approach have included: a sustained policy commitment to industrial development, while attending to the spatial dimension of industrial development by growing initiatives across the state, rather than limiting activity within a concentrated area; the consistency of policy positions across political parties; and, the establishment of specialised agencies to drive the economic vision of the region.

In relation to research, aspects of this ethos were reflected in previously discussed examples such as the dedicated Council for Science and Technology, the placement of the Industrial Parks across Madurai,

Coimbatore and Chennai. Inclusion also permeated through the narratives of several researchers in relation to their own practices, particularly regarding expanding opportunities for early career researchers and research scholars across the region and irrespective of institution type:

> I can say with surety that we are highly inclusive in Tamil Nadu. No other can excel in this case. We are highly inclusive of all the types of students, for the rural, semi-rural. The encouragement and motivation and resources is given. And there is concern by the Tamil Nadu government for all the disciplines, administration, sociology, history, so on…but the way we get projects is the different thing.
>
> Historical studies researcher H9, PCU, Tamil Nadu

As encapsulated in the above perspective, the emphasis on inclusion centred around both the talent pipeline as well as encouraging research across a range of disciplines and fields. However, researchers were also open about the challenges that remain in relation to inclusion – particularly within specific disciplines and institutional contexts. Other participants highlighted the invisible impact of caste, which is felt within fields such as historical studies:

> There is a definite tendency for more Anglicised version of academics within the Tamil Brahmins than not. By this I mean, Tamil Brahmins are isolated in the sense they are thinking, talking and writing in English, and they don't consider the works that are happening in Tamil as much.
>
> Historical studies researcher H1, PHEI, Maharashtra (discussing experiences in Tamil Nadu)

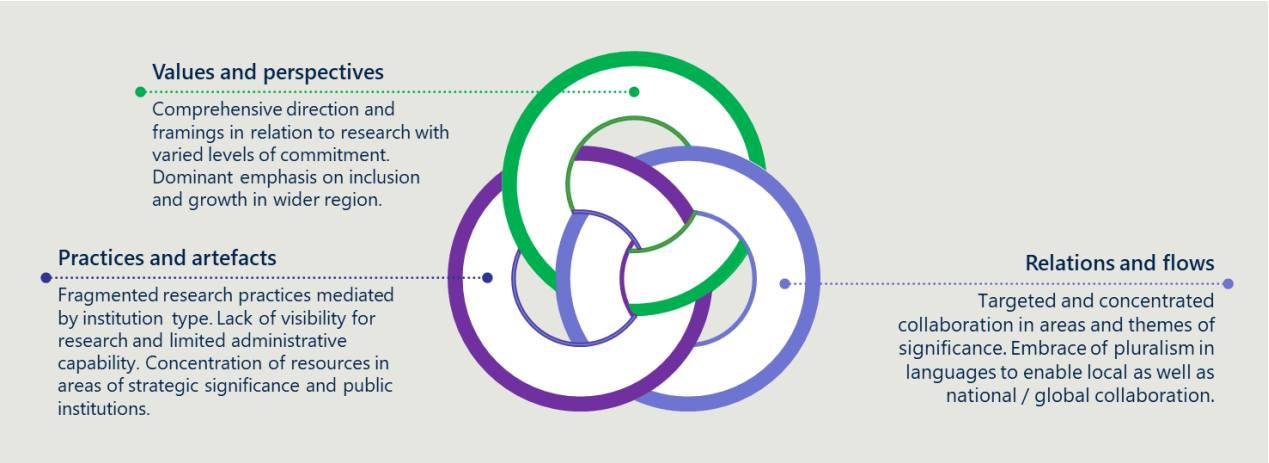
6.3.6 Tamil Nadu research culture: pragmatic and inclusive, embracing linguistic pluralism

The key features of Tamil Nadu's research culture – recognising the significant variation mediated by institutional and disciplinary features – were its comprehensive policy ambition and its structures and framework for research (*values and perspectives*). However, despite their comprehensiveness, these norms were fragmented across the region (*values and perspectives*) and their impact was limited overall. In turn, research practices were also disparate with inefficient administrative processes system-wide *(practices and artefacts)*. While resources were also limited, they were utilised in a strategic and purposive way to build up PCU capabilities (*practices and artefacts*). As well, collaboration occurred in targeted and concentrated ways, particularly within areas of significance to the region *(flows and region)*.

Tamil Nadu's research system has been framed by a regional identity that heavily emphasises inclusion and growth as a means for development and where there was an embrace of linguistic pluralism, to drive collaboration locally, nationally and globally (*values and perspectives*; *flows and relations*). On the other hand, in a populist political climate, there was limited respect towards science and research (*values and perspectives*).

As with the key features of the Maharashtra research culture, the Tamil Nadu features were particularly relevant to the state-funded PCUs whereas the PHEIs and PNIS' were less engaged and impacted by these regional-level agendas. Figure 6.4 summarises the ideas, which are discussed further below.

Figure 6.4 Research culture conceptual framework, applied to Tamil Nadu



Given resourcing constraints and the scale of the system in Tamil Nadu, there was an implicit and stated acknowledgement of the need to be strategic in how research was nurtured within institutions and researchers (*relations and flows*; *practices and artefacts*). The contribution of institutional norms and individual motivation worked alongside system-level influences:

> The Tamil Nadu government is busy with these institutions (state PCUs and affiliated colleges). In Tamil Nadu and across pan India, it comes down to candidates' passion and interest and availability for research projects. If there is that passion and interest, the government does support this. There is no need for so much money alone.
>
> Computer science researcher C8, PCU, Tamil Nadu

Despite the pragmatic mobilisation of resources in support of PCUs, there remained significant gaps in collaboration and capacity across the system, exacerbated by the scale and heterogeneity of institutions within Tamil Nadu. Ideas around encouraging linguistic pluralism were distinctive to Tamil Nadu and were considered to create a competitive advantage for the region's HEIs and researchers, in the way they collaborate with others (*flows and relations*).

6.4 National level features

This section discusses features at the level of the national research system, with an emphasis on synthesising the perspectives of policy and system-level actors and wider literature. Given the heterogeneity of the Indian context and participant perspectives, this section only provides a partial view into the national-level features and wider context. However, the national lens is necessary to forming a fuller picture of research culture in India.

6.4.1 Vision and ambition for research

At the India-wide level, participants articulated the goals and ambitions of the research system through three frames. These concerned: the development of research skills through curriculum and learning; the inculcation of shared values for researchers; and supporting research projects and building capacity across institutions and faculty. Across each of these ambitions, the degree to which they were successfully realised or were consistent across participants varied by institution type and discipline but there was much less by way of differences between subnational regions.

On the first of these frames, participants observed there was a system-wide objective to foster critical thinking and inquiry-based approaches in curriculum, including at the undergraduate level. This was considered a both key input to enabling a thriving research culture and to attract scholars to research careers and a weakness of the current system:

> We need to spearhead HEIs to not just focus on knowledge dissemination but on knowledge production and the generation of new ideas. Whether it is subjects like computer science where you learn to develop new programs, or biomedicine you patent a new product from the undergraduate level. You cannot ignite research all of a sudden, it has to come in gradually to develop a scientific temper and a spirit of questioning across the education system.
>
> Policy and system actor R5, government department

> Our education system was corrupted by the British. They have moulded our system to say 'Yes sir.' We are now teaching to question and return to Gurukalam (ancient method of education) virtues. India is motivating us to do research, only then we will flourish and grow.
>
> Computer science researcher C4, PHEI, Tamil Nadu

Critical thinking abilities and embedding a "discovery-cased style of learning with emphasis on scientific method" are stated aims of India's National Education Policy across all aspects of the education system (Government of India, 2020). This follows successive critiques of the system, as one that has been dominated by rote-learning and repetition (MHRD, 1992; Pal, 2009; Patnaik, 2017). The UGC's expansive regulatory powers to create and ensure "curricular uniformity across the country" (p.601, Jayal, N. G.

2023) further reinforce the notion that fostering critical thinking remains a system-level priority nationally.

Next, many participants also described the important goal of the national system to shape the attitudes and values governing research practices. These were wide-ranging and encompassed the mindsets and behaviours of individual researchers as well as their institutions and funding bodies. For instance, researchers emphasised the role of the national system in promoting responsible research conduct:

> A key aspect is research integrity and having a high code of ethical conduct to do research in the way it is meant to be, as an impartial, neutral body of work. We are the ones that promote ethical conduct of research.
>
> Policy and system actor R9, government agency

Other principles repeated often by participants included excellence, merit, community, service, interdisciplinarity, reputation, public engagement and openness. Beyond these principles, participants mentioned specific policies such as the National Science and Technology Policy, the National Education Policy, UGC Guidelines and government-sponsored initiatives that worked towards embedding these values and principles within their individual institution and disciplines. For example, this included the Department of Biotechnology-led initiative, the Indian Research Management programme to build the capacity for research management and develop a community of practice (India Alliance, 2024). Discipline-specific national networks such as the ICSSR were also concerned with implementing initiatives that reflected these aims. Importantly, there was an understanding that these top-down norms and aspirations needed to be negotiated with individual decision-making and institutional interests:

> These norms lead people to make institutional decisions about what is funded and focused on in research. These flows come from the top but they are very organic as they are also driven by the end users and the growing interest in the topics that make research and researchers' priorities.
>
> Policy and system actor R5, government department

The third and most crucial aspect of these aims concerned the role of the national system in building research capacity through funding projects and developing researcher capability. The role of the central government was instrumental to those who were recipients of funding and support. While these narratives are discussed further in the resourcing section below (section 6.4.3), participants also reflected significant inequities between institution-type and disciplines in relation to the level of importance they were afforded nationally. Some of these perspectives have already been explored the analysis of Chapter Five findings. As discussed below, the most significant source of funding for researchers in this study was grants through national government agencies which were invested within a small group of high-performing institutions such as the PNIS:

> Let's face it, 90 per cent of research is funded directly or indirectly by central government. And so one direct way they influence culture is by creating the competitive conditions through funding. India doesn't have many diverse sources of funding and the states don't participate in this process, so it is a very centrally-driven top-down process, where everyone is approaching research in a similar way through similar models. And because all the terms are set by government, everyone is behaving in a very similar way.
>
> Policy and system actor R2, Maharashtra

> Central government have more funds and they have all this financial space they can play with because of the de facto central heavy education system we have. When we are talking about research, we are only talking about the elite institutions and not the non-elite. By non-elite, I mean the provincial HEIs where more than 90 per cent of students are enrolled.
>
> Policy and system actor R6, academic expert

Findings from this research characterised a vicious cycle, whereby the small group of PNIS and central universities received most of the research funding and engagement from central government (PRS Legislative Research, 2024). While these HEIs comprised a small proportion of the overall higher education system in terms of student enrolment and faculty strength, they ranked highly on leading quality indicators including the NIRF. In turn, given the limited pool of central government funds and intense focus on merit and quality, the cyclical process of investing in 'elite-institutions' has been established. Specialised research laboratories such as the Central Drug Research Institute also received substantial central government funding but are outside the scope of this present study and focus on HEIs. Participants also observed another significant inequity, funding for STEM disciplines being favoured over funding for non-STEM disciplines:

> Today some of the best research funding comes from the Department of Atomic Energy, the Department of Space, the Department of Biotechnology, the Department of Education which funds the central universities. For the central government, broadly speaking, a safer space to fund is that of STEM. Non-STEM is much more political and where you see far greater problems. It is absolutely the case that whatever good research there is in India, by and large, it is federal.
>
> Policy and system actor R7, academic expert

Other participants highlighted that researchers and institutions that were aligned to the priority thematic areas set out by central government also benefited directly from their support. Again, this typically benefited a small group of elite and central institutions. The three-fold ambition of the national system to: embed research skills in curriculum; foster shared values and principles; and, directly fund research activities, had grown in significance and importance over the past two decades. Though the effectiveness

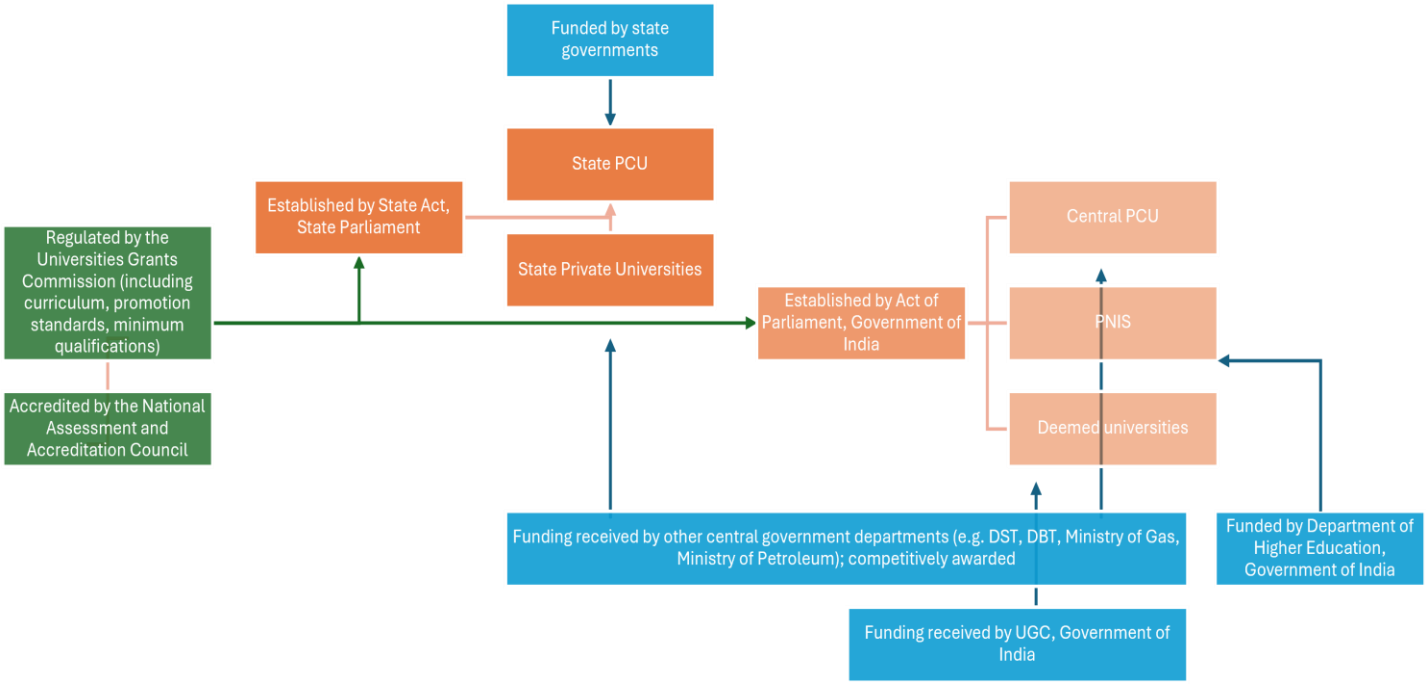
of these approaches were mixed, it stood in contrast to the ambition of the regional governments explored in this study, described as parochial and largely absent from research.

6.4.2 Policy implementation and regulation

Participants' insights need to be grounded in the governance and regulatory juggernaut of the Indian higher education system. The system has been persistently critiqued as fragmented, duplicative and enabling a two-tiered system between the large volume of state-PCUs and affiliated colleges, and a handful of central HEIs (Bharucha, 2024; Borthakur et al, 2024). Overlaying the complex regulatory regimes are the funding mechanisms, which are mapped below at a high-level in Figure 6.5.

In simple terms, regional governments solely resource their respective state HEIs whereas there are a range of funding sources available at a national level. PNISs, such as the IITs, directly negotiate priorities and funding with the Department of Higher Education including for research infrastructure and all HEIs in the country are eligible for grant-based funding available through the UGC and other central government departments such as the DST, Department of Biotechnology and others (Jayal, 2023; GoI, 2023b). The combination of the regulatory and funding arrangements simultaneously privileged and disadvantaged specific HEIs and disciplines (Jayal, 2023; Borthakur et al, 2024).

Figure 6.5 Mapping of regulatory and funding arrangements for Indian HEIs



For participants in this study, the consequences of this complex and tightly regulated framework were manifold but chief among them concerned the pursuit of quality:

> The central government has an overriding emphasis on quality but that is also the central issue (in relation to achieving quality across the system). Quality is being measured in a quantifiable way with performance indicators and there is a policy around performance-based funding…but there is also performative pressure.
>
> Policy and system actor R6, academic expert

> Quality becomes important in a tightly controlled environment where research has a certain intent. Private universities which are emerging are likely to produce better quality, but they don't have the scale yet nor the funding to be globally competitive. But with the IITs, they have scale and they have funding but don't have accountability. It is left to the academics. And as a result, the efficiency of the system in terms of how much is going in versus how much is going out is low.
>
> Policy and system actor R2, Maharashtra

Within this complex landscape, participants described a range of policy pitfalls and contradictions in relation to how research quality was realised. On one hand, the UGC had afforded the PNISs and some central institutions expanded autonomy, enabling them to attract talent from across of India and develop research programmes. On the other hand, the UGC Minimum Regulations for Assistant Professorship, which imposed a doctoral level qualification across all institutions, was critiqued as leading to a deterioration in quality and a rise in cronyism (Jayal, 2023). As previously discussed in Chapter Five, participants from state-funded PCUs highlighted the pressure to publish articles, whereas those in private institutions were encouraged to produce works in reputable journals, even if fewer in number than their PCU counterparts. Despite Bharucha's (2024) diagnosis of the stranglehold of the UGC and its 'heavy-handedness' across the country's HEIs, participants also highlighted that it did not prevent duplication of research activities and inefficient ways of working:

> People know well about the challenges involved in the research admin process. There is no support, no patience. When we apply for funding, no one tells us what to do and how to do. If they could process our paperwork quicker, then we can do the works…
>
> Computer science early career researcher C10, PCU, Tamil Nadu

> For someone to be in a flourishing research culture, we severely underestimate the importance of good administration. Do you have to chase grants 20 times? Does it take one month to get your equipment? Or does it take one year because of rules and regulations? How much of this admin falls onto institutions and team members.

Policy and system actor R7, academic expert

The UGC's primary purpose was not solely to award grants. It was concerned with shaping and maintaining standards in teaching, curriculum, examination and research across all institutions and contexts. As reinforced by participants in this study, achieving quality through regulation and the implementation of research policy had been at odds with the scale and heterogeneity of the national system.

6.4.3 National government resources and funding

Differences in the flow of funding between institution types have been discussed throughout this chapter and in Chapter Five, as well as the consequential impact on volume and scale of research activity, the quantity and quality of talent, and overall performance. As discussed by participants, the mechanisms for funding institutions and their research infrastructure also varied, with PNISs at a distinct advantage of being better resourced and able to negotiate their funding needs directly with the Department of Higher Education whereas PCUs described this as a transactional exercise with the UGC. In part, this was sustained by the notion that PNISs were "islands of excellence, while most others were considered to be a sea of mediocrity" (Altbach and Mathews, 2019).

Flowing from these inequities, there were fractures in funding at the intersection between regional and national systems. Here, participants focused on the politics of funding between actors at the level of the national system and regional systems in several ways including:

- Some participants recounted that the funding panels for certain research schemes and programmes were made up of decision makers largely from Northern states and favoured institutions and researchers from these contexts.
- Another participant described the performative actions of state PCUs and researchers to drum up perceptions of an active research environment as a way to secure research funding and support even if their research activity was limited in reality.
- Others highlighted the desire of national agencies and government departments to fund research projects with an applied focus and which could generate commercial benefit through products and patents. This was perceived to neglect funding in the basic sciences. As cautioned by biomedical researcher B8, "we need a strong base of basic research and if current trends continue, I worry it will have a hugely negative impact on biomedicine" in the long-term.
- Participants emphasised the pros and cons of funding research through nationally determined thematic programmes, in that while it built research capability in specific areas, other disciplines or areas of focus could be disadvantaged. Some described instances of bias in decision making in terms of which projects were awarded and others highlighted that those priorities could change

between governments through the electoral cycle, which created disruption for institutions and researchers. For this reason, many participants expressed the importance of accessing multiple sources of national funding, across a range of government agencies so as not to close the available possibilities. At the time of conducting the study, there were several participants who were concerned about the design of the proposed National Research Foundation. They were anxious that it could curtail the diversity of national funding opportunities.

There are already significant constraints on government expenditure in higher education. Based on current growth rate projections and share of government expenditure in higher education, there will be a substantial shortfall in India's capacity to meet its 2035 national gross enrolment targets (Borthakur et al, 2024). As discussed in Chapter Two, India's expenditure on research and development as a proportion of its GDP has been much less than competitors and HEIs shared a small pool of these funds (PRS Legislative Research, 2024). Despite these issues, participants also acknowledged that increasing resources and funding alone will not change and transform research practices and motivations at a national level:

> When I mean a lack of resources, in the public system, this means there are a lack of actual resources and material. In the private, rich institutions, even if you have access to those resources, there is no formula of excellence. Just because you have the right resource around doesn't mean you'll end up doing excellent work. The culture we are talking about… it is not like I give you money, and you do good work. It (money) is necessary but not sufficient.
>
> Policy and system actor R6, academic expert

> In the past, I would say 20-30 years ago, I would say financial resources were a big constraint. Today, I would say that's not unimportant but it's not as stringent a concern as it used to be. If financial resources were a binding constraint, you would think India would do much better in areas of research that were not financially intensive. So if you take experimental physics, that's very expensive or biological science. But those areas in India, I would say they are doing reasonably well, especially in central research labs under Department of Biotechnology like the Centre for Cellular Biology in Hyderabad. But in other areas this is not the case, it is more than resources.
>
> Policy and system actor R7, academic expert

As identified by the UGC, the "lack of qualified human resource for research guidance and poor physical infrastructure and inadequate funding" is a significant and enduring challenge across the Indian research system (UGC, 2019a, p.4; UGC, 2019c). The above perspectives counter that to some extent, highlighting those sufficient resources enables research activity to take place but to produce the type of high-quality and excellent research that is desired by government as well as participants in the study, the role of institutional and disciplinary norms and individual motivation remained crucial.

6.4.4 Collaboration

Building on findings in Chapters Four and Five, the spectrum of collaborative activities that was supported at a national level included joint research projects, student and faculty exchange, conferences, and networking opportunities. Most participants framed the orientation of collaborative activities as taking place within India, though some highlighted initiatives with researchers and institutions in a global context. Of these examples, the idea that collaborative activities were largely driven by individual researchers and disciplinary communities was reaffirmed and situated the role of the national system as primarily that of a funder.

The role of power emerged as an important issue, particularly in the context of international collaboration, where there was a perceived imbalance between researchers in India and those working in other countries:

> What is perhaps not reflected in publications is the technical nature of collaboration. Who conceptualises the issue? Who does the groundwork? There is a skewness here. In a multi-country project, due to the convening power of the UK, it has worked but this does have an impact on the culture and on researchers locally. Can a leading researcher in India ensure uptake of their findings without an international collaborator?
>
> Policy and system actor R10, research funder

Others echoed the tensions experienced by Indian researchers who grappled with producing work that conformed to international performance metrics or funder expectations, where they may be less familiar with these norms. On the other hand, there were also concerns that some researchers and HEIs were divorced from their local contexts and communities because they were more focused on achieving global success.

The regulations set out by the UGC in relation to Academic Performance Indicators (API) were critiqued as working against collaborative behaviours and practices. This was the principal instrument used to evaluate the performance and progression of researchers nationally (UGC, 2013). Researchers accrued points for undertaking various research activities, including papers in refereed journals, books, consultancy projects, patent outcomes and research supervision, among other tasks (UGC, 2013). Within this context, researchers were less incentivised to work with others, as the API rewarded individual performance:

> On one side, if I am a single author (on a publication), it counts as more points. If I have co-authors in my paper, then my marks are distributed amongst the co-authors. So if I want more API points, I cannot collaborate with other researchers. But, if we have a collaboration with a good author, then a quality publication can come out…and if you have multiple authors from

> different countries, then it impacts positively on citations. But I don't get as much points. This is the real dilemma for us as researchers.
>
> Computer science researcher C9, PHEI, Maharashtra

> The Government of India does not trust us…what happens with the first author getting 70 points, the second and third author getting 30 points is that the UGC thinks we add authors for the sake of our promotions without contributing much to the scholarship. So in order to cuttle that tendency, we are apportioning the points. But when we collaborate, and when we write together with good intention, the quality of the paper might go up. But what is the intention of the UGC, that they do not trust us. This is not a good practice, this is sending a poor signal for collaboration.
>
> Policy and system actor R3, academic expert

One participant partially defended the API, arguing that it boosted the performance of doctoral students and early career researchers who partnered with their more experienced supervisor on joint publications. At the same time, these participants were also critical that some senior researchers who did not have sufficient time or interest to conduct their own research profited off the substantial work engaged in by their more junior colleagues. In many cases, it was evident that this regulatory mechanism did not drive the type of collaboration that was desired by participants in the study.

The role of collaboration with the private-sector and industry was another dominant idea that emerged in relation to the national system. While some participants framed this in terms of a lack of involvement from the private sector, others pointed to examples of initiatives that were funded by the central government to encourage such collaboration. While this study did not consider the perspectives of industry actors, participating researchers focused on differences in the ways of working, highlighting that those in industry were often motivated to develop products and deliver financial value on fast timescales.

6.4.5.2 Autonomy

Understandings and therefore perceptions around autonomy were a contested topic, but pertinent to the features of research culture at the national level. As discussed in Chapter Four, autonomy refers to academic self-determination and agency in the relationships between individual researchers and their peers, as well as between their disciplinary communities and their institutional management (Sen, 1985; Marginson, 2008). Here, the focus squarely concerned an institution's freedom from government command and ideology including the UGC (Sen, 2015). Across and within HEIs, participants had a range of different experiences in relation to institutional autonomy:

> The flipside of having so much autonomy is there is no performance accountability. We have these half-baked schemes that say all the right things and we're good at mouthing that we do research. But the actual R&D output is not there.
>
> Research leader L3, PNIS, Maharashtra

> The most important thing is that faculty have the autonomy. It cannot be unconditional nor full, but it is being restricted. Culture can only grow if we are given the freedom and made to feel a part of the system without much bureaucratic interference. Faculty can be demotivated without this. But today, faculty are being forced to change from intrinsic motivation to one of external surveillance.
>
> Policy and system actor, R3, academic expert

> Our institutional freedom is what drives our quality. The freedom to recruit faculty, promote faculty, recruit students, ultimately authority sits with us as institutions and our self-governance.
>
> Policy and system actor R4, central institution

Autonomy differed and was moderated by a range of factors, including by discipline, leadership, time-period and personal expectations of autonomy. The data demonstrated that there was significant variability in the experience of institutional autonomy in research. In one setting it was rigorously applied and in another autonomy was present but there was limited accountability associated with performance and output. Participants were generally negative about the role of the UGC as a heavy-handed regulator, which had been previously critiqued as the "primary source of the erosion of university autonomy" (Jayal, 2023, p.601). This study did not identify examples of interference, in relation to specific topics such as religion or another aspect of social life. However, this has been a focus of previous research on the topic (Imphal, 2020; Kumar, 2020).

Institutional autonomy from government interference may be conflated with expectations of faculty output and productivity. Academic freedom is considered as much a duty as it is a right, particularly to share discoveries and new knowledge with the wider society (Thorens, 2006). As asserted by policy and system actors R3 and R7, the role of the Vice-Chancellor and senior leaders was identified as important to preserving autonomy as well as role-modelling the duties that come with it, for example in establishing norms and practices and in the appointment of faculty for research activities. Senior leaders also had a role to play in navigating external stakeholder interests and expectations:

> It has become hard for universities to separate themselves out of the political and social churn because the campus has become a site for politics. Too much activism is great for social change but can be less for research. The environment needs to be insulated – you can't be both.

Policy and system actor R7, academic expert

Previous works have pointed to the long-standing practice of political involvement in the appointment of academic leaders in Indian universities (Agarwal, 2012). This data gathered through the study provides limited insight into these practices but highlights the role that these leaders play in the enactment of autonomy through day-to-day practices and behaviours.

6.4.6 Socio-economic features

This section explores themes which are specific to the overarching national context. These are the role of colonialism and the relationship between research and the wider education ecosystem. There is insufficient data to make meaningful inferences about the role of gender and is a limitation of the current study. The role of language was most pertinent in the context of the regional system and has been discussed in sections 6.2 and 6.3 of this chapter.

6.4.6.2 Colonialism

For most participants in this study, the legacy of India's colonial framework was evident in the characteristics of their institutions and in the wider regulatory environment. Whether it be the heavy-handedness of the UGC or the model of affiliated colleges and dominant teaching emphasis in PCUs, participants pointed out the origins of these practices harked back to the three universities set up in India as examination bodies (in the model of the then University of London) and the consequences that have followed since (Jayal, 2023). Beyond this context-setting, there was little that was explicitly stated by way of the perceived, direct impact of colonial rule in the current production and dissemination of knowledge and scholarship.

At the same time, as explored throughout Chapters Four, Five and Six, many researchers were increasingly oriented towards performance on international rankings, had discussed the tensions associated with vernacular and English languages, as well as the inequities in international collaborations and the privileging of those that had trained in Western contexts. These discussions were largely framed around power, where the interests of Western, and increasingly East Asian, actors were of key significance, reflecting a multipolar network. There was a clear stratification of HEIs within the Indian system, where the elite funded PNIS occupied a privileged position, partially because they were the most globally engaged and connected as compared with the PCUs that were much more locally embedded and oriented institutions. The confluence of these dynamics creates many contradictions for researchers, including their conceptions of success:

> For faculty who want to orient their work to global norms, in the so-called WCUs, they are constantly being subject to others' ideals of research success. For example, Economics and

> Politics Weekly is considered a top journal internationally and read by policymakers. But many others say its trash. This dichotomy is there on multiple dimensions,
>
> Research policy and system actor R2, Maharashtra

Even if not explicitly stated, these narratives indicated the implicit influence of epistemological colonialism, wherein typically Western ways of understanding and measures of success superseded indigenous knowledge (Lewis and Simmons, 2010). This reinforces a particular approach to the production of knowledge and how knowledge is rewarded, including through UGC regulations and funding schemes.

The exception is where researchers were focused on addressing questions that pertained to India's history, tradition and identity – broadly the areas that encompassed Indology – and where a different set of narratives emerged. This was extensively discussed in Chapter Four, with reference to the experience of historical studies researchers. Similarly, participants in this study contrasted the inquiring spirit of the Maharajahs and the knowledge systems in pre-colonial India with that of current emphasis on credentialisation of students and the 'academic capitalist' nature of research to produce patents and deliver economic benefit to the country.

6.4.5.3 Relationship with wider education ecosystem

In recent decades, India has made significant strides in improving the gross enrolment ratio at elementary level to 99 per cent (USIDE-Plus, 2022). However, the enrolment rate drops to 54 per cent at higher secondary level at grades 11 and 12, with contributing factors including the limited number of schools, the lack of public investment and the overall costs associated with schooling (Bordoloi and Pandey, 2022). Compulsory education only lasts seven years in India and there are significant inequities in enrolment between the regions (OECD, 2024). For instance, the age-adjusted, higher-secondary enrolment rate was 18 per cent in Bihar, whereas this was at 47 per cent in Tamil Nadu in 2020-21 (Bordoloi and Pandey, 2022).

Through a national lens, participants in this study explored the consequences of inadequate public investment and access to secondary education including the substantial flow-on effects for capacity and capability of the tertiary student population and the overall base of knowledge workers in society. As set out in the Government of India's (2020, p.12) National Education Policy, there was a dominant focus on incorporating "holistic, inquiry-based, discovery-based, discussion-based, and analysis-based learning" to cultivate a desire for originality and critical thinking in students.

As highlighted below, researchers' narratives centred around the idea that India would not be able to achieve its research ambitions if the focus on developing research skills was not extended to that of the wider education ecosystem, as early as primary and secondary education:

> Our NEP does envision that schooling will be improved. But the education we currently offer to the mass is not the level we want and that is something we have not been able to provide as an overall country, and how do we manage the quality? Even many students including those in extreme poverty, their parents still send them to special coaching. Because there is a sense that maybe my son is not getting a good education in school. Because education for them is something that is taken up as a family, that it will liberate them. This is the case for a large class of people in India.
>
> Computer science research leader L1, PNIS, Maharashtra

Others went further, and raised the imperative for HEIs to do more in bridging the gap between research undertaken at their own institutions and other parts of the education ecosystem through driving initiatives and programmes to help build the future research talent pipeline:

> Funding for centres of innovation where we can bring school students and college level students to become involved in research. This will be helpful for the nation and help build the pipeline in the areas we need for the future.
>
> Computer science researcher and head of department C7, PHEI, Tamil Nadu

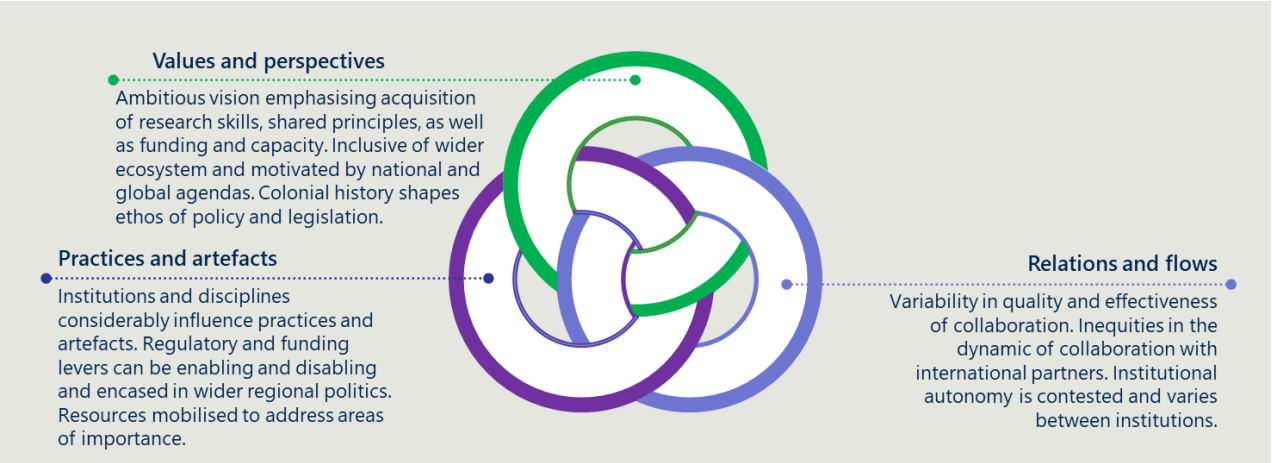
This study is primarily concerned with synthesising key features of research culture within Indian HEIs, at the level of disciplines, institutions and systems. However, these narratives underscore the inextricable links with the wider education ecosystem in framing researchers' motivations, developing their capabilities and enabling the overall productivity of the research system nationally.

6.4.7 National research culture: expansive ambitions, heavy-handed regulation and uneven outcomes

The aggregated view of a national-system research culture is marked by a breadth and expansiveness of vision through policy and governance (*values and perspectives*). As distinct from the regions, the national system has been able to effectively mobilise resources through targeted approaches, but this was not without political tensions (*practices and artefacts*). Another key feature of the national research culture pertained to the labyrinth of regulatory and governance structures (*practices and artefacts*), which constrained researcher performance and quality of output. Power imbalances and the unintended consequences of regulation enabled and disabled researcher collaboration, particularly at a global scale (*flows and relations*).

The role of autonomy loomed large in the national conception of research culture in India and expressed itself differently by institutions (*flows and relations*). Features of a national research culture are inextricably linked with fostering research and critical thinking across the wider education ecosystem (*values and perspectives*). This dynamic understanding of research culture is visually presented below in Figure 6.6 and discussed further below.

Figure 6.6 Research culture conceptual framework, applied to national system



At the national-level, the distribution and flow of resources to the plethora of institutions has been a politically contested arena and has driven performative behaviours (*practices and artefacts*). The way resources have been discharged to build research capacity can exacerbate existing inequities in the system, favouring those institutions which were already well-funded and that were high performing (*practices and artefacts*). Colonial history directly and indirectly shaped the system, through conceptions of research success through to regulatory levers (*values and perspectives*).

6.5 Summary

System-level features of research culture have shaped the actions and performance of a community of scholars and institutions at scale, rather than the behaviours of any one individual. In turn, system-level factors licensed the undertaking of research within institutions, regulated researcher conduct and could meaningfully amplify researchers' and institutions' impact through resources and infrastructure. Equally, as explored throughout this chapter, the system can be an impost on the undertaking of research within communities and HEIs through complex regulation, mismatch of incentives and, in the case of India, an inability to harness the plurality of languages, ideologies and economic realities of those that make up the research system. Their influence can feel simultaneously distant, as well as, pervasive and instrumental.

Underpinned by the experiences of researchers in Maharashtra and Tamil Nadu, this chapter argues that regional systems play a less material role in fostering actions and behaviours in support of research, but there are some instances where they enable research in pursuit of a specific outcome. The socio-economic context of regions, however, is paramount in shaping the temperament and ways of working between researchers, particularly where there is sustained economic growth and investment in the wider education ecosystem. The national system can be much more determinative, due to the twin-forces of regulation and resourcing, and in the institutions and contexts where autonomy is conditional. Institutional characteristics and disciplinary practices offset the dominant forces of the national system, but it remains omnipresent.

The following chapter draws together features of research culture across each of the three lenses of disciplines, HEIs and systems, both regional and national, to inspect and analyse the interrelationships that have emerged and consider arising implications. In doing, the contributions to new knowledge will also be discussed.

7 INTERACTIONS BETWEEN SCALES OF RESEARCH CULTURE

7.1 Introduction

Building on the key features of research culture explored within disciplines (Chapter Four), HEIs (Chapter Five) and regional and national systems (Chapter Six), this chapter analyses the interactions between each of these scales and considers the implications and contributions of these interactions for understanding research culture in Indian higher education. While this chapter draws on participants' narratives, there is a principal focus on appraising the empirical data in relation to the conceptual framework and wider literature.

This is important to consider the specific insights emerging for the current Indian context vis-à-vis general understandings of research culture and to further develop the conceptual framework that has been discussed in earlier chapters. The chapter is structured around an extended discussion of issues that emerge in the spaces between disciplinary, HEI and regional and national system research cultures. Therefore, the chapter extends the framework as introduced in Chapter Two, by exploring the interactions between key features of research culture in relation to values and perspectives, practices and artefacts, and flows and relations. These are described in turn below:

- **Values and perspectives** – Values and perspectives emphasise key ideals about research. Researchers can simultaneously feel aligned to a common purpose or alienated from these ideals. They can be positive, negative or neutral. Values and perspectives flow through people and relationships to shape practices and behaviours and can permeate across systems, institutions and disciplines.
- **Practices and artefacts** – Practices and artefacts are determinative, routine and, typically, enduring. They represent the 'doing' or creating of culture (Oancea, Florez-Petour and Atkinson, 2015). Disciplinary practices are only partially nested within HEI and system practices. Tensions and conflicts in practices between the scales of research culture can emerge as well as harmonisation of approaches and actions.
- **Flows and relations** – Flows and relations occur in the spaces between disciplines, institutions and systems as well as within the scales themselves. They are non-linear and can be mutually reinforcing. They refer to interactions between researchers as well as other actors in the wider ecosystem including policymakers and funders, which can be both harmonising and fragmenting.

Interactions take place in the spaces between regional and national systems and HEIs, as well as between those systems and disciplines, and between HEIs and disciplines. These interactions are dynamic and there is a diversity of configurations that are possible. Values and perspectives, practices and artefacts, and flows and relations may shape or influence each other, although this does not mean that these interplays are always supportive or static. These ideas frame the exploration of participant data in

relation to the current study context and will be revisited at the end of the chapter to evaluate new findings.

This chapter explores the multiplicity of research cultures that emerge between the scales. Drawing on the complexity-framings of cultural interactions from Chapter Two, the multiplicity of cultures is forged through the interaction of the above elements. The study recognises the experiences of researchers as diverse, heterogenous, conflicting and paradoxical, giving effect to multiple cultures (Sackmann and Philips, 2004). These cultures carry "multiple, contradictory meanings that are simultaneously true and false, paradoxes and ironies" (Martin, 2002, p.110; Smerek, 2010). As will be discussed in this chapter, it is possible for individuals to identify with (and hold simultaneous membership within) several cultures which may change over time and circumstance (Sackmann and Phillips, 2004). This will be followed by Chapter Eight, which discusses the study's overall conceptual and empirical contributions in relation to the research questions.

7.2 Values and perspectives

This section discusses key values and perspectives arising from the interactions between disciplinary, HEI and regional and national system research cultures. Given the diversity of disciplines, HEIs and system-perspectives, these values and perspectives will not be relevant to the lived realities of all participants involved in the study but are enduring themes across the sample population.

7.2.1 Cycle of excellence

India is home to a demonstrably stratified higher education ecosystem, where a significant concentration of resources, expanded autonomy and emphasis on excellence is directed towards the small group of PNIS and a selection of PCUs. Further, inspired by the idea of the WCUs, the German Excellence Initiative (a funding scheme to bolster the capability of universities to invest in their long-term infrastructure) and Russia's Project 5-100 (to propel five-leading Russian universities into world university rankings), the Indian system is pursuing similar approaches through the IoE initiative to strengthen the research capabilities of these elite leading institutions (Krieger, 2024; Tsvetkova and Lomer, 2019; UGC, 2023).

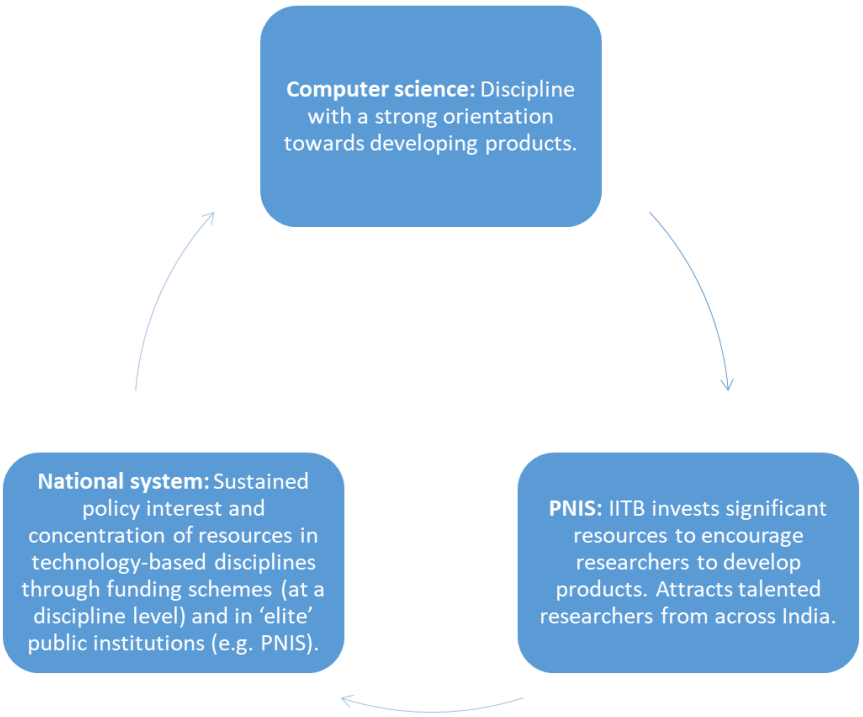
As previously identified in Chapter Five, within the PNIS explored in this study, there are deeply embedded discourses, organisational rules and routinely enacted behaviours around research excellence and competition. This is further reinforced in the interactions at the biomedicine and computer science disciplinary level within this institution, in that the disciplines that are most resource-abundant are those which are assumed to be the drivers of economic growth, and which bolster the national and international standing of the HEI and the country at large. These are also the disciplines which are galvanised through formal and informal practices to secure talent, invest in infrastructure and increase research funding for the promise of the innovation and benefit that it can secure for the institution, region and nation.

The narratives of PNIS researchers and some PHEI researchers within the computer sciences and biomedicine disciplines echo the experience of the German Excellence Initiative, in that universities with "internal cultures that were already well aligned with the basic principles of Excellence Initiative, such as research excellence through meritocratic incentives, interdisciplinarity and a focus on early-stage researchers, seem to have found it easier to apply to the scheme" (Gayer, 2014, p.150). Indeed, the PNIS and, to some extent, the well-funded PHEI in Tamil Nadu discussed in Chapter Five were most aligned with the national vision and policy agendas given their disciplinary strengths and collaboration dynamics. The impact of this is notable:

> Central institutions (referring to PNIS) are just more much comfortable. They can be higher quality and lower volume because of their elite status. They are an island of privilege compared to Bombay University, and it is particularly manifest in the lab-based disciplines...

The incentives to engage in shared effort went further than publication metrics and research outputs (Krieger, 2024). Similar to the experiences of the German Excellence initiative, researchers at the PNIS remained motivated by the reputation attached to the excellence title and the impetus it provided for interdisciplinary collaboration and building their professional networks (Krieger, 2016; Krieger, 2024; Frietsch, Schubert and Rothengatter, 2017). In turn, the virtuous cycle is sustained by the flow of resources and support between the national system, the PNIS and the biomedicine and computer science disciplines as explored in Chapter Four. These interactions are visually represented below at Figure 7.1:

Figure 7.1 Virtuous cycle of excellence between institutions (PNIS), disciplines (computer science) and system



Further, as drawn out from participants in this study, for those engaged in this virtuous cycle of excellence, the influence of neoliberal discourse was potent. For instance, for most computer science and biomedicine researchers working at the PNIS, deriving commercial benefit through patents and products determined their choices in terms of collaboration partners and research topics. This is not a phenomenon that is unique to Indian higher education. Tsvetkova and Lomer (2019) discuss the commodification of excellence through a similar scheme in Russian higher education and highlight models with a neoliberal framing in other countries such as China, France and Australia. Tsvetkova and Lomer (2019) critique the narrow framing of excellence in the policy agenda that has been embraced by the elite institutions that are in receipt of the Project 5-100 funding. They highlight that excellence has been interpreted as "competitiveness enhancement" and has compromised other objectives that are

more socio-democratic in nature (Tsvetkova and Lomer, 2019, p.140). Within the present study context, this type of neoliberal discourse was a dominant theme in the experiences of the PNIS researchers and at newer PHEIs, though a few researchers were also critical of this conception of excellence. In contrast, ideas around excellence, particularly through neoliberal framings received less emphasis within PCUs and in the narratives of historical studies researchers. Another crucial enabler of the cycle of excellence is the role of the Indian scientific elite, in other words, the small group of eminent individuals who hold a disproportionate amount of influence on science and scientific institutions and with government (Krishna, 2024). A product of the national independence movement established by former Prime Minister Nehru and his science for economic development agenda, the influence of this elite continues to play an important role in the rapid expansion of science and technology infrastructure and the success of these elite institutions (Krishna, 2024).

As is discussed elsewhere in this chapter, the alignment in values and perspectives between these institutions and disciplines is in stark contrast to the experience of researchers at PCUs and those working in historical studies (and more broadly in humanities, arts and social sciences disciplines) where there is greater fragmentation.

7.2.2 Advancing technocapitalism

Related to the ideas around a virtuous cycle of excellence is the dominance of the technology agenda in participant narratives across disciplinary, HEI and system dimensions of research culture. Ideas around technocapitalism (Suarez-Villa, 2012), which emphasised the role of technology in enabling India's economic growth has long animated India's national ambitions. The vision of Atmanirbhar Bharat ('self-reliant India'), with a strong indigenous technology base, is reflected in the growing investment in traditional strategic technologies, digital technologies, and new and emerging technologies (Jaishankar and Sirkar, 2024). Further, there is a sustained focus on establishing India's presence as a global digital services and manufacturing hub, the unprecedented expansion in the services exports sector and, as discussed in earlier chapters, the regulatory and financial incentives driving growth in the number of patents filed in the country (Krishna, 2024; DST, 2020; EY, 2023). These top-down flows affirm that India has high hopes for technology-led innovation and recognises that investing in institutions such as the PNIS to enable these ambitions is generally worth doing so. It has already bestowed the country with a comparative advantage these fields, with national and global reach in places like the Silicon Valley (Krishna, 2024).

The present study contributes to understanding the bottom-up flows of these interactions, highlighting the responses of computer science researchers – even those in resource-constrained PCUs – which indicate that these researchers typically experienced a sense of security, encouragement and investment

in these fields of research. Crucially, these researchers highlighted the low-cost funding requirements associated with computer science (as compared with biomedicine or other STEM discipline):

> We have one key advantage over other fields and that is our easy access to hardware, we can access publicly available data sets. This is different to biomedicine because they need equipment, sensors. Whereas, in computer science, you can do research with your system that is available at home.
>
> Computer science researcher C5, PHEI, Tamil Nadu

> Most of the research in any case that government is interested in is science and technology in India. They are very little in social sciences, they are very little in Medicine etc. And what institutions try and do is decrease their reliance on government funding but they fail to do this.
>
> Research policy and system actor R2, Maharashtra

Many participants connected the applicability and relevance of computer science research to the wider technology agenda. Moreover, the consistent ways of ways working within computer science, including universality of language, the relative ease of securing equipment, and funding from industry and government sources, aligned with the stated and unstated expectations of system-level stakeholders such as policymakers and funders:

> Tamil in our field and discipline is not that important because technology is the language. It is all about C++, Java, and the programming languages.
>
> Computer science researcher C7, PHEI, Tamil Nadu

> It is different to aerospace engineering, you don't need a lot of infrastructure to procure where it takes just two years to set up the experiment. We don't have that long developmental cycle, which is somewhat lucky that this is the case in my discipline. I also feel computer scientists are a lot easier to work with, they are more open minded and less hung up, and yes, it's my experience, but I feel that 'computer science' is an American topic (in relation to international collaboration).
>
> Computer science researcher C2, PNIS, Maharashtra

Notwithstanding the positive aspects of these interactions, the study highlights the performative behaviours of researchers in response to organisational research agendas and wider trends. It was not uncommon for researchers to pursue conservative research agendas to secure resources and ranking positions (Jantos, 2024). Such narratives were not immediately evident from those that participated in the study but drawing on fieldwork across the range of HEIs that formed the study, there were visible attempts to highlight projects and collaborations in computer science that aligned with India's

technocapitalist discourse and policy agendas. Researchers were hesitant to step outside the box of formal and informal boundaries, as it would mean challenging their job security and wider career development.

7.2.3 Valuing the humanities

In contrast to the influence enjoyed by technology-embedded disciplines, the confluence of system and institutional factors shaped a more precarious and difficult context for historical studies researchers (and more broadly, within humanities and social sciences). The lack of proper institutional support and variable research quality in the social sciences has been previously established (Department for International Development, 2011; Thorat and Verma, 2021). Even still, "social sciences have overshadowed humanities since independence" given the promise of social science to bring about economic change (Jeffrey, 2022, p.6). Therefore, disciplines such as economics and political science fare better in terms of institutional support and esteem than history and literature. Within this context and as discussed in Chapter Four, research in the humanities is limited and concentrated within a select few HEIs and standalone specialist institutes (Jeffrey, 2022).

In relation to historical studies, Deshpande (2013, p.60) laments that "Indians love their heritage and trust their tourist guides but do not want their sons and daughters to become historians". As discussed in Chapter Two and Four, the precarity of historical studies nationally is well rehearsed and considered troublesome for those within it. Highly talented students are dissuaded from pursuing research careers in these fields and even in the most well-funded PNIS, there are significant vacancies in faculty recruitment. Researchers in these fields are overloaded with teaching responsibilities and cite limited time as a major barrier to progress their own individual projects. Its methods are contested, where there is a "fetish for documentary evidence…and a neglect for oral history" (Deshpande, 2017, p.38; Parpiani, 2013) and certain perspectives are considered too taboo to even be studied, for instance, critiquing the Brahmanical and nationalist sentiment. There remain gaps in documenting the pre-colonial, Islamic past of India (Deshpande, 2011). The contribution of the British Empire is also notable, which conceived "empirical science as universal knowledge…charged with the mission to disenchant the world of the superstitious natives" (Nilekani, 2008, p.4). These are important, contextual factors which frame the expectations of aspirant researchers in relation to academic autonomy, training and peer support, and which influence the politics of funders who are highly sensitive about the research projects they support.

Research for this study also identify the instrumental, economic drivers, or the perceived lack thereof, in sustaining adequate funding for the discipline:

> Our funding compared with the natural sciences is much less. We are getting less than 2.5 per cent of the total budget of what they are receiving in natural sciences. Hopefully this will

> improve in the years to come. And we are trying very hard to bring scholars from remote areas to participate in our schemes. They are not well-versed, no training or workshops, no skills development in writing proposals.
>
> Research and policy actor R12, research funder

In part, the discipline was not well resourced because its value was more routinely challenged. New knowledge from historical studies did not translate into outputs that were valued neither in the dominant neoliberal focus of research in Indian higher education nor by government actors, despite statements that professed otherwise (GoI, 2020). As discussed earlier in this chapter (within section 7.2.4), these interactions were markedly different to computer science, where investment is abundant and research outputs are valued by funders and other actors. There are no patents in history that could deliver financial returns in the way that the technology and market-focused disciplines were able to do so (Deshpande, 2013). And at the same time, history causes discomfort to the political and social elites, resulting in a scenario where historical studies is "blighted by the forces of linguistic, caste, religious and chauvinism in most places" (Deshpande, 2013, p.64).

While the discipline endured an unfavourable national context, the response of scholars and ways of working within the field also revealed a complicated picture:

> There are lots of important differences between disciplines like sociology, political science and economics from the others. What you find is the theory of social sciences does not substantively come from India. One of the reasons for this is some of our best minds are trained in India but continue abroad, take for example, Amartya Sen or Venkataraman… so, it is not just a question of financial resources, but this culture is the product of travelling abroad and a question of competence and capability, which is not yet there. How many are considering original works and original theories?
>
> Research and policy actor R8, academic expert

Previous research has reinforced the idea that many faculty in this disciplinary area have not made a significant theoretical or applied contribution to academic research nor have they conformed to international standards (Department for International Development, 2011). They publish in low-ranking journals and long-form monographs (Department for International Development, 2011). Incentive structures either do not sufficiently reward historical studies researchers or are concentrated within standalone institutes. Importantly, as discussed in Chapter Four, there is inadequate attention to rigour and theory generation and a lack of talented scholars from diverse socio-economic backgrounds. All of this is to reflect the notion that "the majority of historians have not been trained to handle the crisis of their subject" (Deshpande, 2013, p.64). Historical studies experienced a sense of disconnected both within and beyond their HEI.

The consequences of failing to nurture historical studies are well-understood but there remains a paralysis to take the steps necessary to address the current state of decline (Thorat and Verma, 2021). Therefore, it is unsurprising to consider that several leading scholars from this discipline forge their careers abroad, as discussed by participant R8, or take an interest in issues of Indian identity and social life from within a non-Indian country context where they may face lesser pressures. The latter perspective was not an explicit focus of the current study, and there were no participants who had first-hand experience working on issues of Indian identity from a non-Indian HEI.

7.2.4 The indigenous and the global

As discussed throughout the study, among participants in the study there were a range of institutional and disciplinary differences in relation to the audience, dynamics of collaboration and desired impact of their research. However, the study highlights a clear tension in values between some participants who expressed the importance of an indigenous focus and wanted to engage with local communities and knowledges, and others who were much more internationally engaged and found no difficulty in adapting to global norms and ways of working. Many struggled to realise both objectives effectively and considered one priority to be less important than the other.

These observations are tempered by two additional considerations. First, science and engineering research generally have become more global over the past three decades, a process which is driven by researchers themselves, partly through mobilising institutional and industry funding for joint projects (NSB, 2023). Enhanced global engagement has also been reinforced by national governments. This includes the GoI, which encourages international collaboration to work towards outcomes that exceed an individual nation's capacity (NSB, 2023). There are limits and risks to this proposition, as observed sharply during Covid and in relation to China-US relations (Lee and Haupt, 2020).

Secondly, within this study, 'the global' orientation of collaboration is dominated by a focus on interacting with researchers from and modelling the practices of institutions of Anglophone, Western nations who are considered more reputable. As discussed in Chapter Five, researchers and institutions in the East Asian countries are also growing in significance but the dominant emphasis remains towards the West. In sum, within certain disciplines, the trend towards international collaboration is inevitable and important. However, as expressed by some participants, it also invokes some concern about a neocolonial mindset taking hold. This mindset was also pursued to appease the agenda of some policymakers and funders who attributed high levels of esteem to Western institutions. This is reinforced in the present study:

> My sense is that the best research institutions in India follow a little more of the American model and are staffed by those that have worked in the American system…we need to imbue the

> American here. So one thing I might look at is of the fraction of the faculty, how many did their PhDs or training abroad. This is not a bad predictor of research culture.
>
> Policy and system actor R7, academic expert

The inference of a statement such as this is that the desired research culture is one that should be modelled along the lines of American traditions, as compared to being grounded in Indian norms and values. However, interpretations around colonialism in shaping institutional research practices and values are approached with some caution here, as "whatever one can truly say about India, one can also say the exact opposite with equal truthfulness" (Murthy, 2000, p.37). Drawing on participant data, the observations below highlight the shifting, multiple and unsettled nature of these dynamics:

- As discussed in Chapters Five, some participants in Maharashtra PCUs described an insider-outsider dynamic in relation to the role of the Marathi language in conducting fieldwork and establishing credibility. However, many more researchers in Tamil Nadu institutions highlighted the region's norms around plurality of languages and the benefits of individuals working in English and Tamil.
- Chapter Four painted history as a discipline in decline, where many researchers in this study are not afforded the freedom and resources to develop original works.
- Earlier in this chapter, the close relationship between the socio-economic backgrounds of students and research faculty and the institutions they were situated were described. The more affluent individuals from upper caste backgrounds were more heavily concentred within the most elite HEIs. Individuals were also regarded with higher esteem if they completed research training at a Western institution. Such persons were concentrated within elite HEIs. Inequities emerge in the flows of talent between institution types and for individuals that are unable to pursue research careers.

The tensions between the local and the global, and the heterogeneous positions asserted among them, reinforce the notion that the coloniser and colonised cannot be seen only in terms of binaries (Kumar, 2021, p.93). As put by Kumar (2021), scientific knowledge is neither monolithic nor universal. As observed in the interactions between disciplines, HEIs and system-level practices, Kumar's (2021) critique emphasises that even the most formidable empire could not have come to be without the contribution, silent or explicit, of those being colonised. Indeed, he observes that India during colonial rule produced more visible scientific pioneers than post-colonial India (Kumar, 2021).

Participant narratives from the current study highlighted the instances where "consent and coercion are at work in collaboration" to preserve the domination and hegemony of practices such as international rankings, funding schemes and researcher collaborations (Paranjape, 2013, p.41). These processes also draw attention to the ways by which institutional and disciplinary sometimes challenge these dominant practices, values and areas of emphasis. The ideas of "unity and diversity are in a constant and never-ending dialogue when it comes to India" (Paranjape, 2013, p.42).

7.3 Practices and artefacts

In this section, the themes explore the interrelationships in practices and artefacts between the scales of research culture. It will highlight where practices are harmonised across disciplinary, HEI and system domains, as well as where there are points of differentiation and conflict. The actions and behaviours of individuals and the role of resources are central, overarching ideas. The practices discussed in this section are nested within the wider political and regulatory landscapes.

7.3.1 Flow of resources

This study explores the interaction of funding and other resources to shaping research culture across disciplines, institutions and systems, highlighting both their importance and limits. Previous research has extensively focused on the contribution of funding as a lever to improve research impact (measured through citation performance and quantity of research output) and the role of funding in driving specific initiatives, such as collaboration and policy development (Zacharewicz et al, 2023; Roshani et al, 2021; Aagaard, Kladakis and Nielsen, 2020; Alvarez-Bornstein and Bordons, 2021; Thelwal et al, 2023; Heyard and Hottenrott, 2021). These studies paint a complicated picture: on the one hand, Aagaard, Kladakis and Nielsen's review of literature (2020) suggested that spreading out funding on smaller grants yielded better performance on average than funding in fewer and larger portions, whereas the work of Zacharewicz et al (2023) showed the mixed evidence about the impact of competitive funding on research performance across ten countries and 148 universities. Thelwal et al (2023) disaggregated the many sources of funding, the procedure for grant awarding, the influence of funding on shaping research goals and the nature of funding between institutions and systems, among other dimensions of funding involved in the end-to-end research process.

Within this study, the emphasis of funding and resources was central to ideas about research culture across all scales. However, even in institutions and disciplines where there was an abundance of resources, participant narratives emphasised the motivation of individual researchers, the effectiveness of research leaders and administrations, activities to support the development of researchers (e.g. researcher colloquium, quality of supervision), the demands of teaching, the incentives (or lack thereof) for collaboration, the wider economic and social context, and the ease of administrative processes (e.g. timely processing of grant application processes) as factors which are influential in shaping research practices in different and complex ways. The contributions of intangible and tangible dimensions such as these are hard to quantify but crucial to building a research culture at any level.

Conversely, even in institutions and disciplines that are resource-constrained, or where individual researchers may be excluded from global or national funding schemes, research activity can and does take place, though a base of funding is a requisite. Between PCUs and other HEIs, researchers have resorted to cooperative use of resources with private institutions and across disciplines to facilitate

research activity. At the level of the system, there is a focus on injecting and distributing resources across the most deprived areas to build up research culture:

> We should concentrate on the remote areas and see to it that the backward and other areas should achieve parity – they should come up on equal footing with the urban areas. That is how we promote research in the country.
>
> Research and policy actor R12, funder

> The central government continue to fund the so-called better ones, and they keep getting better. But they only support two per cent of the populations. What about the rest?
>
> Research and policy actor R1, Maharashtra

Without resources, there is no research. However, Blatch-Jones, Lakin and Thomas (2024, p.21) demonstrate that "individuals need to feel empowered and safe in the workplace, feels a sense of team support, be treated with respect…focus on the health of research groups", all of which goes beyond resources and into responsible management practices and the behaviours of researchers. By and large, leadership and management practices were important at the level of institutions and disciplines (through project leads, more experienced researchers and supervisors) and at the level of regional and national systems. There are differences in how these forces play out between and within institutions:

> My guess is managerial logic. Research culture as it happens in private universities is managed. Faculty are expected to translate research outcomes, increase their focus on outcomes which leads to better quality. It may be that some faculty members do not like because they may feel at odds with a certain pace. But if done well, a new managerial logic takes place and leads to better outcomes. In contrast, with the X (PNIS), there is little accountability and left to the academics. Here I don't care it if it is contributing to government agenda, it is about our disciplinary performance.
>
> Research and policy actor R2, Maharashtra

This statement exemplifies the importance of the underpinning rules that guide the actions of researchers and how they are reinforced by the wider management and leadership structures across disciplinary, HEI and system scales. This also includes the role and impact of the formal regulatory apparatus, which are discussed next.

7.3.2 The impact of regulation

Unintended consequences resulting from important policy changes and regulatory approaches in higher education are neither distinct to India nor that uncommon as phenomena (King, 2011; Krücken, 2014). Through a review of higher education reforms over a 15-year period in Germany, Krücken (2014, p.1449)

concludes that the unintended consequences are somewhat inevitable due to the variety of "crisscrossing and partly conflicting trends within higher education" as well as that driven by external factors such as technology and scrutiny over public finances. Within the current context, UGC national regulations that evaluate individual researcher as well as HEI performance are widely critiqued as "mechanical and ritualistic processes" (Chattopadhyay and Nandi, 2022, p.190). It is argued that they fail to recognise the diversity of disciplinary norms, micromanage the activity of researchers and administrators alike, and contribute to levels of "distrust (that) has been so disempowering as to have contributed to the very mediocrity and poor governance…that it was meant to overcome" (Kapur and Mehta, 2017 as cited in Chattopadhyay and Nandi, 2022).

The mismatch between several UGC regulations and the way these intersect with the on-the-ground, disciplinary norms for researchers are issues of paramount importance to the current study. Participant narratives asserted that the most significant outcome of some of these regulations was that they inhibited researcher agency and practices and, at times, worked against the ways that researchers were rewarded for their chosen methods and outputs of scholarship. Equally, there was a recognition that there were unintended consequences associated with the way that specific regulations were applied and enforced. Synthesising findings from Chapters Four and Six, with a focus on documents reviewed through fieldwork, Table 7.1 summarises the desired impact of specific regulation and their undesirable impacts and consequences, as reported by participants in this study:

Table 7.1 Impact of specific UGC regulations on disciplinary practices

UGC Regulation	**Desired impact, as stated in policy documentation**	**Unintended impact and consequences, as reported by participants**
Minimum Qualifications for Appointment of Teachers and Other Academic Staff (UGC, 2018)	• Ensuring the recruitment of Assistant Professors, Associate Professors and Professors in Universities and Colleges are appointed based on merit and consistent eligibility criteria. • Establishing a consistent and rigorous promotion framework for the above positions, including provision of guidance for selection panels and decision makers. • Clear guidance around remuneration, leave and other key aspects of the employment agreement.	• Researchers in PCUs and some PHEIs have insufficient time to conduct research activity due to stringent teaching demands set out in regulations. • Differential impact across different disciplines in response to restrictions on time, e.g. biomedical researchers focused on supporting doctoral students whereas, some historical studies researchers solely focused on teaching responsibilities. • Contributes to a culture of 'churning out' publications than developing rigorous and highly original works. • Some workarounds via alternative modes of employment (e.g. Research Associate Professor at the Tamil Nadu PHEI) for specific disciplines.
Academic Performance Indicators (UGC, 2018)	• Assessing the contribution and impact of faculty members that reflects both	• Disincentivises collaboration in biomedicine and computer as points

	their teaching-related activities and research activities. • The Academic Performance Indicator was designed to assess students' learning and evaluate the education performance of HEI and was less explicitly concerned with research.	are awarded and privileged for individual effort. • Points-system does not adequately reward publication of books and conference papers in historical studies research. Given the emphasis on journal publication in assessing impact factors, the specific modes of scholarship in historical studies are not well recognised. This is reinforced by Chattopadhyay (2022) and others.
Minimum Regulations for Assistant Professorship (UGC, 2025)	• Providing a clear framework to attract and recruit Assistant Professors with established research skills and a commitment to undertake independent inquiry.	• Requirement of PhD qualification has contributed to a deterioration in the quality and originality of theses. • Requirement of PhD qualification is attracting scholars who are not intrinsically motivated for research but rather career development.
Other guidelines and processes (UGC, 2025)	• Miscellaneous and varied, including funding rules and processes to support delivery of projects.	• Delays to approve and initiate research projects • Delay with payment of salaries and stipends for doctoral scholars and early career researchers.

Further to the above, Chattopadhyay and Nandi (2022) are also critical of the regulations around Graded Autonomy which pushes some disciplines, namely biomedicine and computer science as well as certain institutions towards excellence and global competitiveness, and others become further restricted in their autonomy. As identified in the current study, there often is "no linear relationship between time spent on research and research output (as required through regulation) in terms of papers produced or books authored" (Chattopadhyay and Nandi, 2022, p.190).

Many participants stated that regulation was of crucial importance to achieving research quality, particularly given the massified system of Indian higher education and the enduring concerns around performance and plagiarism (Chattopadhyay, Varghese and Marginson, 2022). However, the findings illustrate that system-level regulations were neither underpinned by the tacit knowledge and modes of scholarship that were deeply embedded within disciplines, nor were they reflective of differences in discipline-specific ways of working and thinking (Oloyede, 2002). In turn, this had contributed to an enduring sense of mistrust among some researchers in the regulation processes.

This is especially important, as the professional authority of a higher education institution and its success emerges from its disciplines (Oloyede, 2002). Previous works have illustrated that disciplinary practices play an important role in assessment and accreditation and in shaping management and leadership structures and behaviours (Salto, 2022; Godfrey, 2015; Oloyede, 2002). Therefore, these interactions in

relation to regulation emerge as a major point of conflict and differentiation in practices between system and disciplinary cultures.

7.3.3 Capacity and autonomy

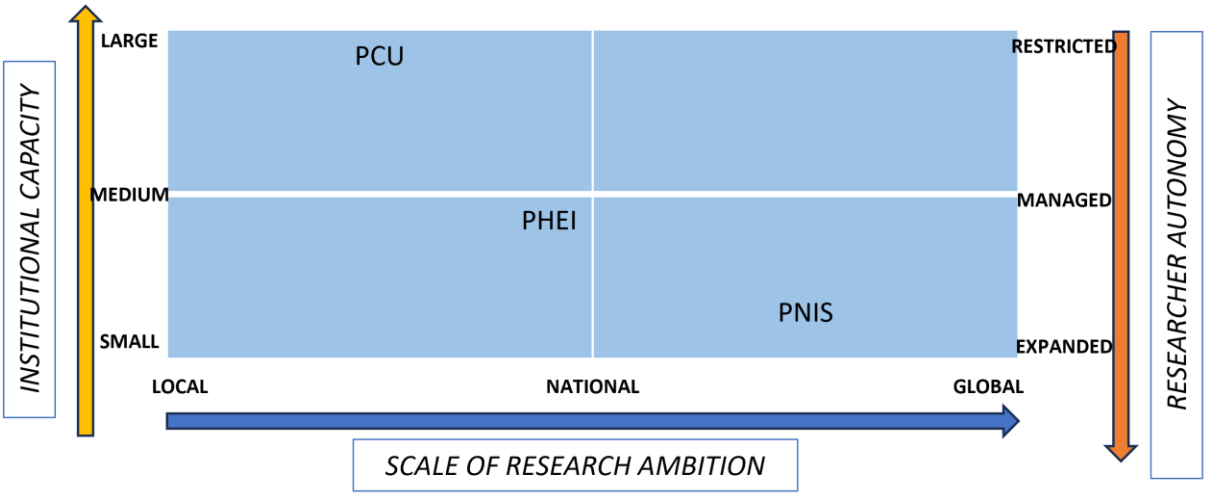
In addition to the critical role of resources and regulation, this study observes linkages between the overall capacity of a discipline or institution (in terms of researcher volume and activity), the scale of research ambition (in terms of a local, national and/or global focus) and normative ideals about researcher autonomy (in relation to the experiences of individual researchers). For instance, PCU researchers frequently highlighted constraints to their autonomy. PCUs are also the largest institutions in terms of student enrolment and are often described as having a weak research culture or lacking one altogether, which is another way of describing limited examples of research activity. For example, one participant stated:

> Research culture is broadly absent in state universities. It is not competent and the overall culture is bad.
>
> Policy and system actor, R3, academic expert

Conversely, PNIS were the smallest institutions with the most concentrated research workforce and greatest intensity of research activity. Further, at these institutions, researchers experienced a high degree of freedom and autonomy to conduct research. As discussed in Chapter Five, these institutions were the most developed in relation to the breadth and depth of their international activity, as measured through joint research projects, publications, mobility of students and staff, and MoUs. However, this is not a totalising explanation, as there are exceptions to these patterns. PHEIs were somewhere in the middle, moderated by discipline.

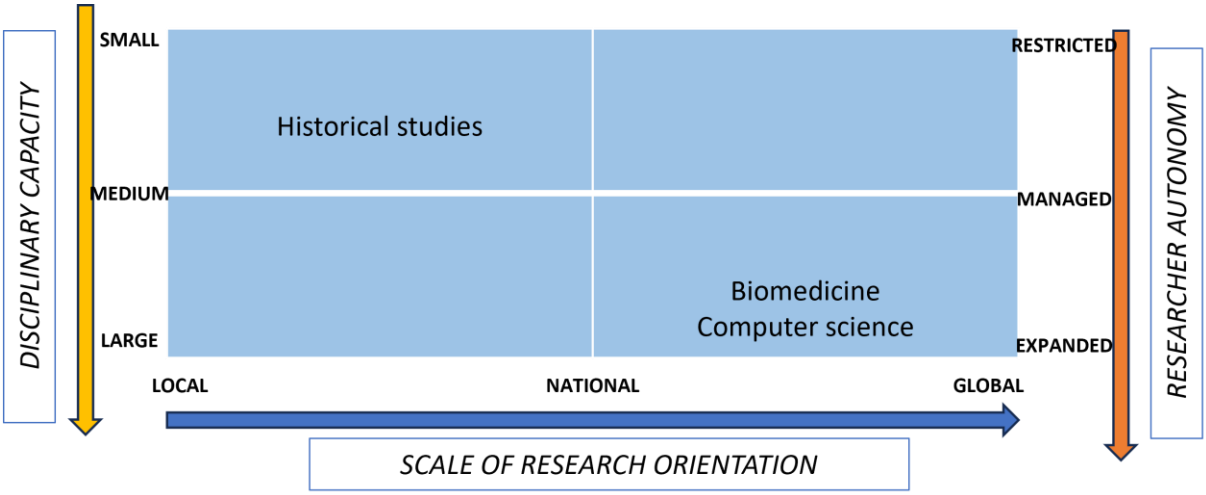
However, the relationships between research capacity within an institution, scale of research ambition and researcher autonomy are not to be reduced as causal, as they do not reflect disciplinary variation, the agency of individual researchers (discussed further in section 7.3.4) and the distinct ways of working within individual institutions. Figure 7.2 provides a simplified illustration to highlight the interactions between capacity of institution, scale of research focus (e.g. global, national, local) and the autonomy of individual researchers, as drawn out from the aggregated perspectives of participants.

Figure 7.2 Interactions between HEI capacity, scale of research ambition and researcher autonomy



This study also observes a relationship between disciplinary capacity (in terms of overall research activity within this discipline), scale of disciplinary research focus and researcher autonomy. As discussed throughout Chapter Four, computer science and biomedicine researchers were larger in volume and experienced a greater sense of freedom to undertake their research activities and collaborate with others. On the other hand, historical studies researchers described a fragmented workforce within their institution and experienced a greater sense of scrutiny within and beyond their discipline. These links are summarised at Figure 7.3 below, but this summary should be interpreted with caution due to the moderating influence of individual researchers and institutional capacity, as well as biases associated with the sample population.

Figure 7.3 Interactions between disciplinary capacity, scale of research ambition and researcher autonomy



Following a glonacal agency heuristic of higher education interacting across multiple scales, these relationships highlight that despite a stated ambition of the national government to contribute to the global knowledge economy through research, the complex configuration of institutional and disciplinary

practices means that there are a "simultaneity of flows and reciprocal effects at work" (Marginson and Rhoades, 2002, p.292). Even within a single institution such as a PCU, the global scale does not contain all other scales, as evidenced by historical studies researchers who prioritised local connections and activities (Marginson, 2022). This is one such example of local resistance to global tendencies (Marginson and Rhoades, 2002).

There are also trade-offs at the aggregated institutional level. For instance, several participants critiqued that the PNIS were among the most globally networked of HEIs in India and, simultaneously, the most disconnected from their immediate localities. Others emphasised there were limited research activities in rural and remote contexts, despite the dispersed nature of affiliated colleges and their heavily populated environments. Through different patterns, the overall capacity of disciplines and HEIs intersects with the glonacal heuristic in framing their dominant orientations, which are captured in Figures 7.2 and 7.3.

These features also build up to the system-level, where there are tensions between the agendas of indigeneity of knowledge traditions and internationalisation. National policies that select a few universities for investment in their capability elevates those institutions' global standing, while further exacerbating inequities across the system (Chattopadhyay, 2022). Employing a glonacal heuristic shows that the interactions between institutional / disciplinary capacity, scale of research ambition and researcher autonomy is dynamic and mutually sustaining.

7.3.4 The agency of researchers

Throughout the study, there were examples of individual researchers who departed from the dominant practices of their HEI and much less frequently, instances where researchers challenged their disciplinary norms. This underscores the crucial role of researchers as autonomous agents who are not strictly bound to the dominant norms and practices of their cultural context, although this too has limits, in that their agency is predicated by the level of control they are able to exert in these different environments (Bauman, 2004; Biesta and Tedder, 2006). Consider these contrasting narratives:

> The gaps are that we would benefit from more interaction with researcher community (beyond their institution), workshops and interacting with experts. But we do all we can… for example I made a profile on Researcher Gate and asked a few questions on the discussion board even if we didn't hear anything back. We don't have leading practice to draw on frequently, but we try…
>
> Computer science early researcher C10, PCU, Tamil Nadu

Researcher C10's narrative was shared in the context of limited collaborations at the level of discipline and across the institution, and as a demonstration of their personal initiative to forge connections.

> But it really becomes up about individual faculty members, they have to come up with the questions and set their research project and do the work. We can motivate but they have to do.
>
> Biomedical researcher and head of department B3, PCU, Tamil Nadu

> Research culture today is established by institutional norms of how you get tenure. You have a structure of 'civil service' where you go up in rank, so it doesn't matter if you don't do research. So then it becomes about intrinsic motivation which is one out of every ten people rather than extrinsic motivation to do better.
>
> Policy and system actor R7, academic expert

Yang et al (2023) study the agentic capacities of researchers in the context of international research collaborations, decoupling the enabling and constraining factors from other factors in exercising agency. The above narratives from the study show a different response by researchers as independent agents in response to wider trends, where they have undertaken actions to pursue their research objectives in ways that were important to them (Yang et al, 2023). Researcher agency is relational and temporal (Emirbayer and Mische, 1998), meaning it can change depending on the situation and the researcher's own capacities. In the current study, this was particularly evident in the mobility of researchers who moved between HEIs and systems and who had different experiences in these contexts due to differences in the levels of resourcing, autonomy and peer support. One the one hand, the motivation and tenacity of some researchers countered institutional cultures that were characterised as bureaucratic and inefficient. Yet on the other hand, not all researchers within a high-performing PNIS were driven by the same goals. Gender, caring responsibilities and the seniority of researchers also shaped their capacities and ambitions.

While the agency of researchers in the study varied across personal factors, working styles and existing collaborative relationships – features that are also highlighted by Yang et al (2023) – the core ways of relating, communicating and knowledge creating between researchers were mostly consistent within disciplines; whereas the actions of individuals and features of research culture within disciplines were more tightly bound. This research suggests that their relationship with HEIs and systems may exhibit more flexible influences.

7.4 Flows and relations

In this section, the themes explore the nature and impact of relationships between disciplines, HEIs and systems. They emphasise change and transformation in relationships and the 'shifting alliances' between research actors (Smerek, 2010, p.385). Conflict, tension and differentiation are a core component of flows and relations, which lead to a range of possibilities in research cultures.

7.4.1 Strength of disciplinary and HEI interactions

Where the contribution of national and regional system research cultures enables research activity through funding and regulates researcher practices, the interaction between the HEI and disciplinary scales is perceived as more crucial in that it principally drives the everyday activities of researchers and continuously reshapes the orientations and practices between the two scales. Across several institutions explored in Chapter Five and the disciplines discussed in Chapter Four, researchers highlighted activities where institutional practices reinforced disciplinary cultures and vice-versa, which are listed below:

- Provision of seed and stipend funding for every new faculty member
- Management decisions about the investment in machinery and infrastructure within disciplines
- Patent offices that support with licensing innovation
- Aligning common expectations and behaviours of researchers through institutional policies
- Recruitment practices for the selection of faculty and research students
- Administering researcher ethics courses and compliance with standards
- Provision of journals, paid databases and plagiarism checkers
- Initiatives to connect researchers across disciplines and networks
- Encouragement and motivation including through rewards and incentives

As compared with regional and national level features, researcher H7 stated that it is the institutional culture that acts as the bricks and mortar upon which research activity takes places:

> It is X (institution)'s job to provide a library for books, a place to sit, and access to internet. They also set the size of our faculty, how many were appointed and so on.
>
> Historical studies researcher H7, PHEI, Tamil Nadu

Another researcher observed that it is not just the 'hardware' of research activity but the intangible values that are instilled within the scholarly community:

> Here we are gaining a reputation and confidence, we are building a culture where academics are not the bookish type, where we are establishing research within our premises.
>
> Computer science researcher C1, PHEI, Tamil Nadu

Gerhart's earlier work (2008, p.254) found that management discretion and the "central role of a unique organisational culture as a key path to competitive advantage" were more significant than differences in national policy and culture. Goldstein (2024) explored the capacity of organisations – particularly the powerful role of internal networks and supervisory authority – in resisting wider national, political change, including in highly hierarchical contexts. Findings from the present study do not minimise the influence of national and regional systems in the undertaking of research activities and researcher behaviours.

However, participant data provided some evidence that within a diverse and massified higher education and research ecosystem, as is the case with India, the relationship between institutional and disciplinary research cultures looms as more central and closely aligned. Even in resource-constrained environments such as the state-based PCUs, participants highlighted the powerful role of departmental leadership, peer networks within their institution and cooperative sharing of resources within the one institution. In the more resource-abundant PHEIs and PNIS, participants discussed incentives for interdisciplinary collaboration and stipends. These narratives build on the previous work of Wyk and Jacobs (2012) who highlight the different capacities of institutional norms and practices to advance research in the face of increasing government pressures. Wyk and Jacobs (2012) contrasted two HEIs' differing policies and strategies, where one was characterised by plurality of knowledges and the other centred around growth and fulfilling market needs, highlighting the multiple expressions of institutional approaches. The strength of the relationship between institutional and disciplinary culture also plays a significant role in enabling and facilitating interdisciplinary collaborations, which is discussed next.

7.4.2 Interdisciplinarity

Despite the significant drivers for interdisciplinarity in this study, as identified by participants across the scales of disciplinary, HEI and system-level cultures, it remains a challenging and hard-fought practice. Within the Indian context, the barriers to interdisciplinarity in research encompass the wider education system. For instance, Dattagupta (2020, p.1332) critiqued the "malaise in the school system", where there is limited opportunity for final year school students to work across subject areas and the apathy of teachers who are "unwilling to leave the comfort zones of our cocooned shell" (p.1332).

As discussed throughout the study, interdisciplinarity required significant time to engage in 'out of the box thinking' and inspiration. In several HEI and disciplinary contexts, there were significant constraints on the time available for researchers to engage in research and scholarship, particularly those in resource-fragile PCUs or where teaching demands were considered more primary in participants' work, as is the case in historical studies. Epistemological influences could lead researchers on divergent pathways, even if they were working on a shared topic, and some researchers mentioned a lack of sufficient networks both within and beyond their institution to forge these collaborations.

Notwithstanding the specificity of these roadblocks to interdisciplinarity in the current Indian context, many of the same issues have been observed in other country-contexts as well.

In cases where interdisciplinary research collaborations were observed in the study, several factors acted to enable these practices. The most frequently cited factor was a large-scale social issue or research agenda that was driven out of industry need, institutional scheme or UGC-funded initiative. Here, researchers were able to become "students of problems…and problems cut across the borders of any subject matter or discipline" (Popper, 1962, 35). Building on the preceding discussion, institutional factors such as the availability of shared equipment and technologies, reward and incentive structures, exposure to new and different bodies of knowledge, and established principles to guide ways of collaborative working could all help to advance interdisciplinarity.

Whereas computer science and biomedical researchers were more likely to engage in projects with peers from outside their disciplines on shared topics and joint-funded research programmes, those in historical studies framed interdisciplinarity in terms of engaging in perspectives and knowledges outside their domain. These dynamics are not new. Bellotti, Kronegger and Guadalupi (2016) evaluated research output over a five-year period to demonstrate the high interdisciplinarity in medicine, biology and chemistry as measured through co-authorship and citation networks compared with the social sciences, underscoring the benefits of common and/or compatible epistemological frameworks to generate effort. Barry, Born and Weskalnys (2008) framed interdisciplinarity as offering new techniques to integrate science into the knowledge economy, where disciplinarity has been associated with a defence of academic autonomy. They speculated whether these leanings could explain some of the variation between disciplinary practices in their openness to interdisciplinarity. Interdisciplinarity has been seen to provide different value to the parties involved and incorporates a wide variety of methodologies and approaches (Zhou, Guns and Engels, 2023). Elsewhere, Green and Hansman (2020) highlighted the discomfort a researcher trained in the positivist paradigm may encounter with those from a constructivist paradigm, reinforcing the role of epistemological influences.

Therefore, interdisciplinarity can be considered less in rigid terms, where it is enacted in a singular way, and more as a spectrum of activities and approaches that are reshaping research cultures at each of the level of disciplines, HEIs and regional and national systems. At the level of disciplinary practices, participants highlighted the significant emphasis on cross-referencing articles and citation analysis as a measure of knowledge flows. Alongside these narratives, participants also discussed the richer base of knowledge that emerged from engaging across disciplinary areas:

> In my field, I am also working in the astrobiology field. And here itself astrobiology is a mixture of different disciplines such as astronomy, planetary sciences, microbiology, geology. And see I can integrate microbiology with geology by looking at geological histories, the history of the soil, how

> it has evolved and how it has deformed. So that gives me an idea then of how microorganisms have also evolved.
>
> Biomedical researcher B4, PHEI, Maharashtra

Taken together, participant narratives from this study highlighted the gulf between aspiration and reality in relation to interdisciplinarity and the contribution of various funding, regulatory, institutional and epistemological processes that are required to drive change in practice.

7.4.3 Class, caste, and talent flows

The characteristics of the researcher population within the HEIs explored in this study reflected wider Indian socio-economic trends, except for gender (where there is insufficient data to make meaningful findings). Some of the key features of these scholarly communities are illustrated below:

> There is an element of ghettoisation which has killed excellence. And the roots of it are in the preferential treatment of the Marathi people. Maharashtra has a violent history with the influence of Shiv Sena and its strong right-wing identity, which starts with whether you're Marathi or not. You would only see people at Bombay (University of Mumbai) if you're Marathi. Why does a state public university have one community of intellectuals? And an attitude of if you speak Marathi, you are welcome here. But if someone from UP (Uttar Pradesh) or Bihar comes, you are seen to be snatching jobs.
>
> Research policy and system actor R1, Maharashtra

> First of all, if you are doing research, you need financial support…and so the best minds in India go to central institutions. And those with money come here.
>
> Historical studies researcher H7, PHEI, Maharashtra

> We are very lucky because we are one of the very well-regarded institutes… we have a competitive undergraduate exam. It is a blessing because you get excellent students and excellent faculty without trying very hard. So, it's kind of like Oxford I guess but in India.
>
> Biomedical researcher B8, PNIS, Maharashtra

Previous scholarship has largely concentrated on the role of socio-economic factors, including class, in relation to enrolment in higher education (Goswami, 2022; Cassan, 2019). Class inequalities, which are reproduced through socialisation processes within family structures and disparities in household expenditures, have been attributed to the lower rates of enrolment among disadvantaged groups such as farmers, manual labourers and poor agriculturalist classes (Goswami, 2022). On the other hand, Srinivasan (2022, p.157) critiques the IIT model as "favour(ing) the wealthy more than the needy", in that

it largely supports a private good, enabling high-income employment and privileges for the upper classes. All the while, the "lower sections of the middle class unhappily continue to suffer" (Srinivasan, 2022, p.159). Others have focused on understanding experiences of discrimination faced by students within institutions; this is an area of renewed interest following the high-profile death of doctoral student, Rohith Vermula, who championed Dalit rights in Indian higher education (Hegde, 2016).

While the present study did not conduct a systematic analysis of the socio-economic contexts of participants, their narratives reinforced many of these insights and extended their impact to the researcher workforce, including career trajectories. The elite PNIS were able to attract research students and faculty from across India, many of whom were affluent, mobile and able to work in these institutions with ease. As observed by Priyam (2022, p.159), the "Brahmins (specifically of South India) as an English-speaking upper-caste category have reaped enormous benefits through their success in the IIT system". Researchers that were employed in these institutions and at PHEIs were very well-remunerated.

However, the researchers that were employed at PCUs were often from within immediate localities and as discussed above by Researcher H1, mirrored the wider culture milieu. Arguably the starkest example of the connections between the socio-economic context and the characteristic of researcher communities within HEIs concerned the global orientation. Almost all participants interviewed within the PNIS had completed their doctoral studies or a substantial portion of their careers in another country. The expectation to have international experience, predominantly in Western country contexts, was deeply imbued (as discussed in section 7.2.4). On the other hand, ideas around patriotism and a service-orientation to local communities were a feature of PCUs. Therefore, while there was significant diversity between institutions, there was much less within institutions in terms of the backgrounds and characteristics of researchers. There were some exceptions to this finding, which were moderated by discipline and individual circumstances. For instance, through scholarships and targeted schemes, the PNIS attracted research students from scheduled caste backgrounds and those in positions of leadership at PCUs had completed postdoctoral training outside of India. But these examples were few and far between. In general, these were consistent patterns that emerged at the intersection of HEIs and the wider regional and national systems within which they were situated.

7.5 Implications of interactions

This final section integrates the key concepts discussed throughout the Chapter and reconceptualises research culture in Indian higher education as multiple and plural.

7.5.1 An integrated perspective of research cultures

The findings of this study reinforce that research cultures across disciplines, HEIs and systems are held together by a series of aspirations, as captured here by values and perspectives. They reflect both what is currently experienced and moreover, emphasise what is possible. For instance, the virtuous cycle of excellence was deeply internalised by PNIS researchers because in part, excellence is a normative ideal expressed at the level of the system through policy and stated ambition. In this way, excellence was cascaded through disciplines, HEIs and systems. On the other hand, the indigenous and the global perspective reflects the everyday realities of many historical studies researchers and the dilemmas that they experienced in reconciling different, competing agendas. This idea emerged from the tensions across disciplines and system-level lenses of research culture. Taken together, the cycle of excellence, advancing technocapitalism, valuing the humanities, and the indigenous and the global, each served as agendas which mobilise the researcher participants in the study. It is also possible for researchers to be animated by more than one of these central ideas (for instance, advancing technocapitalism and the cycle of excellence were both central to the narratives of many computer science researchers across both PNIS and PHEIs). In turn, researchers were simultaneously inhabiting several cultural realities across the disciplinary, institutional and regional and national system scales, and where they experienced varying degrees of freedom and belonging (Holliday, 2010).

Meanwhile, the contribution of practices and artefacts to the understanding of research culture is two-fold; individual researcher action can either reinforce or disrupt dominant patterns and flows, and examining disciplinary practices can broaden and diversify the horizons of research culture. On the first, researchers' capacities to influence behaviours and practices is demonstrably visible within their immediate disciplinary networks but is more contained within and beyond their institutions through policy, formal structures and regulation. Nevertheless, researchers are active participants in the making and creating of research culture; researchers can autonomously work towards the values and perspectives of their discipline, HEI or system or can depart from these ideals. On the second key idea, disciplinary practices play a central role, where researchers' motivations, skills, networks and capacities are nurtured or constrained in more immediate and enduring ways. Taking an institutional view alone can mask important nuances in differences and variation. However, as shown through the discussion of UGC regulation and its diverse impacts on disciplinary ways of working as well as researcher autonomy, subcultures can emerge, evolve or expire over time.

Finally, flows and relations study the “complex, overlapping, fractal shapes” including “images of uncertainty and chaos” as well as “order, stability and systemacity” (Appadurai, 1990, p.20) that are formed through interactions between research actors across the scales of research culture. The findings highlight and make clear the strength and mutually reinforcing nature of disciplinary and HEI interactions, and the contribution of system-level dynamics to HEI and disciplinary practices, which are more unpredictable and further removed. Further, the interactions between system-level dynamics and disciplinary practices are also encased within the complexity of India’s wider social and economic context including caste and economic status. The study reinforces the deeply disjunctive dynamics between ethnoscapes, technoscapes and finanscapes which are profoundly unpredictable due to their “own parameters and constraints” (p.298, Appadurai, 1990). Similarly, interdisciplinarity reshapes both the practices and boundaries of scholarly communities as well rewiring institutional norms, traditions and siloes. These dynamics contribute to ever changing, ever evolving relations for researchers and the realities they inhabit.

In turn, an integrated perspective as developed through these findings makes clear that the what and how of framing research culture is not a singular proposition (Callard, 2024). Ultimately, it is “fragmented, not unified; multiple, not singular, expansive, not bounded” (Kumaravadivelu, 2007, p.1443). It is always becoming (Saha, 2022). Weaving together the material and interpretive properties of research culture, with the heterogeneity of knowledge practices and the social, economic and environmental conditions of India, crucially requires research culture to be understood as a series of multiple imaginaries or, at its simplest, as a “singular, unifying plane that is linked to constitutive multiplicities” consistent with the imagination of the nation (Buchanan, Varghese and Manoj, 2022, p.223). The national scale is dominant as the primary domain of political life, but this is mediated by disciplinary, institutional and regional variation. Consequently, some imaginaries may emphasise certain features and interactions over others, but each is forged through the interaction of disciplines, HEIs and regional and national systems. In this way, these realities are hybridised along polarities of tradition and modernity, and community and state, and not entirely true to any one position (Nilekani, 2008).

Within this plural imaginary of research culture, there is a risk that that certain narratives of science and knowledges are privileged or that certain imaginaries are excluded (Nandy, 1989, 1991). These risks further underscore the importance of democratising research culture through a variety of disciplinary, institutional, linguistic and regional lenses. Equally, there is a concern that there is no limit to the container of material, interpretive and relational properties that give effect to research culture; this can be addressed through paying careful attention to identifying the key features at the level of disciplinary, HEI and regional and national systems. The interactions between these scales, including their fragmentations and contradictions, reveal the many imaginaries of research culture that are possible which hold empirical and practical value. These will be discussed in the final chapter.

7.6 Summary

Through the discussion of interactions and interrelationships between the disciplinary, HEI and regional and national system lenses of research culture, the idea of Indian research culture as plural and multiple is further solidified. In doing, the study's imaginary of research cultures partially echoes Nandy's (1989, 2016) conception of India as formed through concentric rings of communities:

> A person, individually, belongs to not one community, but to a series of communities which are concentrically organised, from the country to the region, to the language group, to sects, religious groups and then caste groups. It is a very complex system. A person has multiple identities, multiple allegiances. A normal Indian lives with a splintered self, and is quite comfortable with it, because it is a diversity they're really used to, it has been there for centuries.
>
> Nandy, as cited in Vajpeyi (2016)

Here, research cultures conceived of as intersecting and, partially concentric, rings that researchers live within. They can inhabit more than one ring and embrace the diversity and tension that this brings with it. This chapter draws together the major ideas in relation to values and perspectives, practices and artefacts, and flows and relations across the rings of communities (disciplines, HEIs and regional and national systems) that are most pertinent to the current study, in other words, the lenses of research culture. As discussed in this chapter, the interactions between these rings also lead to differentiation, conflict and ambiguity.

From this study, the crucial argument is to conceive Indian research culture as multiple and plural, enabling a more expansive set of possibilities. This reconceptualisation of research culture represents a major finding of the study. The final chapter extends on these findings through developing imaginaries of research culture, drawing out further empirical and practical implications and appraising the new knowledge in relation to the key research questions.

8 CONCLUSION

8.1 Introduction

This chapter draws the research findings together insofar as they address the key two research questions. Building on these conclusions, it extends the conceptualisation of research cultures as plural through developing a series of research culture imaginaries. It presents a reflection on the methodological and theoretical approaches adopted in this study and the limitations inherent in the study. Finally, this chapter considers the overarching implications of the study findings and proposes recommendations for policy makers and practitioners.

8.2 Response to research questions

The study conceives of research culture in multiple ways, including as a construction of features forged across disciplinary, HEI and system lenses (research question one) and, in turn, as a plurality of cultures that emerge from the interaction of these various features (research question two).

8.2.1 Key features of research culture

Research question one: **What are the key features of research culture at the level of disciplines, institutions and regional and national systems in Indian higher education (HE)?**

Drawing on literature and participant findings, the overarching features of research culture emerged as a set of: values and perspectives; practices and artefacts; and, flows and relations. They manifest in disciplines, HEIs and within regional and national system lenses and are summarised below in Table 8.1.

Table 8.1 Summary of research culture features, across disciplines, HEIs and systems in Indian HE

	Values and perspectives	***Practices and artefacts***	***Flows and relations***
High-level description	The motivators for research include underlying values, beliefs and contextual drivers. This also refers to the alignment and enactment of vision among a group of researchers.	The doing of culture, through the repeated, enduring tasks associated with research and the meaning derived from these activities. These include elements that are both observable and material as well as those which are interpretive.	Flows and relations illuminate the relationships with others including between researchers, with industry and wider society.
Discipline	Disciplines are motivated by different priorities, be it to address a social purpose, to bring about practical change and improvement, and/or advance understanding about India. They may respond to a specific	Each discipline has its own way of working, where researchers work individually and/or in teams. They may engage in experimentation, use software or work in laboratories. Others work by immersing themselves in the discovery and synthesis of material and by focusing on	Disciplines are oriented towards local, national and/or global agendas and organised in specific ways through associations and networks. They collaborate within and beyond their discipline

	industry need or challenge.	offering a distinctive and original explanation.	through sharing resources, ideas and approaches. Interdisciplinarity emerges through purposive joint working and in addressing a specific need.
HEIs	HEIs express ambitions in terms of contributing to local, regional or national economic development, and through emphasising specific disciplinary capabilities. HEIs enact their ambitions in a variety of ways from distributed through to embedded.	HEIs vary greatly in their provision of resources and infrastructure. Each institution has distinct: mechanisms for talent development; performance measures; norms around quality, impact and innovation; and, leadership and governance arrangements. HEIs can be systematic in their practices and behaviours and/or ad hoc in approach.	HEIs collaborate locally, nationally and globally, with varying degrees of engagement with industry. HEI vary in their levels of autonomy and reputation within and beyond institution.
Regional and national system	Regional systems express commitment to research in way that is either comprehensive or fragmented.	Regional and national systems differ primarily in resourcing capacity. National system is more determinative through regulation, policy and administrative capacity	Regional systems emphasise flows between regions, whereas national considers flows across country borders.

These features contribute to a complex and integrated perspective of research culture in Indian HE. The descriptions of research culture developed here go beyond weak, strong and ineffective to a more comprehensive set of ideas that reflects the realities of researchers (Holligan, 2011). Below, I expand on the features of research culture across the scales of disciplines, HEIs and systems and the implications of these. I also highlight where there is harmonisation of features as well as where there is fragmentation and disjuncture (Martin, 2002)

Values and perspectives

Values and perspectives focus on the ideas, motivators and perspectives that animate researchers to undertake scholarly activity within disciplines, HEIs and systems. They underpin shared practices and norms and the extent to which researchers within disciplines, HEIs and systems are bound by these values and perspectives. The detailed features are captured in Table 8.2 and are applied, in turn, to disciplines, HEIs and regional and national systems.

Table 8.2 Features of values and perspectives within disciplines, HEIs and regional and national systems

Scale	Concept and brief definition
Disciplines	• **Motivation** – the reasons to undertake research within discipline (including underlying values, life experiences) • **Purpose and audience** – the desired outcomes and impacted parties of research • **Triggers** – the way specific research activity is initiated • **Network** – the community and organisation of scholars within discipline • **Status** – the esteem afforded to discipline within and beyond discipline
HEI	• **Values** – the core attitudes and beliefs towards research within an institution • **Scale and alignment** – the ambition and agreement in vision towards research across HEI • **Areas of focus** – the defined and specific goals of research within HEI • **Leadership orientation** – the style and commitment of leaders and the climate they create • **Leadership and governance framework** – the overarching structure and processes for research • **Status** – the esteem afforded to research within institution and how it is signified
System	• **Context and alignment** – the scale, underpinning values and agreement in vision towards research • **Identity** – the wider social relations that system is nested within and relevant socioeconomic factors

Disciplinary values framed the primary motivation for researchers within these disciplines and, in turn, the overall direction of their scholarly activities. Values reflected in HEIs influenced the commitment of individuals to research activity and the level at which these commitments were to be realised. Regional and national systems contributed in different ways to shaping the values and perspectives of research culture across institutions and disciplines. Where regional systems portrayed a disparate and loose commitment to the values of research, the national system reflected a stronger, more ambitious and more comprehensive set of values about research.

Practices and artefacts

Practices and artefacts are both implicit and explicit features of research culture and act as important distinguishing factors between research cultures. The patterns of behaviour, rules and rituals shape the lives of researchers in material ways. The relevant features are captured in Table 8.3 and are applied, in turn, to disciplines, HEIs and regional and national systems.

Table 8.3 Features of practices and artefacts within disciplines, HEIs and regional and national systems

Scale	Concept and brief definition
Discipline	• **Scholarly practices** – the routine norms and traditions of researchers • **Knowledge creation** – the relationship and interaction with bodies of knowledge • **Capability** – the ways researchers are nurtured and developed within scholarly practices • **Resources** – the availability, utilisation and coordination of resources • **Measures of success** – the ways researchers are recognised and rewarded for their effort
HEI	• **Recruitment** – the selection and onboarding practices within HEI • **Training and development** – the ways researchers are nurtured and supported within HEI • **Resources** – the scale and utilisation of institutional resources towards research • **Incentives** – the formal and informal mechanisms that encourage research activity • **Output** – the desired products of research activity • **Measures of success** – the mechanisms to recognise and reward researcher performance
System	• **Implementation** – the enactment of system-level vision and ambition towards research • **Financial resources** – the scale and application of financial resources towards research • **Non-financial supports** – the role and effectiveness of non-financial activities for research • **Measures of success** – incentives and mechanism to recognise and reward researchers

Disciplinary practices were highly enduring across HEI and system contexts. Practices were specific to disciplines and differed between disciplines. Researchers operated outside of institutional boundaries to communicate with peers within and beyond their disciplines and with actors in the research ecosystem such as industry and other funders. These dynamics emphasise disciplinary cultures that were only partially nested within institutional and system cultures. A related phenomenon was that of researchers working across disciplines, through interdisciplinary collaborations, while retaining their distinct traditions and norms. HEI practices and artefacts substantively mediated research cultures. They established the stated and unstated rules of operation in research, influenced the mix and volume of talent and set out guardrails for researchers in terms of workload and performance. Within this, the role of financial resources and the talent pipeline of researchers played a determinative role in giving effect to the differences in research culture between HEI types. System practices comprised the direction-setting, funding and implementation of research initiatives across a region or all of India. Practices across Maharashtra and Tamil Nadu regions were fragmented. In contrast, the practices at the national system were characterised by a complex regulatory apparatus and where resources played an influential role.

Flows and relations

The final set of features in this study, flows and relations, described the changing dynamics that researchers have with their peers, internal and external actors, and themselves. They were concerned with any conflicts, tensions and disjuncture that emerge between researchers as they undertook research activities. The specific concepts studied within this feature are captured in Table 8.4.

Table 8.4 Features of flows and relations within disciplines, HEIs and regional and national systems

Scale	Concept and brief definition
Discipline	• **Discipline-specific collaboration** – the nature and emphasis of collaboration within discipline • **Interdisciplinary collaboration** – The aims and purpose of collaboration across disciplines
HEI	• **Orientation** – the focus and direction of relationship and collaborative activity within HEI • **Autonomy** – the degree of independence and freedom enjoyed by unit within HEIs and from HEI leadership
System	• **Modes of collaboration** – the nature and forms of collaboration facilitated at a system-level • **Autonomy** – the experiences and degree of independence and autonomy between HEI and system • **Social relations** – the interaction and influence of wider social issues (including factors such as colonialism and language, as relevant for this study)

Disciplinary flows and relations dictated the nature of collaboration for researchers and the horizons at which this took place, be that local, national or global. HEI flows and relations influenced the esteem of an institution within higher education and beyond. System flows and relations were nested within the wider social relations of the country and, therefore, mirrored these dynamics in how relationships between researchers were forged and evolved. Language played a significant role in these flows and in relations between the regions; researchers-based in Maharashtra highlighted how Marathi was used to reinforce an insider-outsider status, whereas those in Tamil Nadu emphasised the importance of linguistic pluralism. This study also charts the relationship between research and the wider education system in relation to the stratification of students and how this influences their research aspirations, as well as the role of socioeconomic factors such as class and caste.

8.2.2 Interactions and implications of research culture

Research question two: **What are the interactions between disciplinary research cultures, HEI research cultures, and the culture of the wider research system in Indian HE, including implications of these interactions?**

This study makes clear that research culture in Indian HE is multiple and plural. Research culture comprises: values and perspectives; practices and artefacts; and, flows and relations. This occurs across

the lenses of disciplines, HEIs, and regional and national system. Importantly, research culture is concerned with what happens in the spaces between these scales and in the interactions between disciplines, HEI and systems, and through fragmentation and disjuncture.

The interaction of ideas pertaining to values and perspectives identified the esteem afforded to specific knowledge traditions over others and, consequently, the disparities that have emerged (or, in some cases, been exacerbated by) in the ways of working between disciplines. In working towards a "Atmanirbhar Bharat" (self-reliant India) vision, the work of computer science researchers and, to a lesser extent, biomedical researchers has been elevated, particularly those whose work and innovation may bring about economic benefit. As with disciplinary traditions, the study also highlights instances where certain institutions have received significant support and privilege over others that are less nourished. This sense of privilege is established through formal policy and incentive structures as well as the informal role of scientific elites, who act as brokers between government, industry and researchers.

The study crucially highlights that multiple visions of research excellence are possible, yet researchers are incentivised to work towards only a few of these through HEI and system practices. In sum, the interaction between the disciplinary, HEI and system-level lenses reframe research culture as a series of plural imaginaries, where researchers are simultaneously inhabiting several cultural realities that co-exist in harmony, or in conflict, and that evolve over time.

8.3 Emerging contributions

8.3.1 Hybridised conception of research culture

Contemporary research on research culture in higher education centres the unit of analysis on the institutional dimensions of culture (Salazar-Clema and Almonte-Acosta, 2007; Holligan, 2011; Mendez and Cruz, 2014; Tierney, 1988). Organisational studies and cultural psychology have been influential in these conceptualisations and there remains a significant affinity to Tierney's (1988) elements of institutional culture. This is despite developments that have provided new understanding of the layered nature of academic identities (Välimaa, 1998), the role of individual agency (Yokoyama, 2014) and complexity in cultures (Martin, 2002).

The conceptualisation of research culture in grey literature has often been framed at the system-level as the area that determines or can resolve a range of effects and outcomes (The Royal Society, 2018; Wellcome, 2020). However, the present study has focused on disciplinary practices, drawing on sociological and educational studies scholarship to widen the frame, and, in so doing, has integrated the disciplinary, HEI and system dimensions into a hybridised understanding of research culture (Becher, 1994; Rescher, 2003). It asserts that each of these dimensions combined is crucial to the undertaking of research and knowledge generation and, in turn, the conceptualisation of research culture. Such an approach can be used to study research culture within other jurisdictions where there is the presence of substantial research activity across disciplines and institutions within a higher education system.

The explanatory strength of this integrated understanding of research culture also comes from it being nested within and bound to India's wider social relations. At the system-level, the study considers the role of India's colonial history. It recognises that research culture in the Indian context means "trafficking between the alien and the indigenous, forcing negotiations between modernity and tradition, and rearranging power relations between the coloniser and colonised" across disciplinary, HEI and system-level values, practices and flows (Nilekani, 2008, p.8). For example, within the HEI scale of research culture this means paying closer attention to the hegemony of the scientific elite and how their proximity to the corridors of politics and power has helped them to both secure resources and bolster the capacity of PNIS researchers (Krishna, 2024). Considerations of colonial dominance also loom large in the study of disciplinary cultures, where the "implacable opposition between Western science and native unreason" plays out in the trajectory of different disciplinary cultures (Seth, 2009, p.32). The neglect of HASS disciplines, especially within the large, comprehensive public universities, is a notable example, as is the emphasis on English language in the elite PNISs and PHEIs, which have been forged in an Anglophone, Western image.

The study asserts that research culture in higher education is a hybridisation of the disciplinary, HEI and system scales where "the choices presented as one or the other are false choices, for there are no pure

positions" (Inden, 2000, p. 81). The hybridised conception of research culture goes beyond comparative labels of culture as weak, strong, less or more, which have been typically used in institutional contexts and empirical literature. It instead reflects the full diversity of practices, beliefs and relationships within research cultures (Rossouw, 2020, Sporn, 1996). The analytical framework is dynamic and enables comparison. Ideas around performance and quality can flow from a more considered conceptualisation of research cultures. Crucially, as used in this study, this conception pays attention to the Indian dimension, be that sociopolitical or historical, and elevates the aspiration and agency of individual researchers.

8.3.2 Plurality of research culture imaginaries in Indian HE

Where the above section emphasises the formation of research culture in Indian higher education as a hybridisation of features across disciplinary, institutional and system lenses, here, various research culture imaginaries come to life through the interaction between these lenses. Previous works have appraised India's research culture in generalised, national-system terms. This study interrogates the interaction between the scales of research culture. It considers factors such as the flow of resources and regulation, among others, on specific disciplinary and HEI practices. It examines the agency of individual researchers to counter and disrupt dominant system-level patterns. Several themes highlighted through the study create different imaginaries for researchers, based on their discipline, institution or system context; these include the scarcity of resources, the pressure to publish and tension between fulfilling global and local agendas (Chakraborty, 2017; David and Motala, 2017).

The move towards research culture as multiple and plural promotes a more dynamic understanding of research culture – one that allows researchers to work towards parallel visions of success, institutions to nurture different types of research capability and systems to harness the diversity of research practices found within India. For instance, the role of regional languages has played out in significant ways in the narratives of historical studies researchers but was relatively inconsequential to the experiences of computer science researchers. Relatedly, the extent to which the command of plural languages (English included among this) has stratified the flows of researcher talent between the HEI types has been highlighted in the study. The fact that regional languages are important to understanding India's research culture is not new, but understanding the specific ways they interact with disciplines, institutes and systems provides novel insight (Urvashi, 2020).

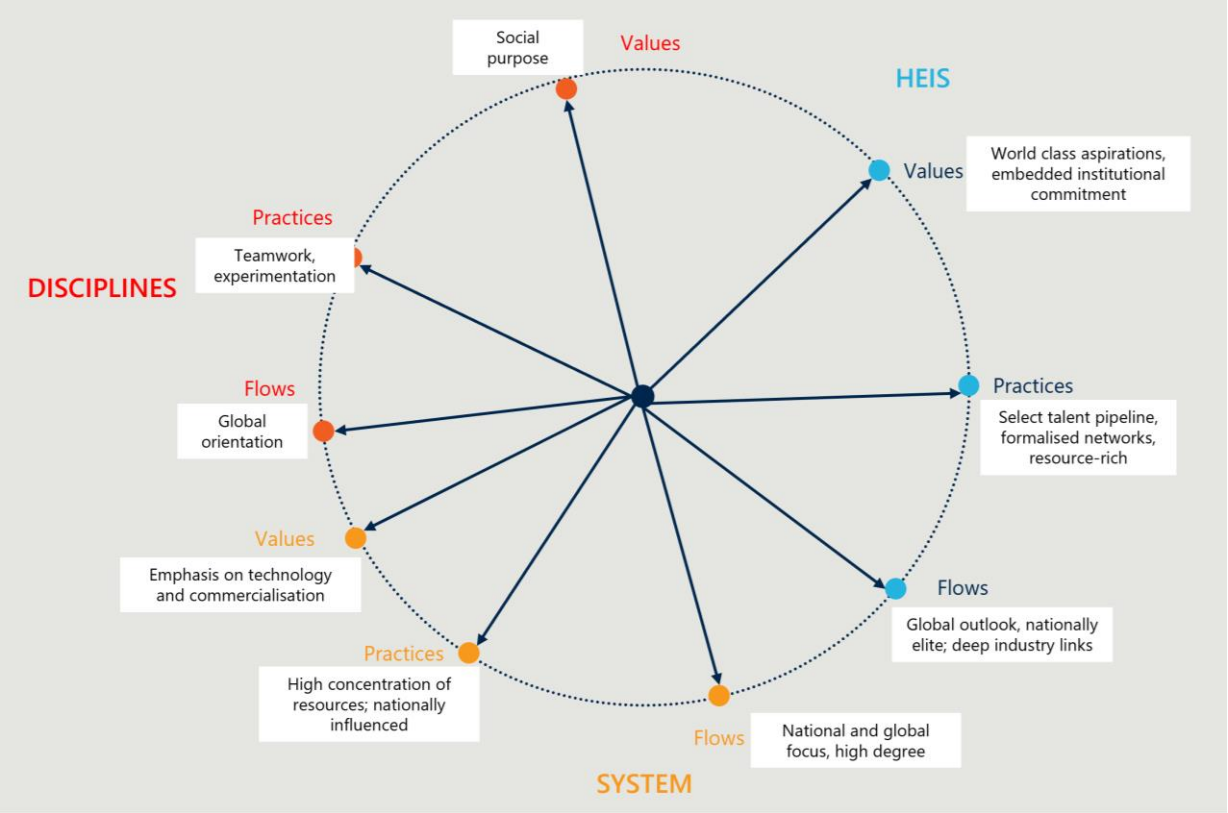
Drawing on these key ideas that have emerged through interrelationships between the lenses of research culture, this chapter envisions four such research culture imaginaries, including: (1) Technology Titans, (2) Conflicted Comprehensives, (3) Indigenising India, and (4) Entrepreneurial Elites, to highlight their material and interpretive value, while noting that more imaginaries are possible. These imaginaries of

research culture reflect the multiple forms that it can take. They are nested within India's wider social and economic context and highlight the central role of disciplinary research cultures.

Technology Titans

The Technology Titans imaginary is forged out of the cultural realities of predominantly computer science researchers working within PNIS as well as the resource-abundant PHEIs considered in this study. This conceptualisation holds resonance for both the Maharashtra and Tamil Nadu regions, as well as nationally, given the emphasis on technocapitalism as discussed in Chapter Seven. At a system level, this imaginary is an exemplar of the science as market good notion, where research is expected to deliver commercial benefit (Krishna, 2024). Figure 8.1 maps this imaginary in relation to the features of research culture (drawing on Tables 8.2 – 8.4).

Figure 8.1 Technology Titans, mapped against features of research culture



The disciplinary dimension is a key driver of this imaginary. Within both computer science and biomedicine disciplines, researchers are typically working in teams. The teams within the Technology Titans imaginary are highly productive. There is purposive collaboration through sharing ideas, methods and approaches to solve empirical challenges, as well as collaboration through shared use of infrastructure. Both disciplinary practices align closely with the expected HEI outputs of publishing and patenting products. The reward structures strongly tie in with the expected outputs at HEI level. Another key feature of disciplinary practices that contributes to the highly productive and collaborative

orientation is the ongoing development of individuals and 'learning by doing' ethos that is embedded within these disciplines.

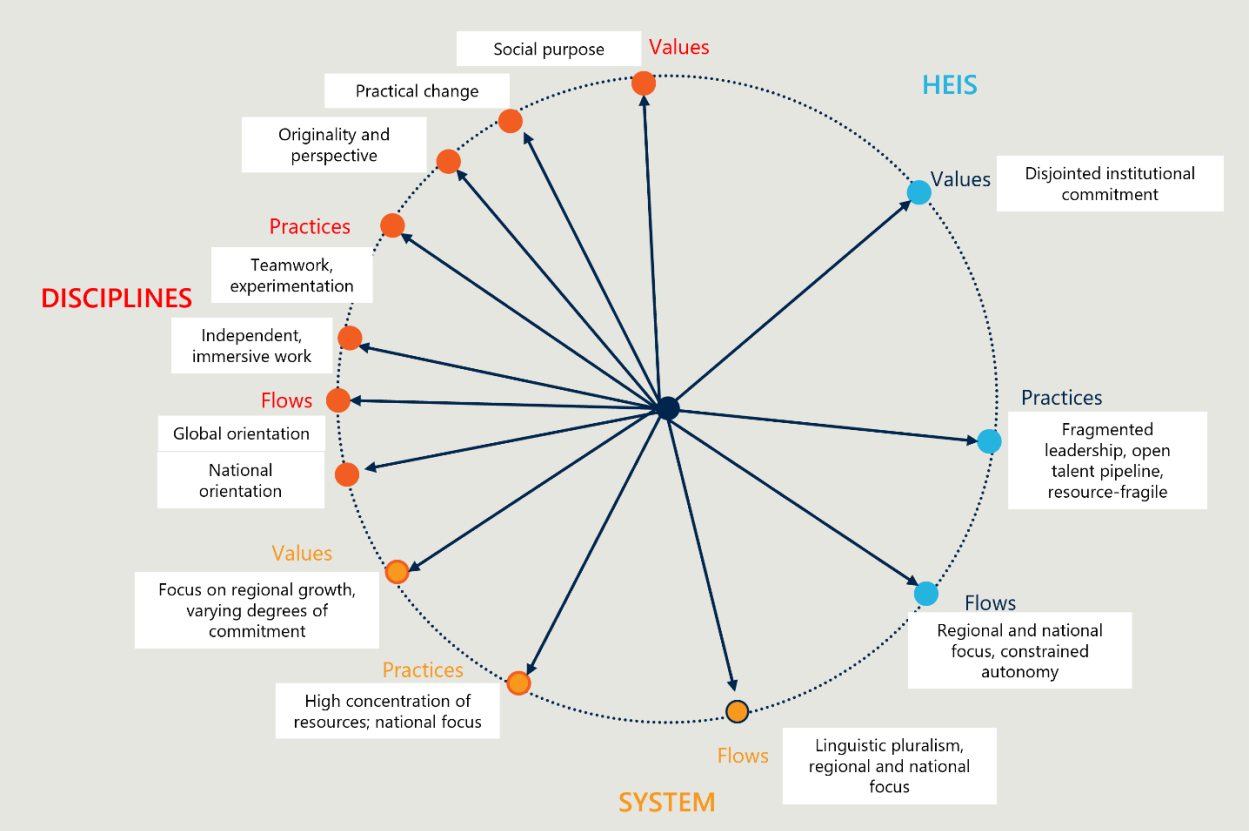
The flows of resources and talent are a centrally binding property which gives effect to this imaginary; there is an alignment between the high concentration of resources, the skilled research workforce (often those from economically advantaged backgrounds and with English-proficiency), industry linkages and a disciplinary orientation that works to global norms and metrics of success. Through government policy as well as industry support, this imaginary is seen as crucial to the ongoing economic and social development of India.

As discussed in this study and more widely, the critique of this imaginary as one that is disconnected from local agendas and communities. However, this is somewhat countered by the ambition of the discipline to develop low-cost, indigenous technologies and solutions that can propel India's growth and development. The disciplinary cultures within this imaginary lend themselves to a focus on interdisciplinarity, which is required to solve shared social challenges through development of products and services. While there are differences in autonomy moderated by institutional cultures, this imaginary is one that is centred around a high degree of autonomy, given the freedom with which researchers forge collaborations with industry and in international contexts. This imaginary has resonance for many, given the prominent role technology-led researchers and institutions have played in India's wider social life.

Conflicted Comprehensives

The Conflicted Comprehensives imaginary reflects a research culture of straddling multiple purposes and ways of working. It is most familiar to researchers working in any one of computer science, biomedicine and historical studies in a PCU that is based either in Tamil Nadu or Maharashtra. Given constraints such as resources and teaching demands, this imaginary is characterised by a fragmented approach to research practices. Figure 8.2 conceptualises this imaginary in relation to the features of research culture.

Figure 8.2 Conflicted Comprehensives, mapped against features of research culture



This imagery is one that is steeped in history and legacy. They occupy a place of significance to their localities, driven at a disciplinary level through the relationships that are forged by researchers to local communities (this is especially relevant to historical studies researchers), through the embrace of regional languages and through the significant volume of student and staff employed within PCUs, even if they are not undertaking research activity.

As discussed by participants, this imaginary confronts themes of inequities and tension. The conflicts in this imaginary are most pronounced in the intermeshing of the various disciplinary cultures within the PCU. Historical studies researchers are disparately networked, whereas there is a concentration of biomedicine and computer science researchers at both PCUs. Some disciplines are well resourced and encouraged to undertake research activities, such as computer science; others such as historical studies are more concerned with teaching responsibilities. There is a range of disciplinary orientations at play from the local to the global and there are tensions within these. For instance, historical studies researchers produce works catered to local communities and institutions, but these are not rewarded by institutional systems that emphasise journal publications.

Given resource constraints, this imaginary invokes researchers working in parallel, heterogeneous ways and with autonomy being more tightly regulated and constrained. The complex interplay of disciplinary, HEI and system practices within this imaginary wrestle with the global and indigenous tensions. It is possible for some researchers, such as computer science researchers at PCUs, to inhabit both the

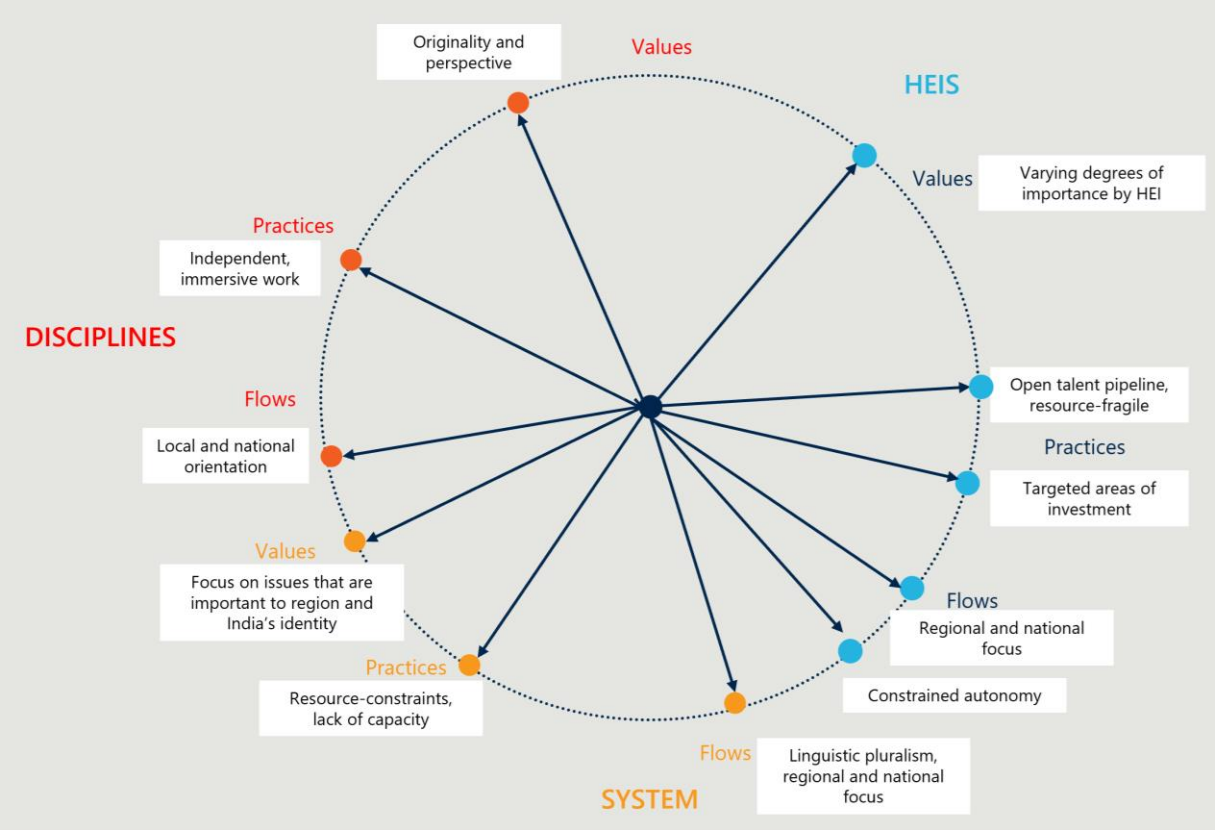
Conflicted Comprehensiveness and a place in the Technology Titans imaginary. These dynamics are moderated by their disciplinary cultures. Indeed, tensions may arise between these imaginaries of culture. The imagery of Conflicted Comprehensive invokes the ideas of individual agents behaving in unpredictable ways, in response to or as a way of dealing with the conflicted realities of this imaginary. Where the Technology Titans imaginary emphasises the disciplinary dimension, the institutional lens is key here.

Indigenising India

The Indigenising India imaginary is inclusive of all those working in HEIs and in disciplinary contexts where there is a shared purpose in addressing India-specific research problems and where the orientation is locally and nationally, rather than globally, focused. While it is tempting to limit this imaginary to the cultural realities of historical studies researchers alone – given their disciplinary orientation to uncovering and advancing knowledge about India's social life – the scope of this scenario encompasses computer science, biomedicine and other disciplines in the context of their interdisciplinarity.

This imaginary transcends institution-type and discipline, though in the present study is most relevant for historical studies researchers. Figure 8.3 conceptualises this imaginary in relation to the features of research culture.

Figure 8.3 Indigenising India, mapped against features of research culture



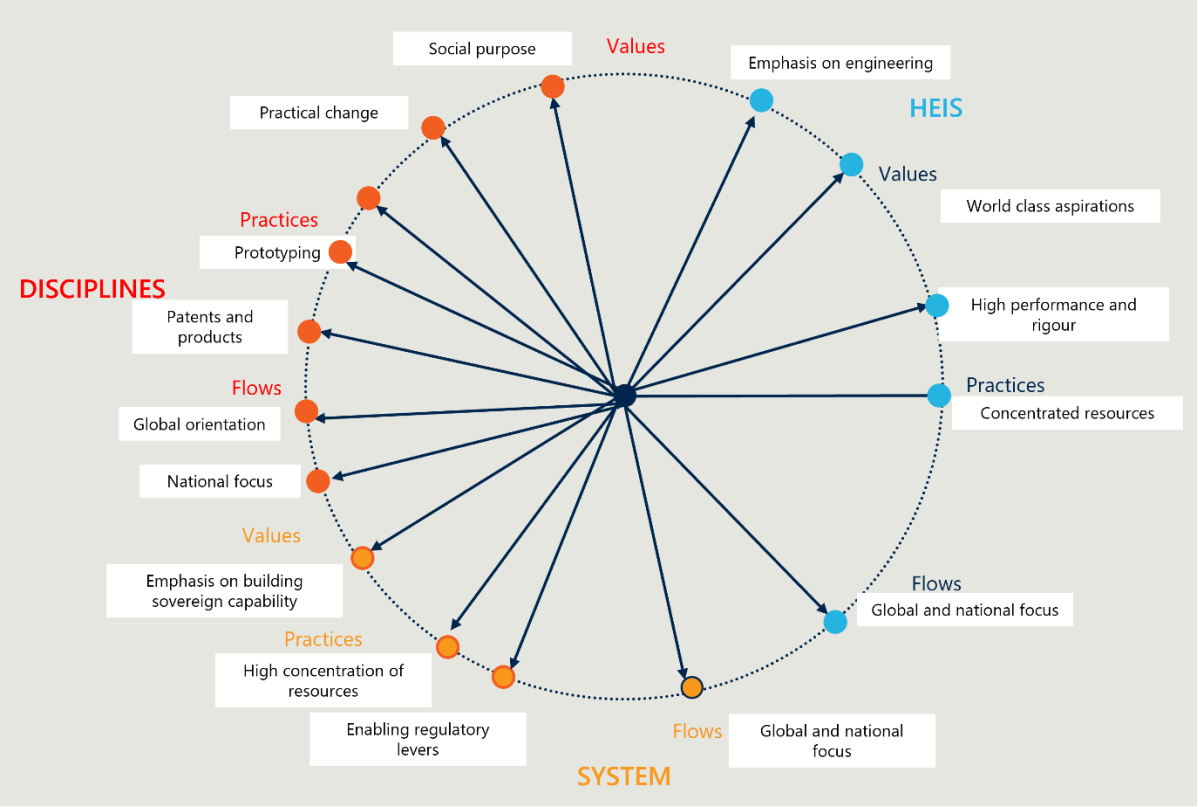
Disciplinary practices within this imaginary emphasise archival, immersive work, through the study of texts and material that facilitate understanding of the social realities. They also concern working in regional languages and, at times, with local communities. In most cases, researchers are working on inquiries independently or with select others. These are not typically team-based cultures.

Following a system-lens, in this imaginary, there is an explicit recognition of and a need to make sense of India's past and traditions, through uncovering histories, nurturing indigenous methods and practices, and embracing plurality of languages. However, this imaginary is also fraught with constraint and critique. As shown in this study, it is especially important to single out ways of working within historical studies which is undernourished across many institutional and system contexts. This imaginary can also be seen to run against the dominant flows of Indian research to be engaged in global conversations and collaborations. In turn, this imaginary is also known to experience epistemic violence, as conceived of by Spivak (1988), where the ways of knowing and working in the Indian contexts can be invalidated by Anglophone metrics and agendas. But both aspirations can work in parallel. The people dimension of this imaginary centre the diversities and pluralities of life experience and motivation, economic status, caste, language and disciplinary ways of working. It is inherently inclusive. The people dimension is also crucial in making sense of India's heterogeneous social relations.

Entrepreneurial Elites

The Entrepreneurial Elites imaginary envelops a small group of biomedical researchers and institutions within the context of Indian higher education. It emphasises disciplinary and institutional cultures focused on interdisciplinary collaboration and responding to the needs of industry. Harnessing the role of the scientific elite to broker connections with industry and secure investment and privilege is important (Krishna, 2024). Figure 8.4 conceptualises this imaginary in relation to the features of research culture.

Figure 8.4 Entrepreneurial Elites, mapped against features of research culture



Researchers inhabiting this imaginary operate with a distinct social licence and purpose (which is well understood by both faculty and collaborating partners), with a substantial concentration of resources and have expanded access to autonomy and flows of talent across the country and globally. It is not clear whether it is the character of the institution, or the disciplines, that drives the focus on excellence, and which has shaped a comprehensive, distinctive approach around collaboration and extensive industry links. They are entrepreneurial and their orientation is global. Interdisciplinarity is at the heart of this imaginary, given the dominant emphasis on developing products to address shared social challenges.

Despite the influential position of this imaginary within Indian higher education and the country at large, much of which has driven by significant investment in resourcing, it is important to note that it also represents stratification. The discussion around class and caste reveals an Entrepreneurial Elites imaginary that contributes to inequality and disparity, where largely those of privilege from economically affluent, English-speaking backgrounds find themselves identifying with this imaginary within PHEIs. Taking a part system, part institution view, this imaginary also stands isolated from the rest of the Indian landscape. The researchers, disciplines and institutions of focus here experience a much more resource-abundant position as compared with most of their peers and disciplinary networks nationally. A final challenge is at the disciplinary level, where there is a tension between the teamwork that is required to produce patents and products and reward structures that centre the individual. As with the other

imaginaries, fragmentation is possible here too. Though rare, the agency of individual researchers may counter the dominant flows of the imaginary.

These imaginaries of research culture are crucial to India, where the heterogeneity of traditions and histories found within it means that it is contending with several sociopolitical agendas all at once. On one hand, India continues to recover from the dismantling of colonialism. Fanon (1963) critiques the newly decolonised who adopt many of the former coloniser's tactics, and thereby, partake complicitly in neo-colonialism. In relation to research culture, the privileges enjoyed by researchers who have trained overseas in Anglophone countries and the focus on rankings echo a new type of this complicity, though it also delivers expanded opportunities for those Indian researchers and institutions. Indeed, the formal education system and, by extension, research and knowledge generation activities are key sites through which colonial modes of thinking are perpetuated (Rizvi, Lingard and Lavia, 2006).

On the other hand, the post-1991 era witnessed new economic reforms and liberalisation, where the country's own path to self-determination and success required the development of high-end scientific capabilities in globally networked disciplines such as biotechnology and pharmaceuticals (Krishna, 2024). The changing social contract understands science as a public good. This has contributed to increased income and wealth for large sections of society. The framing of science as a public good also underscores the need to address major human challenges such as climate change. These factors create a new competitive dynamic for researchers, HEIs and research systems. Here, the stakes go further than producing distinctive knowledges. In the eyes of research funders, policymakers and leaders of Indian HEIs and indeed internalised by researchers themselves, there are winners and then there are losers. In particular, the winners are those research culture imaginaries, including Technology Titans and Entrepreneurial Elites, are considered to generate immediate, tangible profit. And those neglected are Indigenising India and Conflicted Comprehensives, even though these imaginaries play a hugely significant role in unearthing critical questions about the nation's past, present and future. In that way, the plurality of research culture imaginaries is shaped by, and influence the most crucial debates relating to India's development agenda.

8.4 Theoretical and methodological reflections

The conceptualisation of research culture in this study was built up by centring the diverse voices, perspectives, identities, practices and languages of researchers and other research stakeholders working within Indian higher education. It has purposefully adopted an 'insider-perspective' and the findings were inductively generated, based on the meaning 'insiders' made about research culture. An insider conceptualisation of research culture in the India not only emphasises what is missing or absent, but highlights researchers' ambitions, their everyday realities and changes over time and between places. In this way, this study addresses a gap that has been evident in previous and related research (Ahmad, 2020; Urvashi, 2020; UGC, 2019a; Shah, 2005). In contrast, previous works about research culture in Indian higher education have been developed either through appraisal of literature and performance data (Patel, 2012; Ravi, Gupta and Nagaraj, 2019) or as comparative studies through an international lens (Marks, 2018).

In line with the methodological orientation of this study, as set out in Chapter Three, the study focussed on participants' meaning making of research culture and drew in their diverse life experience and beliefs (Terre Blanche and Durrheim, 2006). This included material elements from which meaning is derived, in relation to infrastructure, funding and technology, but also emphasised those elements which were more experiential in nature, privileging participants' voices on matters such as leadership, ethics and socialisation processes. In this way, the study centred participants' lived experience and narratives and used reflexive thematic analysis to yield deeper, richer insights about their cultural realities (Braun and Clarke, 2021). Further, the use of fieldwork complemented participants' narratives to elucidate a real-world understanding of their lived experiences. Artefacts gathered during fieldwork, including institutional documents and strategies, complemented participant narratives but remains secondary to their reflections and perspectives. In the context of understanding research culture, in general and in India in particular, there has been limited use of participants' lived experience in constructing meaning (Ion and Castro Ceacero, 2017; Rossouw, 2020). Historically, there has been greater importance afforded to interpretations about research culture, rather than interpretations developed from within. I have sought to emphasise the latter in this study, which can serve as an approach to be used in other contexts.

Further, the study has engaged a range of actors situated across the researcher lifecycle, from those in early career roles, leadership positions, research funders and even policymakers. The diversity of these actors and their positioning has contributed towards an expanded understanding of research culture, which has not previously been reflected in research. As discussed above, earlier works have substantially focused on institutional perspectives of research culture and developing knowledge from a contained set of actors (Mendez and Cruz, 2014; Ion and Castro Ceacero, 2017). However, as will be discussed in the recommendations for future research, there is value in extending the range of perspectives and contributors to research culture.

8.5 Limitations of the study

Notwithstanding the contributions of the study to advance new understanding about research culture in Indian higher education, the study is not without limitations.

This study is built on an understanding of culture that is both dynamic and plural but that stops well short of a 'culture is everything' perspective (Martin, 2002; Williams, 1961). This plays out in several ways. First, theoretically, there is not agreement on the container of culture and the properties within it. For the purposes of the study, I employed a dynamic understanding of culture that emphasised fragmentation and conflict as well as enduring patterns. This was more reflective of the realities of researchers but required careful judgement and iteration. Second, there is some overlap in the way findings have been categorised across: values and perspectives; practices and artefacts; and flows and relations. For example, an institutional culture can project a global ambition, captured as values and perspectives, and forge collaborations with international actors, reflected in flows and relations. Another issue is the duplication of material across lenses of research culture, in that the biomedicine discipline emphasises collaborations with industry, which reappears at the institutional and system levels as well, albeit with a different focus. And at times, participants discussed cultural practices interchangeably with whole of research issues such that it felt overly expansive.

Within this study, the rationale for this analysis was explicitly set out with clear definitions and scope for each of the lenses. The emphasis was on meaning-making of wider issues, such as funding, and great effort was made to avoid duplication across categories. Upon reflection, the conceptual framework worked well in describing the features of disciplinary and institutional research culture, where there were observable and material properties as well as the interpretive elements, but it was less effective in capturing the nuance and somewhat more vague ideas at the system level. At times, it was challenging to contain the ideas at the system-level such that it would be analytically valuable. I dealt with these by focusing on enduring issues that were raised by participants, such as UGC regulation, and carefully considering how system-level ideas impacted research practices specifically. This would need to be sharpened in future studies. Relatedly, the approach taken to developing research culture imaginaries has its limits. It was shaped by the constellation of disciplines, institutions and systems considered for this study. If these variables were to change, then so would the possible imaginaries. This is an area worthy of further exploration in future.

Chapter Three identified a few sampling limitations – the major issues were a lack of historical studies researchers, an overrepresentation of researchers from the Tamil Nadu based PHEI and limited involvement from PCU researchers. In turn, there is a tension in fulfilling the range of disciplinary, HEI and system-perspectives that were desirable for the study, particularly the diversity of disciplinary perspectives. Given the significant role of disciplinary cultures, their moderating role in relation to institutional and system-level practices, and the relative similarities in practices within institution-types

(e.g. between the two PHEIs and two PCUs considered in this study), the study is limited in what can be inferred about the diversity in disciplinary norms and traditions. The study provided only a partial exploration of the interaction between disciplinary and institutional practices and behaviours. Given the scale and size of the study, there was limited opportunity to delve further into these interactions, particularly through fieldwork, but this would have been extremely useful. Taking this further, the study should have focused more closely on understanding the disciplinary cultures of historical studies researchers, a deliberately looser grouping due to sampling issues discussed in Chapter Three. In addition, a more theoretically grounded discipline would have added to new understandings of commonalities and differences in disciplinary research cultures.

Another limitation of the study is that it paid less attention to the temporal aspect of culture. The study was conducted point-in-time and did not directly observe transition, as culture may have shifted from one way of working towards another, though these were indirectly referenced throughout the study (Ion and Castro Ceacero, 2017; Fortado and Fadil, 2012). For instance, historical studies researchers described their disciplinary culture as experiencing a state of decline and others discussed the increasing expectation to deliver commercial benefit through research in response to national policy aims and funding schemes. Given the constraints of the data collection period, identifying the key shifts and the impact on researchers' practices would have proved challenging. Conducting follow-up interviews over a longer time-period and a data-gathering approach that systematically compared the experiences of early-career, mid-career and established researchers would have addressed some of these gaps and enabled the formulation of insights that were temporally based. Another way of treating these issues would have been to encourage participants to reflect on their life-experiences more explicitly, by asking them to compare cultural practices across different time periods. The limitations of this research yield insights into potential new and important areas of research. These recommended areas for further research are detailed below, as well as suggestions for policy and practice.

8.6 Recommendations for future research, policy and practice

8.6.1 Recommendations for research

Informed by the contributions and gaps of the current study, recommendations for future research should concentrate on expanding the understanding of research culture in Indian higher education through two broad directions: (1) inquiry into the similarities and differences in research culture across the heterogeneity of geographical, disciplinary and institutional contexts, and (2) research into the trajectories and life experiences of individual researchers and how these factors shape their lived experience of research culture.

The first theme is crucial because the study provided only a limited view into the rich complexity and variation in India's regional contexts. It may be valuable to extend the analyses of research culture across the 36 states and union territories of India. Undertaking a broader and more granular geographic approach would also include examining similarities and differences in research culture between urban and metropolitan contexts versus rural and remote areas, features that are distinct to areas where there is a significant concentration of industries, and the relationship with regional sociopolitical traditions and ideologies. For example, the Communist Party has a long-standing presence within Kerala and its social structures (Mattumannil, 2023). Through detailed mapping, it may also be fruitful to draw out patterns by regions or zones of research culture that emphasise ways of working, values and other key features. Previous work has found common features in the 'post-Confucian zone' of several East Asian nations and though the focus here would be within intra-country region, this may be a helpful lens to take in making sense of India's heterogeneity in relation to research (Marginson, 2011).

Given the constraints of scale, this study deliberately limited the disciplinary areas to computer science, biomedicine and historical studies. At a minimum, it would be helpful to identify features of research culture within an applied social science discipline, such as education or social work, and a largely theoretical discipline such as mathematics or one from within the natural sciences. These are not the only disciplines where further investigation could yield new insight. The study is distinct in that it focused on the discipline-specific values and ways of working associated with research, which can and should be further broadened including across other country contexts.

Further, while the current study focused on major HEIs within the Indian context, including those with significant teaching responsibilities such as public universities funded by the regional government and the IITs, there is a conceptual and practical need to undertake this work within India's scientific institutes. There are a substantial number of scientific research organisations that work outside the formal framework of higher education institutions but where substantial research activity occurs (CSIR, 2024). Developing a complete and thorough picture of research culture in India requires the unearthing of practices, values and relations within and beyond these institutions, particularly in how they interact with

HEIs in the country. Methodologically, these studies would be greatly enhanced by inclusion of, in addition to researchers and HEI leaders, the contributions of other actors within the research ecosystem including industry partners, funders and policy makers. These additional perspectives would have helped form a more rounded understanding of the key elements of research culture, rather than privileging any one set of actors' lived experiences. They would complement the 'insider' researcher perspective. The comprehensiveness of perspectives, as well as specificity of viewpoints, would be valuable in helping to shape the multidimensional nature of research culture.

Focusing on the second suggested research theme, concerning the trajectory and life experiences of researchers in shaping their discourse around research culture, the current study makes a helpful start by identifying key areas of focus including caring responsibilities, caste, gender and other personal characteristics, as well as highlighting the experiences of early career researchers where this was available in the data. However, there is a wider list of personal factors that likely influence the ways of working, outlook and values that researchers bring to their work. While the study keenly explores caste and how it interfaces with HEI and system-level ideas of research culture, other personal factors and the interrelationships were not given primary attention in a study of this size and scale.

Given the contribution of human creation in giving effect to that which is culture, future research should make a concerted effort to examine the paradigms, life stories, stated and unstated motivations, and biases of research actors, and how they come to understand these ideas (Grossberg, 2010). After all, researchers have a key stake in defining, transforming and seeking benefit from the notion of research culture. Relatedly, there is value in exploring the relationships between researcher performance – whether that is self-perceived notions of performance or objectives measurement – and conceptions of research culture. For example, developing an understanding about the conception and features of research culture by focusing on high-performing, highly productive individual researchers and research teams in India may help shape or challenge preconceived research culture ideals towards which researchers can work. Such research would require intensive data, gathered over time and in different contexts. It would also require more detailed observation of researcher practices and output. It is not the work of one single research project, but rather, an ongoing endeavour that focuses even more deeply on researcher practices. However, the benefit of such research is that it would allow policymakers and practitioners alike to re-imagine some of their research norms in a way that both values their life experiences and benefits the issues and outcomes they are working towards.

8.6.2 Recommendations for policy and practice

An overarching recommendation to shift the focus of governments and institutions from a 'one-size-fits-all' approach to developing India's research culture towards strategies that fosters the diversity of disciplinary research cultures. Government policy and regulation and industry could be designed in a way

that reinforces this diversity and, by using a consistent framework around research culture, that can support continuous improvement within India and more globally. Each of these recommended strategies would be shaped by changing government legislation, industry ambition and institutional priorities, but they are offered in the spirit of optimising India's research potential now and into the future and adopting a more expansive understanding of research culture that is grounded in researchers' realities and aspirations. They are discussed in turn, with reference to specific initiatives:

Nurturing disciplinary diversity

A novel contribution of this study is an explicit reorientation of research culture to disciplines, noting the domination of the institutional and system-lens in policy and discourse. For practitioners and policymakers alike, there is much value to be gained from examining research culture from the perspective of disciplines.

HEI resources, policies, incentives and other factors remain crucial, but evidence from this study indicated a lack of understanding as to how these factors interact with and moreover positively reinforce disciplinary practices. Equally, the opposite is also true: institutional leaders and policy actors do not sufficiently incorporate differences in disciplinary research practice in the allocation of institutional and system resources, employment conditions, policies and other crucial tasks. This results in a patchwork arrangement, characterised by differing agendas, competing tensions and ineffective use of resources.

Designing policies, systems and regulations

In the context of regional and national government policy, funding and regulatory frameworks as well as through industry-led initiatives, it is essential that these interventions contribute positively to building the desired research culture across all disciplines and institutions. As argued in Chapter Seven, there are several areas where there is a disconnect between the intended outcome of these instruments and their actual impact. With these generalities in mind, there are emerging opportunities to design these approaches in a different way.

- Established in 2023, the Government of India's Anusandhan National Research Foundation (NRF) is the apex funding body to provide high-level strategic direction of scientific research in the country and forges collaboration among industry, academia, government departments and research institutions (Ghosh, 2023). While the NRF is still coming into full force, there are already concerns that the measures used to evaluate performance and reward grants will further advantage elite institutions and science and technology disciplines and that there are inadequate funds and mechanisms to support research in the humanities disciplines (Lem, 2023). In designing competitively funded research programmes and merit-based processes, it is essential that these schemes align with

and support discipline-specific ways of working and approaches to knowledge generation (e.g. ensuring there are appropriate measures of recognising and rewarding outstanding scholarship in historical studies beyond journal publications), rather than creating disparities by deploying blanket grant awarding approaches.

- It would be inappropriate to suggest an entire rework of the frameworks in place to support research through the University Grants Commission. There is insufficient evidence from this study to suggest this, though throughout the study, there were various critiques of regulation in relation to research culture. The current measures appeared to disproportionately disrupt the practices of historical studies researchers and those working in PCUs. Policymakers should endeavour to design measures that are underpinned by the diversity of knowledge traditions and practices, that are clear about the changes in culture that are being sought, and whose rationale is readily understandable for researchers.

Consistent framework for evaluation and improvement

Existing tools and studies that evaluate culture in higher education predominantly focus on organisational dimensions, including works that focus on research culture (Mendez and Cruz, 2014, Bland and Ruffin, 1992). These tools are heavily grounded in Anglosphere norms and practices. They downplay the role of sociocultural differences and do not focus on the specific dynamics and ways of working within disciplines. However, this study provides an integrated framework through which to explore research culture across all these lenses and is distinctive in producing a 'fully worked-out example' of the framework within a significant, Global South context. This conceptualisation of research culture in this study can be applied in different country contexts to provide a richer understanding of research culture, and to provide insights that are not appraised solely against normative ideals, but that more clearly reflect lived realities of researchers themselves. Over time, it may be helpful in being able to draw out similarities and differences between country contexts.

8.7 Concluding remarks

At the time of writing, the Government of India had recently launched the 'One Nation, One Subscription' scheme to provide access to scholarly research and journals (GoI, 2025). While the initiative has already been met with some criticism, the intent of the scheme is to substantially expand access for researchers and students undertaking scholarly work (Madhan, 2024). In the same year, the Government pledged to invest some £4.6 billion between 2024 – 2029 through the Anusandhan NRF to encourage collaborative research that address pressing challenges facing humanity. Through initiating these schemes, the Government has reiterated an express ambition to improve research culture (GoI, 2024). For instance, within specific industries and policy objectives in relation to the achievement of India's technology missions, commentators have highlighted the need for a "culture shift" to engage more spontaneously and frequently in goal-oriented collaborations with industry and government (Ghosh & Sood, 2024, p.1). Here too, research culture emerges as a central objective. There is frequent mention of research culture in the most recent news articles about science and research in India and it is increasingly discussed in HEI strategies and communications. Globally too, the use of research culture as a concept is dominating policy discussion, assessment frameworks and funding criteria (Science Europe, 2024; Royal Society, 2024).

However, within the Indian scenario, developing knowledge about research culture has been important not just in relation to current discourse and debate. Former Prime Minister Jawaharlal Nehru (1937, p.507 as cited in, Vinod and Desphande, 2013) said: "the future belongs to science". Further, India's research cultures are as much about creating the intellectual and organisational conditions for scholars to undertake discovery and contribute to India's prosperity, as they are to make sense of questions of the past, of India's traditions and of its histories. In the light of this, it is essential that a clear understanding of the key features of India's research cultures is developed: one that reflects the heterogeneity of the country, that is underpinned by the diversity of disciplinary traditions and ways of working, that is attuned to variations in institutional characteristics and norms, nested within wider social relations, and that explores the interactions and implications of these cultures. Importantly, an understanding of India's research cultures is redundant if they do not centre the lived realities, tensions and aspirations of the scholars who are engaged in the empirical effort. In that spirit, this study has harnessed the perspectives of computer science, biomedicine and historical studies scholars across a range of public and private HEIs in Maharashtra and Tamil Nadu to construct and provide meaning into all that is research culture. The study offers several novel contributions; in the case of India, research culture is plural, and the possibilities are many. However, they are not endless. Research cultures are forged from the context-specific values and perspectives, practices and artefacts, and flows and relations engaged in by researchers. Through these interactions, several powerful research culture imaginaries are emerging which reflect the ambitions and paradoxes of India at large. In that way, research cultures unfurl alongside India's own reckoning of its past, present and future with no singular end point. It is evolving.

REFERENCES

Aagaard, K., Kladakis, A., and Nielsen, M, W. (2020). Concentration or dispersal of research funding? *Quantitative Science Studies, 1*(1), 117-149. https://doi.org/10.1162/qss_a_00002

Abramson, D., & Parashar, M (2019). Translational Research in Computer Science. *Computer, 52*(9) 16-23. https://doi.org/10.1109/mc.2019.2925650

Abrar, P. (2018). *Indian ride-hailing company Ola takes on Uber in New Zealand.* The Hindu. Retrieved from: https://www.thehindu.com/business/Industry/indian-ride-hailing-company-ola-takes-on-uber-in-new-zealand/article24974285.ece

Adorno, T, W. (1931). "Die Aktualität der Philosophie", in Theodor W. Adorno, *Gesammelte Schriften I: Philosophische Frühschriften, R*olf Tiedemann (ed.), Frankfurt am Main: Suhrkamp, 1973, pp. 325–344; translated as "The Actuality of Philosophy", Benjamin Snow (trans.), Telos, 31 (1977): 120–133

Adorno, T, W. (1975). Culture industry reconsidered. *New German Critique, 6,* 12 – 19. Retrieved from: https://www.sfu.ca/~andrewf/Culture_industry_reconsidered.shtml

Adorno, T, W., and Walter, B. (1999). *The complete correspondence 1928–1940.* Trans. Nicholas Walker. Cambridge, MA: Harvard University Press

Agarwal, P. (2007). Higher education in India: growth, concerns and change. *Higher Education Quarterly, 61*(2), doi: https://doi.org/10.1111/j.1468-2273.2007.00346.x

Agarwal, P. (2009). *Indian higher education: envisioning the future.* SAGE Publications: Thousand Oaks

Ahlin, E, M. (2019). Semi-structured interviews with expert practitioners: their validity and significant contribution to translation research. In, *Sage Research Methods Cases Part 2.* SAGE Publications Ltd. Retrieved from: https://methods.sagepub.com/case/semi-structured-interviews-with-expert-practitioners-translation

Ahmad, T. (2020). Measures to promote research and innovation in Indian universities. In. P. Mittal and S. Rama Devi Pani (eds). *Reimagining Indian universities.* Association of Indian Universities: New Delhi

Ahnert, R., Griffin, E., Ridge, M., & Tolfo, G. (2023). *Collaborative historical research in the age of big data.* Cambridge: Cambridge University Press

Akileswaran, K., & Graziadei, L. (2020). Inclusive growth in Tamil Nadu: the role of political leadership and governance. Tony Blair Institute of Global Change. Retrieved from: https://institute.global/insights/politics-and-governance/inclusive-growth-tamil-nadu-role-political-leadership-and-governance

Alexiadou, N., Kefala, Z., & Ronnberg, L. (2023). Through the eyes of the disciplines – student perspectives and positioning towards internationalisation-at-home. *European Journal of Higher Education*, 1 – 18. https://doi.org/10.1080/21568235.2023.2168719

Altbach, P, G. (2014). India's higher education challenges. *Asia Pacific Education Review, 15,* 503 – 510. https://doi.org/10.1007/s12564-014-9335-8

Altbach, P, G., and Mathews, E. (2019). Why India will fail to attract global faculty. *International Higher Education, 99,* 17 – 18. https://doi.org/10.6017/ihe.2019.99.11657

Alvarez-Bornstein, B., and Bordons, M. (2021). Is funding related to higher research impact? Exploring its relationship and the mediating role of collaboration in several disciplines. *Journal of Infometrics, 15*(1), Retrieved from: https://ideas.repec.org/a/eee/infome/v15y2021i1s1751157720301309.html

Alvargonzalez, D. (2011). Multidisciplinarity, interdisciplinarity, transdisciplinarity, and the sciences. *International Studies in the Philosophy of Science, 25*(4), 387-403. doi: 10.1080/02698595.2011.623366

Alvesson, M. (2003). Beyond positivists, romantics, and localists: a reflexive approach to interviews in organisational research. *The Academy of Management Review, 28*(1), 13 – 33. https://doi.org/10.2307/30040687

Amity University. (2023a). *About Campus.* Retrieved from: https://www.amity.edu/mumbai/about-us

Amity University. (2023b). *Financial Report on FY 2022 and 2023.* Retrieved from: https://www.amity.edu/mumbai/pdf/sustainbility/33.%20financial%20statement%20fy%202023-24.pdf

Amity University Mumbai (2024a). *Vision, mission and core values.* Retrieved from: https://www.amity.edu/mumbai/vision-mission.aspx

Amity University Mumbai (2024b). *Careers.* Retrieved from: https://www.amity.edu/mumbai/careers

Angom, S. (2015). Private higher education in India: A study of two private universities. *Higher Education for the Future, 2*(1), 92 – 111, https://doi.org/10.1177/2347631114558192

Appadurai, A. (1990). Disjuncture and Difference in the Global Cultural Economy. *Theory Culture and Society, 7*(3), 295-310. https://doi.org/10.1177/026327690007002017

Appadurai, A. (1993). "Disjuncture and Difference in the Global Cultural Economy." In *The Cultural Studies Reader*, edited by Simon During, 220–230. London: Routledge

Appadurai, A. (1996). *Modernity at large: cultural dimensions of globalisation.* Minneapolis: University of Minnesota Press.

Appadurai, A. (2021). Fear of small disciplines: India's battle against creative thought. *Postcolonial Studies, 24*(1), 11-15. https://doi.org/10.1080/13688790.2021.1882069

Association of Indian Universities (2020). *India Higher Education profile.* Retrieved from:

https://www.aiu.ac.in/documents/AIU_Publications/IHE_Profile/INDIA%20HIGHER%20EDUCATION%20PROFILE%202018-19.pdf

Baber, Z. (2001). Globalization and scientific research: The emerging triple helix of state-Industry-university relations in Japan and Singapore. *Bulletin of Science, Technology and Society, 21*(5), 401–408. https://doi.org/10.1177/027046760102100509

Banshal, S, K., Singh, V, K., Basu, A., & Muhuri, P, K. (2017). Research performance of Indian Institutes of Technology. *Current Science, 112*(5), 923 – 932.

Bardhan, P., and Mookherjee, D. (2006). Decentralisation and accountability in infrastructure delivery in developing countries. *The Economic Journal, 116* (508), 101-127. Doi: https://doi.org/10.1111/j.1468-0297.2006.01049.x

Barry, A., Born, G., and Weskalnys, G. (2008). Logics of interdisciplinarity. *Economy and Society, 37*(1), 20-49. https://doi.org/10.1080/03085140701760841

Basu, A. (1989). Indian higher education: colonialism and beyond. In: Altbach, P, G., Selvaratnam, V (Eds). *From Dependence to Autonomy. Springer,* Dordrecht (pp.167 – 186). https://doi.org/10.1007/978-94-009-2563-2_7

Bauman, Z. (2004). Culture and management. *Parallax, 10*(2), 63 – 72. DOI: 10.1080/135346404200020852

Becher, T. (1981). Towards a definition of disciplinary cultures. *Studies in Higher Education, 6*(2), 109-122, https://doi.org/10.1080/03075078112331379362

Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher Education, 19*(2), 151 – 161. https://doi.org/10.1080/0307507941233138200 7

Becher, T. and Trowler, P. R. (2001). *Academic tribes and territories: intellectual inquiry and the cultures of disciplines.* Second edition. Buckingham: Society for Research into Higher Education / Open University Press

Bellotti, E., Kronegger, L., and Guadalupi, L. (2016). The evolution of research collaboration within and across disciplines in Italian Academia. *Scientometrics 109*, 783–811. https://doi.org/10.1007/s11192-016-2068-1

Benedict, R. (1934). *Patterns of behaviour.* New York: Marine Books Classic

Berlin, J, A. (1992). Postructuralism, cultural studies, and the composition classroom: postmodern theory in practice. *Rhetoric Review, 11*(1), 16-33. https://www.jstor.org/stable/465877

Bernstein, B. (2000). *Pedagogy, symbolic control, and identity.* London: Rowman and Littlefields.

Bhargava, P, M. (2016). Scientific research and economic development. *Social Change, 46*(2), 260-266. https://doi.org/10.1177/0049085716635403

Bharucha, J. (2024). India's realignment of higher education. *Daedalus, 153*(2), 136-148. https://doi.org/10.1162/daed_a_02070.

Biesta, G., & Tedder, M. (2006). *How Is Agency Possible? Towards an Ecological Understanding of Agency-as-Achievement. Learning Lives: Learning, Identity, and Agency in the Life Course.* Working Paper Five, Exeter: Teaching and Learning Research Programme. Retrieved from: https://www.semanticscholar.org/paper/How-is-agency-possible-Towards-an-ecological-of-Biesta-Tedder/ea1fbe8a43199a69edd100b472ab09b0f08bc115

Biglan, A. (1973). The characteristics of subject matter in different academic areas. *Journal of Applied Psychology, 57*(3), 195 – 203. https://doi.org/10.1037/h0034701

Bland, C, J., and Ruffin, M, T. (1992). Characteristics of a productive research environments: Literature Review, *Academic Medicine, 67*(6), 385 – 397. doi: 10.1097/00001888-199206000-00010

Blatch-Jones, A, J., Lakin, K., & Thomas, S. (2024). A scoping review on what constitutes a good research culture: Systematic review. F1000 Research. Retrieved from: https://f1000research.com/articles/13-324

Borthakur, P., Nath, S, K., & Chakraborty, S. (2024). Higher Education Landscape in India: Government
Expenditure and Its Implications on Growth and Access. *Space and Culture India, 12*(1), 42-63. DOI:10.20896/saci.v12i1.1422

Braddock, R. (2002). The Asia-Pacific region. *Higher Education Policy, 15*(3), 291 – 311. doi: 10.1016/S0952-8733(02)00019-3

Brandt, A, M., & Freidenfelds, L. (1996). Research ethics after World War II: The insular culture of biomedicine. *Kennedy Institute of Ethics Journal, 6*(3), 239 – 243, doi: 10.1353/ken.1996.0021

Braun, V., and Clarke, V. (2021). Thematic Analysis: A practical guide. *SAGE Publications Ltd.* Retrieved from: https://us.sagepub.com/en-us/nam/thematic-analysis/book248481

Brinkman, S. (2016). Methodological breaching experiments: Steps toward theorizing the qualitative interview. *Culture and Psychology, 22*(4), 520-533. https://doi.org/10.1177/1354067X16650816

British Educational Research Association. (2011). *BERA Ethical Guidelines for Educational Research.* Retrieved from: https://www.bera.ac.uk/publication/bera-ethical-guidelines-foreducational-research-2011

Boon, G, C. (1998). Creating a research and development culture in Southeast Asia: Lessons from Singapore's experience. *Southeast Asian Journal of Science, 26*(1), 49 – 68. https://doi.org/10.1163/030382498X00058

Borgeson, E., Sotak, M., Kraft, J., Bagunu, G., Biorserud, C., & Lange, S. (2021). Challenges in PhD education due to COVID-19 – disrupted supervision or business as usual: a cross-sectional survey of Swedish biomedical sciences graduate students. *BMC Medical Education, 21,* 294 – 305. https://doi.org/10.1186/s12909-021-02727-3

Boucher. (2014). What is a philosophical stance? Paradigms, policies and perspectives. *Synthese, 191*(10), 2315 – 2332. http://doi.org/10.1007/s11229-014-0400-y

Bourdieu, P. (1983). The field of cultural production, or: The economic world reversed. *Poetrics, 12*(4), 311 – 356. https://doi.org/10.1016/0304-422X(83)90012-8

Bowen, G, A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal, 9*(2), 27-40, doi: 10.3316/QRJ0902027

British Council (2014). *Understanding India: the future of higher education and opportunities for international cooperation.* Retrieved from: https://www.britishcouncil.org/sites/default/files/understanding_india_report.pdf

Brown, H, D. (1994). *Principles of Language Learning and Teaching* (3rd Ed). Englewood Cliffs, NJ: Prentice Hall Regents.

Buchanan, I., Varghese, G, K., and Manoj, N, Y. (2022). *Deleuze, Guattari and India: exploring a post-postcolonial multiplicity.* Retrieved from: https://www.routledge.com/Deleuze-Guattari-and-India-Exploring-a-Post-Postcolonial-Multiplicity/Buchanan-VargheseK-NY/p/book/9781032108476?srsltid=AfmBOoofJzPERMZ62RKv7r-mbkArjGRzNn6Di1Rm_C9Jx6YUpJtqPIuw

Burr, V., and Dick, P. (2017). Social constructionism. In B. Gough (Ed.), *The Palgrave handbook of critical social psychology* (pp. 59–80). Palgrave Macmillan/Springer Nature. https://doi.org/10.1057/978-1-137-51018-1_4

Buys, T., Casteleijn, D., Heyns, T., and Untiedt, H. (2022). A reflexive lens on preparing and conducting
semi-structured interviews with academic colleagues. *Qualitative Health Research, 32*(13), 2020-2039. doi: 10.1177/10497323221130832

Byrne, D. (2021). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Quality and Quantity, 56,* 1391-1412. https://doi.org/10.1007/s11135-021-01182-y

Callard, F. (2023). Towards a critical-conceptual analysis of 'research culture'. *Area, 56*(2), https://doi.org/10.1111/area.12905

Carnoy, M., Loyalka, P., Dobriakova, M., Dossani, R., Froumin, I., Kuhns, K., Tilak, J. and Wang, R. (2013). *University expansion in a changing global economy: Triumph of the BRICS.* Stanford University Press

Cassan, G., (2019). Affirmative action, education and gender: evidence from India, 136, 51-70. Retrieved from: https://econpapers.repec.org/article/eeedeveco/v_3a136_3ay_3a2019_3ai_3ac_3ap_3a51-70.htm

Castro-Gomez, S. (2002). The cultural and critical context of postcolonialism. *Philosophia Africana, 5*(2), 25 – 35.

Chakrabarty, D (2008). The public life of history: an argument out of India. *Postcolonial Studies, 11*(2), 169-190. https://doi.org/10.1080/13688790802004695

Chakraborty, S. (2017). *Creating a culture of research in India.* The Hindu, Business Line. Retrieved from: https://www.thehindubusinessline.com/opinion/creating-a-culture-of-research-in-india/article9830350.ece

Chakraborty, T. (2018). Role of interdisciplinarity in computer sciences: quantification, impact and life trajectory. *Scientometrics, 114*, 1011 – 1029. https://doi.org/10.1007/s11192-017-2628z

Chandresh, K., & Singh, P, K. (2019). *Scopus-based comparative analysis of computer science research in India and USA.* 10th International Conference on Computing, Communication and Networking Technologies.

Chattopadhyay, S. (2022). *Quest for excellence in Indian higher education: negotiating the trade-off between autonomy and accountability.* In. M. Priyam. Reclaiming Public Universities: Comparative Reflections for Reform. London: Routledge India. Retrieved from: https://www.taylorfrancis.com/chapters/edit/10.4324/9781003229384-12/quest-excellence-indian-higher-education-saumen-chattopadhyay

Chattopadhyay, S. and Nandi, E. (2022). *Changing Contours of Regulation in Indian Higher Education* in S. Chattopadhyay, S. Marginson, and N.V. Varghese (Eds) Changing Higher Education in India, London: Bloomsbury Academic.

Chattopadhyay, S and Panigrahi, J. (2022). *Financing of higher education in India.* in S. Chattopadhyay, S. Marginson, and N.V. Varghese (Eds) Changing Higher Education in India, London: Bloomsbury Academic.

Chaturbhuj, S., Batcha, A, M. (2021). Scientometric analysis of scholarly publications of University of Mumbai from 2001 to 2019. *Library Philosophy and Practice, 41*(6), 438-447 Retrieved from: https://digitalcommons.unl.edu/libphilprac/5922/

Clark, M. (2003). Computer Science: A hard-applied discipline? *Teaching in Higher Education, 8*(1), 71–87. https://doi.org/10.1080/1356251032000052339

Coccia, M., Roshani, S. (2024). General laws of funding for scientific citations: how citations change in funded and unfunded research between basic and applied sciences. *Journal of Data and Information Science, 9*(4), 71–89. https://doi.org/10.2478/jdis-2024-0005

Cohen, L., Manion, L., and Morrison, K. (2017). Methodologies for educational research (Eds). In *Research methods in education.* Oxford: Routledge

Constitution of India (1950). Retrieved from National Portal of India. https://www.india.gov.in/my-government/constitution-india#:~:text=The%20Republic%20is%20governed%20in,structure%20with%20certain%20unitary%20features.

Cornish, W, R. (1884). *Convocation Addresses of the Universities of Bombay and Madras.* Lawrence

Asylum: Mount Road. Retrieved from: https://ia800200.us.archive.org/18/items/convocationaddre00subbrich/convocationaddre00subbrich.pdf

Council of Scientific and Industrial Research (2024). *CSIR Laboratories and Institutes.* Retrieved from: https://www.csir.res.in/csir-labs-unit

Curtis, F, J. (1954). *Science as Culture. From the Presidential Address at the meeting of the Society of Chemical Industry*, Nottingham, England, July 22, 1963

Creswell, J, W., and Guetterman, T, C. (2019). *Educational research: planning, conducting, and evaluating qualitative and quantitative research.* Pearson: New York.

Damaschin, A. (2024). Social Constructionism in the Educational System. New Dimensions regarding School Participation . *Revista Romaneasca Pentru Educatie Multidimensionala, 16*(2), 497-514. https://doi.org/10.18662/rrem/16.2/868

David, S, A., and Motala, S. (2017). Can BRICS build ivory towers of excellence? Giving new meaning to world-class universities. *Research in Comparative and International Education, 12*(4), 512 – 528. https://doi.org/10.1177/1745499917740652

Datta, S. (2017). *A history of the Indian university system – Emerging from the shadows of the past.* London: Palgrave Macmillan

Dattagupta, S. (2020). Guest Editorial on Interdisciplinarity. *Current Science, 118*(9), 1331-1332. Doi: 10.2307/27226427

Day, C. (2011). Singapore applies itself to science. *Physics Today, 64*(6), 20 – 21. https://doi.org/10.1063/1.3603911

Demetrescu, C., Finocchi, I., Ribichini, A., and Schaerf, M. (2022). On computer science research and its temporal evolution. *Scientometrics 127*, 4913–4938 (2022). https://doi.org/10.1007/s11192-022-04445-z

Department for International Development. United Kingdom (2011). *Social science research in India: a Mapping Report.* Retrieved from: https://assets.publishing.service.gov.uk/media/57a08abee5274a31e0000754/60911-MappingReport_social_science.pdf

Department of Science and Technology, Government of India (2020). *Science, Technology and Innovation Policy.* Retrieved from: https://dst.gov.in/sites/default/files/STIP_Doc_1.4_Dec2020.pdf

Department of Science and Technology (2023). *S&T Indicator Tables: Research and Development Statistics 2022-23 – March 2023.* Retrieved from: https://dst.gov.in/sites/default/files/S%26T%20INDICATORS%20TABLES%202023.pdf

Deshpande, P. (2007). *Creative pasts: historical memory and identity in western India, 1700 – 1960.* Columbia University Press

Deshpande, A. (2011). *Colonial modernity and historical imagination in India.* Proceedings of the

Indian History Congress, 72, 1311-1324. Indian History Congress. Retrieved from: https://www.jstor.org/stable/44145742

Deshpande, A. (2013). Remaking the Indian historian's craft: the past, present and future of history as an academic discipline. *Economic and Political Weekly, 48*(7), 60 – 68. doi: https://www.jstor.org/stable/23391310

Deshpande, A. (2017). *Past, present and oral history. Economic and Political Weekly,* 52(29), 38-43. Economic and Political Weekly. Retrieved from: https://www.jstor.org/stable/26695691

DeWalt, K, M., DeWalt, B, R. (2011). *Participant observation: a guide for fieldworkers.* 2 nd ed. Rowman and Littlefield.

Dongerkery, S, R. (1957). *1917 Convocation Address to the University of Bombay.* Freeman Freeman-Thomas, 1st Marquess of Willingdon. In. A History Of The University Of Bombay 1857-1957. Retrieved from: https://archive.org/stream/in.ernet.dli.2015.97560/2015.97560.A-History-Of-The-University-Of-Bombay-1857-1957_djvu.txt

Dornyei, Z. (2007). *Research methods in applied linguistics.* New York: Oxford University Press

Dreze, J., and Sen, A. (2013). *An uncertain glory: India and its contradictions.* Allen Lane

Economic Advisory Council to the Prime Minister – Office of the Principal Scientific Secretary (2019). *RandD expenditure ecosystem: current status and way forward.* Retrieved from: http://psa.gov.in/sites/default/files/pdf/RD-book-for-WEB.pdf

Emerson, R, M., Fretz, R, I., Shaw, L, L. (2011). *Writing ethnographic fieldnotes,* 2nd ed. Chicago: The University of Chicago Press.

Emirbayer, M., and Mische, A. (1998). What is Agency? *American Journal of Sociology, 103*(4). https://doi.org/10.1086/231294

Erosa, V, E. (2012). Dealing with cultural issues in the Triple Helix Model implementation: A comparison among government, university and business culture. *Procedia – Social and Behavioral Science, 52*, 25-34. https://doi.org/10.1016/j.sbspro.2012.09.438

Etzkowitz, H., and Leydesdorff, L (2000). The dynamics of innovation: from National Systems and ''Mode 2'' to a Triple Helix of university–industry–government relations. *Research Policy, 29*(2), 109-123. https://doi.org/10.1016/S0048-7333(99)00055-4

EY. (2023). *How India is emerging as the world's technology and services hub.* Policy Insights Paper Retrieved from: https://www.ey.com/en_in/insights/india-at-100/how-india-is-emerging-as-the-world-s-technology-and-services-hub

Fanon, F (1963). *The Wretched of the Earth.* Grove Weidenfield.

Fetters, M, D., and Rubinstein, E, B. (2019). The £Cs of content, context, and concepts: a practical approach to recording unstructured field observations. *Annals of Family Medicine, 17*(6), 554-560. Retrieved from: https://pubmed.ncbi.nlm.nih.gov/31712294/

Feuer, M., Towne, L., and Shavelson, R, J. (2002). Scientific culture and educational research.

Educational Researcher, 31(8), 4 – 14, DOI:10.3102/0013189X031008004

Fiala, D., and Tutoky, G. (2017). Computer science paper in web of science: a bibliometric analysis. *Publications, 5*(4), 23 – 28. https://doi.org/10.3390/publications5040023

Finnegan, D, E., and Gamson, Z, E. (1996). Disciplinary adaptations to research culture in comprehensive institutions. *The Review of Higher Education, 19*(2), 141-177. https://doi.org/10.1353/rhe.1996.0028

Fortado, B., and Fadil, P. (2012). The four faces of organisational culture. *Competitiveness Review: An International Business Journal incorporating Journal of Global Competitiveness, 22*(4), 283-298. doi: 10.1108/10595421411247132

Frietsch, R., Torben, S., & Rothengatter, O. (2017). An analysis of the Excellence Initiative and its effects on the funded universities," *Studien zum deutschen Innovationssystem, 11* Expertenkommission Forschung und Innovation (EFI) - Commission of Experts for Research and Innovation, Berlin. Retrieved from: https://ideas.repec.org/p/zbw/efisdi/112017.html

Fussy, D. S. (2019). The hurdles to fostering research in Tanzanian universities. *Higher Education, 77*(2), 283–299. https://doi.org/10.1007/s10734-018-0276-8

Garnham, N., and Williams, R. (1980). Pierre Bourdieu and the sociology of culture: an introduction. *Media, Culture and Society, 2*(3), 209 – 223. https://doi.org/10.1177/016344378000200302

Gerhart, B. (2008). Cross cultural management research: assumptions, evidence and suggested directions. *International Journal of Cross Cultural Management, 8*(3), 259 – 274. Retrieved from: https://journals.sagepub.com/doi/pdf/10.1177/1470595808096669

Ghosh, S. (2023). *Indian lawmakers greenlight National Research Foundation.* Nature India (News Feature). Retrieved from: https://www.nature.com/articles/d44151-023-00111-2

Ghosh, A., and Sood, A, K. (2024). Materials research will be central to India's technology missions, but a culture shift is needed. *Nature Reviews Materials, 9*(4), doi: 10.1038/s41578-024-00667-0

Gnanam, A (1990). *Report of the UGC Committee towards New Educational Management.* University Grants Commission. New Delhi. Retrieved from: https://www.ugc.ac.in/oldpdf/pub/report/7.pdf

Geertz, C. (1973). The interpretation of cultures. New York: Basic Books Inc Publishers

Gergen, K. (2012). The social dimension of social psychology: A historical analysis. *Handbook of the History of Social Psychology.* 137-158, doi: 10.4324/9780203808498.ch7

Gerritsen, R. (2014). Canvases of political competition: image production as politics in Tamil Nadu, India. *Ethnos 79*(4), 551-576. Retrieved from: https://doi.org/10.1080/00141844.2013.793208

Geyer, A. (2014). *The German Excellence Initiative.* In OECD. Promoting Research Excellence: New

approaches to funding. Retrieved from: https://www.oecd.org/content/dam/oecd/en/publications/reports/2014/02/promoting-research-excellence_g1g3951a/9789264207462-en.pdf

Godfrey, E. (2015). Understanding disciplinary cultures: the first step to cultural change. In. A Johri and B. M. Olds (eds.). *Cambridge Handbook of Engineering Education Research*, pp.437-456. https://doi.org/10.1017/CBO9781139013451.028

Godin, B., and Schauz, D. (2016). The changing identity of research: a cultural and conceptual history. *History of Science: an annual review of literature, research, and testing, 54*(3), https://doi.org/10.1177/0073275316656007

Goldkuhl, G. (2012). Pragmatics vs interpretivism in qualitative information systems research. *European Journal of Information Systems, 21*(2), 135 – 146. doi: 10.1057/ejis.2011.54

Goldstein, D, A, N. (2024). Reversals of capacity: norms, culture and institutional disruption. *The Journal of Politics,* 86(2). https://doi.org/10.1086/726969

Goswami, N. Unequal higher educational attainment across social backgrounds in West Bengal, India:
a sociological analysis. *Cogent Social Sciences, 8*(1). https://doi.org/10.1080/23311886.2022.2144135

Goulden, M., Greiffenhagen, C., Crowcroft, J., McAuley, D., Mortier, R., Radenkovic, M., & Sathiaseelan, A. (2017). Wild interdisciplinarity: ethnography and computer science, *International Journal of Social Research Methodology, 20*(2), 137-150. doi: 10.1080/13645579.2016.1152022

Government of India. (2020). New Education Policy – Final Policy. Retrieved from: https://www.education.gov.in/nep/about-nep#:~:text=National%20Education%20Policy%2C%202020&text=The%20NEP%202020%20is%20founded,the%20present%20and%20the%20future.

Government of India. Intellectual Property India (2021a). *Annual Report 2020-2021.* Author. Retrieved from: https://ipindia.gov.in/writereaddata/Portal/IPOAnnualReport/1_112_1_Final_English_AR_2020-21_for_Net.pdf

Government of India. Ministry of Higher Education (2021b). *All India Survey on Higher Education 2020-21.* Author. Retrieved from: https://aishe.gov.in/aishe/viewDocument.action;jsessionid=77E27E8279EE7BF4237ECA3FA9592EC9.n3-documentId=352

Government of India. Office of the Principal Scientific Advisor (2024). *Anusandhan National Research Foundation.* Retrieved from: https://www.psa.gov.in/nrf

Government of India (2024). Ministry of Education, Department of Higher Education and Department of School Education and Literacy. *Annual Report.* Retrieved from: https://www.india.gov.in/annual-reports-ministry-education-0

Government of India. One Nation One Subscription. (2025). *About.* Retrieved from:

https://www.onos.gov.in/

Government of Maharashtra. Industries Department (2019). *New Industrial Policy 2019 – For Futuristic Maharashtra.* Retrieved from: https://maitri.mahaonline.gov.in/PDF/Industrial%20Policy%20-%202019.pdf

Government of Maharashtra. Higher and Technical Education Department (2023a). *Focus Areas.* Retrieved from: https://htedu.maharashtra.gov.in/Main/FocusAreas

Government of Maharashtra. Higher and Technical Education Department (2023b). *Rastriya Uchchatar Shiksha Abhiya scheme.* Retrieved from: https://htedu.maharashtra.gov.in/Main/RUSA

Government of Maharashtra. (2023c). *Rajiv Gandhi Science and Technology Commission.* Retrieved from: https://rgstc.maharashtra.gov.in/index.php/commission

Government of Maharashtra (2023d). *Empowered Autonomous Cluster Institutions.* Retrieved from: https://htedu.maharashtra.gov.in/Main/UniqueInitiative

Government of Tamil Nadu (1992). *Tamil Nadu State Council for Higher Education Act.* Retrieved from: https://tnsche.tn.gov.in/media/tansche_act.pdf

Government of Tamil Nadu (2022). Research and Development Policy. Retrieved from: https://spc.tn.gov.in/policy/tamil-nadu-rd-policy-2022/

Government of Tamil Nadu (2024a). *Higher Education Department (2023). Policy Note 2023-24.* Author. Retrieved from: https://cms.tn.gov.in/sites/default/files/documents/hedu_e_pn_2023_24.pdf

Government of Tamil Nadu (2024b). Higher Education Department. *Policy Note 2024-25.* Author. Retrieved from: https://cms.tn.gov.in/cms_migrated/document/docfiles/hedu_e_pn_2024_25.pdf

Goyal, S., Chauhan, S., and Kapoor, A. (2020). Understanding the challenges in the research and innovation ecosystem in India. In E. Popkova and B. S. Bergi (Eds). *The 21st century from the positions of modern science: intellectual, digital, and innovative aspects.* Springer

Green, W., and Hansman, C. Understanding power, politics, and organizational culture in order to effectively develop interdisciplinar disciplinary partnerships. *Adult Education in Global Times: An International Research Conference (AEGT2020) (Vancouver, BC).* Retrieved from: https://newprairiepress.org/aerc/2020/

Grimson, A. (2010). Culture and identity: two different notions. *Journal for the Study of Race, Nation and Culture*, 1, 61 – 77. https://doi.org/10.1080/13504630903465894

Griswold, W. (2004). *Culture and societies in a changing world.* (Second Ed). SAGE Publications

Grossberg, L. (2010). James W. Carey and the conversation of culture. In C. Christians (Ed.), *Key concepts in critical cultural studies.* University of Illinois Press.

Gu, M. M., and Lee, J. C. K. (2019). “They lost internationalization in pursuit of internationalization”:

students' language practices and identity construction in a cross-disciplinary EMI program in a university in China. *Higher Education, 78*(3), 389–405. https://doi.org/10.1007/s10734-018-0342-2

Gridhar, P, P. (2009). Editorial. *Translation Today, 6*(1), 6 – 10, Retrieved from: https://www.anukriti.net/

Guba, E, G., and Lindoln, Y, S. (1994). Competing paradigms in qualitative research. In N. K Denzin and Y.S. Lincoln (Eds.), *Handbook of Qualitative Research*, p.105–117. Washington: SAGE Publications. Retrieved from: https://psycnet.apa.org/record/1994-98625-005

Guillemin M, Heggen K. (2011). The Narrative Approach as a Learning Strategy in the Formation of Novice Researchers. *Qualitative Health Research, 22*(5):700-707. doi:10.1177/1049732311431443

Gunster, S. (2000). Revisiting the culture industry thesis: mass culture and the commodity form. *Cultural Critique, 45,* 40 -70. https://www.jstor.org/stable/1354367

Hanson, M. (2012). Kuhn's the structure of scientific revolutions in East Asia, expanded. *East Asian Science, Technology and Society: an international journal, 6*(4), 561-567, DOI: 10.1215/18752160-1906549

Haslanger, S. (2017). Culture and critique. *Aristotelian Society Supplementary Volume, 91*(21), 149-173. doi:10.1093/arisup/akx001

Harcourt, B, E. (2007). An answer to the question: "What is poststructuralism?" University of Chicago Public Law Working Paper No. 156. Retrieved from: https://scholarship.law.columbia.edu/faculty_scholarship/1466/

Harouel, J, L. (2001). Sociology of culture. *International Encyclopaedia of the Social and Behavioural Sciences.* Retrieved from: https://philpapers.org/rec/HARSOC-2

Hayhoe, R. (2019). The gift of Indian higher learning traditions to the global research university. *Asia-Pacific Journal of Education, 39*(2), 177-189. https://doi.org/10.1080/02188791.2019.1621799

Hazelkorn, E. (2009). Rankings and the battle for world-class excellence: institutional strategies and policy choices. *Journal of Higher Education Policy and Management, 21*(1), 4. https://arrow.tudublin.ie/cserart/2/

Hegde, S. (2016). The gift of a life and death: Rohith Vermula and 'Us'. *Economic and Political Weekly, 51*(49), 28-30. Retrieved from: https://www.jstor.org/stable/44165928

Heine, S, J., and Ruby, M, B. (2010). Cultural psychology, *Advanced Review. 1*(2), 254 – 266. doi: https://doi.org/10.1002/wcs.7

Henning, C. (2017). Theories of culture in the Frankfurt school of critical theory. In M, J, Thompson (Ed). *The Palgrave Handbook of Critical Theory.* Doi: 10.1057/978-1-137-55801-5_12

Heyard, R., Hottenrott, H. The value of research funding for knowledge creation and dissemination: A

study of SNSF Research Grants. *Humanities and Social Sciences Communications, 8*, 217 (2021). https://doi.org/10.1057/s41599-021-00891-x

Hill, R. (1999). *Revisiting the term 'research culture.'* held at HERDSA Annual International Conference, Melbourne

Holden, J. (2015). *The ecology of culture.* Swindon: Cultural Value Project: Arts and Humanities Research Council

Holliday, A. (2010). *Complexity in cultural identity. Language and intercultural communication, 10*(2), 165–177. https://doi.org/10.1080/14708470903267384

Holligan, C. (2011). Feudalism and academia: UK academics' accounts of research culture. *International Journal of Qualitative Studies in Education, 24*(1), 55–75. https://doi.org/10.1080/09518398.2010.485134

Horkheimer, M. (1931.) Die gegenwärtige Lage der Sozialphilosophie und die Aufgaben eines Instituts für Sozialforschung. In *Sozialphilosophische Studien: Aufsätze, Reden und Vorträge 1930–1972,* ed. Werner Brede, 33–46. Frankfurt/M.: Fischer 1981. English as The present situation of social philosophy and the tasks of an Institute of Social Research". Retrieved from: www.marxists.org/reference/archive/ horkheimer/1931/present-situation.html

Horkheimer, M., and Adorno, T. (1944). *Dialektik der Aufklärung: Philosophische Fragmente. Leipzig: Reclam 1989.* English as Dialectic of enlightenment: Philosophical fragments. Stanford: Stanford University Press

HT Correspondent. (2023). *University of Mumbai signs MOUs with 2 US Universities.* Hindustan Times. Retrieved from: https://www.hindustantimes.com/cities/mumbai-news/university-of-mumbai-signs-mous-with-2-us-universities

Huber, L. (1990). Disciplinary cultures and social reproduction. *European Journal of Education, 25*(3), 241 – 261, https://www.jstor.org/stable/1503315

Husband, G. (2020). Ethical data collection and recognising the impact of semi-structured interviews on research respondents. *Education Science, 10*(8), 206. https://doi.org/10.3390/educsci10080206

Hutcheon, P, D. (1999). *Building character and culture.* USA: Praeger Publishers

Inden, R, B. (2000). *Imagining India.* C Hurst and Co Publishers Ltd

Indian Council of Historical Research (2023). *About us.* Retrieved from: http://ichr.ac.in/v3/history.php

Indian Council of Social Science Research (2023). *Our vision and mission.* Retrieved from: https://www.icssr.org/about-icssr

India Japan Laboratory (2022). *Keio University AY 2022-23 Activity Summary Report.* Retrieved from: https://indiajapanlab.org/wpIJ/wp-content/uploads/2024/09/2022-2023-IJL-Activity-Summary-2022-English.pdf

International Institute of Population Science (2021). Assessing urban vulnerabilities in Maharashtra.

Ion, G., and Castro Ceacero, D. (2017). Transitions in the manifestations of the research culture of Spanish universities. *Higher Education Research and Development, 36*(2), 311–324. https://doi.org/10.1080/07294360.2016.1208153

iTNT Hub. (2024). About us. Retrieved from: https://itnthub.tn.gov.in/

Jacob, K, S. (2019). The cultures of academic medicine in India. *The National Medical Journal of India, 32*(5), 308-310. doi: 10.4103/0970-258X.295958

Jackson, K. (2021). "What should I do know?" Navigating relational ethics in practice as an early career researcher as illustrated by a qualitative interview study about women's drinking practices. *International Journal of Qualitative Methods, 20*, https://doi.org/10.1177/1609406920986044

Jaishankar, D., and Sirkar, T. (2024). India's Tech strategy: an introductory overview. Background Paper, Foreign Policy and Security. *ORF America.* Retrieved from: https://orfamerica.org/newresearch/india-technology-policy

Jalote, P. (2021). *Building research universities in India (SAGE Studies in Higher Education).* SAGE Publications. Retrieved from: https://sk.sagepub.com/book/mono/building-research-universities-in-india/toc

Jayal, N, G. (2023). *India: History and thrust of overall higher education and research pattern.* In. D. Kapur, L. Kong., F. Lo., and D, M, Malone. The Oxford Handbook of Higher education in the Asia-Pacific region. Oxford University Press. Retrieved from: https://global.oup.com/academic/product/the-oxford-handbook-of-higher-education-in-the-asia-pacific-region-9780192845986?cc=ch&lang=en&

Jayaram, N. (2011). *Toward world-class status? The IIT system and IIT Bombay.* In P. G. Altbach & S. Jha (Eds.), It all adds up, the story of V. K. Bansal. New Delhi: Penguin Enterprise.

Jeffrey, R. (2022). *Introduction.* In. B. Freeman. Australian-Asian Research collaborations in the humanities: Mapping the present, planning the future. Australia India Institute. Retrieved from: https://aii.unimelb.edu.au/wp-content/uploads/2022/05/03-LASP-ASIA-LAYOUT-V2-INDIA-FINAL.pdf

Jessop, T., and Maleckar, B. (2016). The influence of disciplinary assessment patterns on student learning: a comparative study. *Studies in Higher Education, 41*(4), 696 – 711.

Jiang, F, K., and Hyland (2023). Titles in research articles: changes across time and disciplines, *Association of Learned and Professional Society Publishers, 36*(2), 239 – 248. https://doi.org/10.1002/leap.1498

Johnson, L, R. (2017). *Community based qualitative research: approaches for education and the social sciences.* SAGE Publications, Inc. Retrieved from: https://methods.sagepub.com/book/community-based-qualitative-research

Joshi, D., & McGrath, K. (2015). *Political ideology, public policy and human development: explaining the gap between Gujarat and Tamil Nadu. 10*.1080/00472336.2014.1003392. Retrieved from: https://ink.library.smu.edu.sg/soss_research/1949/

Kallio, H., Pietila, A-M., Johnson, M., and Kangasniemi, M. (2016). Systematic methodological review: developing a framework for qualitative semi-structured interview guide. *Journal of Advanced Nursing, 72*(12), 2954-2965. doi: 10.1111/jan.13031

Kapur, D., and Mehta, P, B. (2004). Indian higher education reform: from half-baked socialism to Half-baked capitalism. *CID Working Papers 108.* Cambridge: Harvard University. Retrieved from: https://dash.harvard.edu/handle/1/42406326

Kashima, Y. (2000). Conceptions of culture and person for psychology. Journal of cross-cultural psychology, *Journal of Cross-Cultural Psychology, 31*(1), 14 – 32. https://doi.org/10.1177/0022022100031001003

Kastenhofer, K. (2007). Converging epistemic cultures? A discussion drawing on empirical findings. Innovation: *The European Journal of Social Science Research, 20*(4), 359-373. http://dx.doi.org/10.1080/13511610701767908

Kaur, N., & Singh Bhatt, M. (2020). The Face of Education and the Faceless Teacher Post COVID-19. *Journal of Humanities and Social Sciences Research, 2,* 39-48. https://doi.org/10.37534/bp.jhssr.2020.v2.nS.id1030.p39

Keesing, R, M. (1974). Theories of culture. *Annual Review of Anthropology, 3,* 73 – 97. https://doi.org/10.1146/annurev.an.03.100174.000445

Khwaja, S & Javed, R (2023). *Private higher education in India: Challenges and Prospects.* International Journal of Private Higher Education, 1(3), 1 – 22. Doi: 10.60166/DQTP8780

King, R. (2011). *Globalisation and higher education.* In. J. Brennan and T. Shah. Eds. Higher education and society in changing times: looking back and looking forward. Centre for Higher Education Research and Information. The Open University

Koroshetz, W, J., Behrman, S., Brame, C., Branchaw, J., Brown, E., Clark, E, A., Dockterman, D., Elm, J.,
Gay, P., Green, K., His, S., Kaplitt, M, G., Kolber, B., Kolodkin, A., Lipscombe, D., Macleod, M., McKinney, M., Munafo, M, R., Oakley, B., Olimpo, J., Percie, N., Raman, I., Riley, C., Shelton, A.,, Uzzo, S, M., Crawford, D, C., and Silberberg, S, D. (2020). Research culture: Framework for advancing rigorous research. *eLifesciences, 9*, DOI: https://doi.org/10.7554/eLife.55915

Kowal, S., and O' Connell. (2004). The transcription of conversation. In. U. Flick., E. V. Kardorff., and I. Steinke. (Eds.), *A companion to qualitative research.* London: SAGE Publications

Koya, K., & Chowdhury, G. (2020). Measuring impact of academic research in computer and information science on society. In: *APIT 2020: Proceedings of the 2020 2nd Asia Pacific Information Technology Conference.* 17-19 Jan 2020, Bali Island, Indonesia. pp. 78-85. Retrieved from: https://eprints.whiterose.ac.uk/188268/

Krauss, S. E., Hamzah, A., Omar, Z., Suandi, T., Ismail, I. A., Zahari, M. Z., and Nor, Z. M. (2009). Preliminary investigation and interview guide development for studying how Malaysian farmers form their mental models of farming. *The Qualitative Report, 14*(2), 245-260. https://doi.org/10.46743/2160-3715/2009.1382

Kroeber, A, L., and Kluckhohn, C. (1952). *Culture: a critical review of concepts and definition.* Papers of the Peabody Museum of Archaeology and Ethnology, Harvard University. New York: Vintage Books

Krieger, A. (2016). Germany: equality of excellence. *Nature, 537,* S12-S13. https://doi.org/10.1038/537S12a

Krieger, B. (2024). Heterogeneous university funding programs and regional firm innovation: An empirical analysis of the German Excellence Initiative. *Research Policy, 53*(5), https://doi.org/10.1016/j.respol.2024.104995

Krishna, K. (2024). *Mediating role of the scientific elite.* In. The Indian Science Community. Routledge India. Retrieved from: https://www.taylorfrancis.com/chapters/mono/10.4324/9781003512646-8/mediating-role-scientific-elite-venni-krishna

Krücken, G. (2014). Higher education reforms and unintended consequences: a research agenda. *Studies in Higher Education, 39*(8), 1439–1450. https://doi.org/10.1080/03075079.2014.949539

Kuhn, T, S. (1962). *The structure of scientific revolution.* University of Chicago Press: Chicago

Kulkarni, M. (2014). Memories of Maratha history and regional identity in Maharashtra, India. *India Review, 13*(4), 358-371. doi: 101080/14736489.2014.965006

Kumar, K. (2021). Colony and empire, colonialism and imperialism: a meaningful distinction? *Comparative Studies in Society and History, 63*(2), 280-309. doi:10.1017/S0010417521000050

Kumar, A., Singh, M., & Ranjan, C. (2018). Measuring the research output of IITs with special reference to Web of Science database: a bibliometric approach. *Library Philosophy and Practice (e-journal).* Retrieved from: https://digitalcommons.unl.edu/libphilprac/2077/

Kumaravadivelu, B. (2007). *Cultural globalisation and language education.* Yale University Press

Lambert, P., & Schofield, P. (2004). Introduction. In, P. Lambert & P. Schofield (Eds.)., *Making History: an introduction to the history and practices of a discipline.* London: Routledge. Retrieved from: https://doi.org/10.4324/9780203645024

Latour, B. (1993). *We have never been modern* (translated by Catherine Porter). Cambridge: Harvard University Press

Latour, B. (1998). From the world of science to the world of research? *Science, 280*(5361), 208-209. doi: 10.1126/science.280.5361.20

Lee, J, J. (2007). The shaping of the departmental culture: measuring the relative influences of the institution and discipline. *Journal of Higher Education Policy and Management, 29*(1), 41-55, DOI: 10.1080/13600800601175771

Lee, J, J., & Haupt, J, P. (2020). Scientific globalism during a global crisis: research collaboration and

open access publications on COVID-19. *Higher Education 81*, 949–966 (2021). https://doi.org/10.1007/s10734-020-00589-0

Lem, P. (2023). *High hopes, low expectations for National Research Foundation. Times Higher Education.* Retrieved from: https://www.timeshighereducation.com/news/high-hopes-low-expectations-national-research-foundation

Lewis, T., and Simmons, L. (2010). Creating research culture in Caribbean universities. *International Journal of Educational Development, 30*(4), 337–344. https://doi.org/10.1016/j.ijedudev.2009.08.005

Lowe, P., and Phillipson, J. (2009). Barriers to research collaboration across disciplines: scientific paradigms and institutional practices. *Environment and Planning Administration, 41*(1), 1171 – 1184. doi:10.1068/a4175

Loyola College. (2024). *About Loyola.* Retrieved from: https://www.loyolacollege.edu/about/home

Lushington, G., & Chaguturu, R. (2016). Biomedical research: a house of cards? *Future Medicinal Chemistry, 8*(1), 1 – 5. Doi: 10.4155/fmc.15.171

Macfie, A, L. (2013). Towards a new definition of history, *Rethinking History, 17*(3), 401-412. https://doi.org/10.1080/13642529.2013.774730

Madhan, M. (2024). *The One Nation One Subscription scheme is no game changer.* University World News. Retrieved from: https://www.universityworldnews.com/post.php?story=20241211082524609

Mangla, A. (2015). Bureaucratic norms and state capacity in India: Implementing Primary Education in the Himalayan Region. *Asian Survey, 55*(5), 882 – 909. DOI:10.1525/AS.2015.55.5.882.

Marcovich, G, G. (2018). On the potentialities (and limits) of collaboration in global history. *L'Atelier du Centre de recherches historiques*. 18. doi: https://doi.org/10.4000/acrh.8074

Marginson, S., and Rhoades, G. (2002). Beyond national states, markets, and systems of higher education: A glonacal agency heuristic. *Higher Education 43,* 281–309. https://doi.org/10.1023/A:1014699605875

Marginson, S. (2011). Higher education in East Asia and Singapore: rise of the Confucian Model. *Higher Education, 61*(5), 587 – 611. https://doi.org/10.1007/s10734-010-9384-9

Marginson, S. (2020). The world research system: Expansion, diversification, network and hierarchy. In C. Callender, W. Locke, and S. Marginson (Eds.), *Changing higher education for a changing world.* London, England: Bloomsbury.

Marginson, S., and Yang, L. (2020). The role of higher education in generating 'public' and 'common' goods: a comparison of Sinic and Anglo-American political cultures. *Centre for Global Higher Education Working Paper no. 52.* Retrieved from: https://www.researchcghe.org/perch/resources/publications/working-paper-52.pdf

Marginson, S (2021a). *Heterogeneous systems and common objects: the relation between global and*

national science. Centre For Global Higher Education. Special report. Retrieved from: https://www.researchcghe.org/wp-content/uploads/migrate/publications/cghe-special-report-april-2021.pdf

Marginson, S (2021b). Global science and national comparisons: beyond bibliometrics and scientometrics. *Comparative Education, 58*(2), 125-146. https://doi.org/10.1080/03050068.2021.1981725

Marginson, S (2022). What is global higher education? *Oxford Review of Education, 48*(4), 492–517. https://doi.org/10.1080/03054985.2022.2061438

Marks, S, P (2018). Challenges of knowledge creation for Indian universities. In C. Raj Kumar (Ed). The future of Indian universities: *Comparative and international perspectives* (pp.192-221). Retrieved from: https://doi.org/10.1093/oso/9780199480654.001.0001

Markusen, A. (2011). *California's Arts and Cultural Ecology.* San Francisco: James Irvine Foundation

Martin, J. (2002). *Organisational culture: mapping the terrain.* London: SAFE Publications Inc

Mathews, E. (2017). The contradictions of private higher education expansion in India. *International Higher Education*, 91(4), 27-29. Retrieved from: https://doi.org/10.6017/ihe.2017.91.10137

Matthews, E. (2022). *Elite private universities are shaking up the HE sector.* University World News. 03 December. Retrieved from: https://www.universityworldnews.com/post.php?story=20221129094334661

Mattumannil, S. (2023). The left approach to social diversity: How the Communist Party interacted with Kerala's social landscape. *Cognitive Social Sciences, 10*(1), https://doi.org/10.1080/23311886.2023.2292840

McLean, M., Abbas, A., and Ashwin, P. (2013). A Bernsteinian view of learning and teaching undergraduate sociology-based social science. *Enhancing Learning in the Social Sciences, 5*(2), 32 – 44, https://doi.org/10.11120/elss.2013.00009

McMorrow, A. (2018). Introducing poststructuralism in international relations theory. *E-international Relations.* Retrieved from: https://www.e-ir.info/2018/02/13/introducing-poststructuralism-in-international-relations-theory/

McNeill, D. (2019). Japanese universities test collaboration. *Nature, 567*(7748), S9 – S11. doi: 10.1038/d41586-019-00830-6

Mendez, E, H., and Cruz, M, R, R. (2014). Research culture in higher education: the case of a foreign language department in Mexico. *PROFILE Issues in Teachers' Professional Development*, 16(2), 135 – 151. Retrieved from: http://dx.doi.org/10.15446/profile.v16n2.40819

Merton, R, K. (1973). *The sociology of science: theoretical and empirical investigation.* University of Chicago Press: Chicago

Miller, T, R., Baird, T, D., Littlefield, C, M., Kofinas, G., Chapin III, F, S., and Redman, C, L. (2008). Epistemological pluralism: reorganising interdisciplinary research. *Ecology and Society, 13*(2), 46 – 64. http://www.ecologyandsociety.org/vol13/iss2/art46/

Ministry of Education (2021). *All India Survey On Higher Education (2021)*. Retrieved from: https://cdnbbsr.s3waas.gov.in/s392049debbe566ca5782a3045cf300a3c/uploads/2024/02/20240719952688509.pdf

Ministry of Education (2023). *National Institutional Ranking Framework – overall 2023 indicators.* Retrieved from: https://www.nirfindia.org/Rankings/2023/Ranking.html

Ministry of Education (2024). *Statistics.* Retrieved from: https://www.education.gov.in/statistics-new?shs_term_node_tid_depth=384

Ministry of Human Resource Development (1992). National Education on Policy 1986 (revised in 1992). Retrieved from: https://web.archive.org/web/20101126024709/http://education.nic.in/policy/npe86-mod92.pdf

Ministry of Human Resource Development. (2020a). National Institutional Ranking Framework. Retrieved from: https://www.nirfindia.org/Home

Ministry of Human Resource Development (2020b). National Education Policy 2020. Retrieved from: https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf

Ministry of Human Resources Development (2021). *Department of Higher Education.* Retrieved from: https://www.education.gov.in/hi/higher_education

Ministry of Human Resources Development (2023). *Annual Report 2021 – 2022.* Retrieved from: https://www.education.gov.in/sites/upload_files/mhrd/files/document-reports/AR_2023-24_en.pdf

Ministry of Science and Technology (2023). *Introduction to Biomedicine and Biotechnology.* Retrieved from: https://dbtindia.gov.in/scientific-directorates/emerging-frontiers-biotechnology/biomedical-sciences

Misra, R., and Singh, S. (2015). *Continuum of ignorance in Indian universities.* Economic and Political Weekly, 50(48), 1 – 3. Retrieved from: https://www.epw.in/journal/2015/48/discussion/continuum-ignorance-indian-universities.html

Mitsunobo, S. (1998). The world conception of Japanese social science: the Kōza faction, the Ōtsuka school, and the Uno school of economics. *Positions, 6*(1), 67 – 112. https://doi.org/10.1215/10679847-6-1-67

Morillo, F., Bordon, M., & Gomez, I. (2003). Interdisciplinarity in science: A tentative typology of disciplines and research areas. *Journal of the American Society for Information Science and Technology, 54*(13), 1237 – 1249. https://doi.org/10.1002/asi.10326

Muller, J. (2009). Forms of knowledge and curriculum coherence, *Journal of Education and Work, 22*(3), 205-226. doi: 10.1080/13639080902957905

Murmu, D. (2023). *165th convocation of University of Madras. Rashtrapati Bhavan.* Retrieved from:

https://presidentofindia.nic.in/press_releases/president-india-graces-165th-convocation-university-madras

Murthy, A U.R. (2000) Towards the concept of a new nationhood: Languages and literatures in India. In *Contemporary India: Transitions,* ed. Peter Ronald de Souza, 37–48. New Delhi: Fundacao Orient and Sage Publications.

Nalanda University. (2020). *History and revival.* Retrieved from: https://nalandauniv.edu.in/about-nalanda/history-and-revival

Nandy, A. (1989). The political culture of the Indian state. Daedalus, 118(4), 1 – 26. Retrieved from: https://www.jstor.org/stable/20025262

Nandy, A. (1991). *At the edge of psychology: essays in politics and culture.* Oxford India Paperback.

Narasimhan, R., & Rao, PVS. (1984). Computer science and technology in India: A critical assessment. *Sadhana, 7,* 203 – 222. https://doi.org/10.1007/BF02743887

Narayan, S. (2018). The Dravidian years: politics and welfare in Tamil Nadu. New Delhi: Oxford University Press, 2018. Retrieved from: https://global.oup.com/academic/product/the-dravidian-years-9780199488179?lang=en&cc=ch

Natesan, S, D., & Marathe, R, R. (2021). MGNREGA Implementation in Tamil Nadu: voices from the fields. *Indian Journal of Human Development, 15*(1), 128-137. DOI: 10.1177/09737030211008298

National Science Board (2018). *Science and Engineering Indicators 2018: Outputs of S&E research – publications.* Retrieved from: https://www.nsf.gov/statistics/2018/nsb20181/assets/nsb20181.pdf

National Science Board (2023). *Publication output: International collaboration and citations.* Retrieved from: https://ncses.nsf.gov/pubs/nsb202333/international-collaboration-and-citations

National Testing Agency (2023). *About us.* Retrieved from: https://www.nta.ac.in/about

National Translation Mission (2023). *Origin.* Retrieved from: https://www.ntm.org.in/languages/english/origin.aspx

National University of Educational and Planning Administration (2017). *CPRHE Policy Brief on Diversity and Inclusion Higher education. Policy Brief 1.* Retrieved from: https://www.ugc.gov.in/pdfnews/8714294_CPRHE-POLICY-BRIEF-1-Diversity-and-Inclusion-in-HE.pdf

Nature (2023a). *Nature Index – Amity University, Institution outputs.* Retrieved from: https://www.nature.com/nature-index/institution-outputs/articles/all/global/India/Amity%20University/all

Nature (2023b). *SRM Institute of Science and Technology, India. Research Leader Index.* Retrieved from: https://www.nature.com/nature-index/institution-outputs/india/srm-institute-of-science-and-technology/5295b132140ba0ac67000000

Neale, A. (1985). Animism and Totemism in Popular Culture. *The Journal of Popular Culture, 19*(2), 15-24. https://doi.org/10.1111/j.0022-3840.1985.00015.x

Nerland, M., Jensen, K., and Bekele, T, A. (2010). Changing cultures of knowledge and learning in higher education, *The Norwegian Research Council.* Retrieved from: https://www.uv.uio.no/iped/forskning/prosjekter/eie-utd2020forprosjekt/HEIK-Utd2020-Part2-Changing_cultures.pdf

Nesi, H., and Gardner, S. (2006). Variation in disciplinary culture: university tutors' views on assessed writing tasks. In. *Language, Culture and Identity in Applied Linguistics.* Ed. R. Kiely. Equinox Publishing Ltd.

Nilekani, N. (2008). *Imagining India: The idea of a renewed nation.* Penguin Group

NITI Aayog (2020). *India Innovation Index.* Retrieved from: https://niti.gov.in/sites/default/files/2021-01/IndiaInnovationReport2020Book.pdf

Noftre, D., Priestley, M., & Alberts, G. (2014). When technology became language: the origins of the linguistic conception of computer programming, 1950-1960. *Technology and Culture, 55*(1), 40-75, 2. DOI: 10.1353/tech.2014.0031

Nowotny, H. (1993). Socially distributed knowledge: five spaces for science to meet the public. *Public Understanding of Science, 2*(4), 307-319. https://doi.org/10.1088/0963-6625/2/4/002

Nowotny, H., Scott, P, B., and Gibbons, M, T. (2001). *Re-thinking science: knowledge and the public in an age of uncertainty.* Polity: Cambridge

Nuffield Council on Bioethics (2014). *The findings of a series of engagement activities exploring the culture of scientific research in the UK.* https://www.nuffieldbioethics.org/publications/the-culture-of-scientific-research

Oancea, A., Florez-Petour, T., and Atkinson, J. (2015). The ecologies and economy of cultural value from research. *International Journal of cultural Policy, 24*(1), 1 – 24. https://doi.org/10.1080/10286632.2015.1128418

Ogbor, J. (2001). Critical theory and hegemony of corporate culture. *Journal of Organizational Change Management, 14*(6), 590 – 608. https://doi.org/10.1108/09534810110408015

Oloyede, O. (2002). Disciplinary cultures and academic leadership. *Society in Transition, 33*(1), 116–133. https://doi.org/10.1080/21528586.2002.10419054

Padmanabhan, S. (2021). To take or not to take: is the freebie culture in Tamil Nadu elections a threat to Indian democracy? *Asian Journal of Political Science, 29*(2), 215-237. Retrieved from: https://doi.org/10.1080/02185377.2021.1951783

Pal, Y (2009). *Report of the Committee to Advise on Renovation and Rejuvenation of Higher Education.* New Delhi: Ministry of Human Resource Development. Retrieved from: https://www.education.gov.in/sites/upload_files/mhrd/files/document-reports/YPC-Report_0.pdf

Paliwal, A. (2023). How India's caste system limits diversity in science. *Nature, 613*(7943), 230-234. doi:10.1038/d41586-023-00015-2

Pan, S. Y. (2006). Economic globalization, politicocultural identity and university autonomy: The struggle of Tsinghua University in China. *Journal of Education Policy, 21*(3), 245–266. https://doi.org/10.1080/02680930600600242

Panigrahi, J. (2018). Innovative Financing of Higher Education: Changing Options and Implications. *Higher Education for the Future, 5*(1), 61-74. https://doi.org/10.1177/2347631117738644

Paranjape, M, S. (2017). Deepening crisis of governance in University of Mumbai. *Economic and Political Weekly, 52*(41). Retrieved from: https://www.epw.in/journal/2017/41/commentary/deepening-crisis-governance-university-mumbai.html

Paranjape, M, R. (2012). *Making India: Colonialism, national culture, and the afterlife of Indian English authority.* Sophia Studies in Cross-cultural Philosophy of Traditions and Cultures, vol 2. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-4661-9_1

Parthasarathi R, Sinha SP (2016). Towards a Better Health Care Delivery System: The Tamil Nadu model. *Indian Journal of Community Medicine.* 41(4):302-304. doi: 10.4103/0970-0218.193344. PMID: 27890982; PMCID: PMC5112973.

Patel, P, J. (2012). Academic underperformance of Indian universities, incompatible academic culture and the societal context. *Social Change, 42*(1), 9 – 29, https://doi.org/10.1177/004908571104200102

Patel, P. J. (2016). Research Culture in Indian Universities. *Social Change, 46*(2), 238–259. https://doi.org/10.1177/0049085716635398

Petricek, T. (2019). *Cultures of programming: understanding the history of programming through controversies and technical artefacts*, 1, 1 – 75. Retrieved from: https://tomasp.net/academic/drafts/cultures/cultures.pdf

Pickstone, J, V. (2007). Working knowledges before and after circa 1800: practices and disciplines in the history of science, technology, and music. *Isis (The History of Science Society), 98,* 489 – 516. doi: 0021-1753/2007/9803-0003$10.00

Pillai, K., & Obasanjo, I. (2023). Assessing the implementation of India's new health reform program, Ayushman Bhatat, in two Southern states: Kerala and Tamil Nadu. *World Medical and Health Policy, 15*, 6 – 20.

Pinto, M. (1984). *Federalism and higher education: Indian experience.* Hyderabad: Sangam Books Ltd.

Popper, K, R. (1962). *Conjectures and refutations: the growth of scientific knowledge.* New York: Basic Books

Pradhan, N (2018). Governance and management of higher education in India: An overview. *Bhatter College Journal of Multidisciplinary, 8*(1), 31-38. Retrieved from: http://www.bcjms.bhattercollege.ac.in/v8/n1/v8n1sc03.pdf

Pratt, M., Margaritis, D., and Coy, D. (1999). Developing a research culture in a university faculty. *Journal of Higher Education Policy and Management, 21*(1), 43–55. https://doi.org/10.1080/1360080990210104

Priyam, M. (2022). Introduction. In Ed. Reclaiming public universities: comparative reflections for reforms. New Delhi: Routledge India. Retrieved from: https://www.routledge.com/Reclaiming-Public-Universities-Comparative-Reflections-for-Reforms/Priyam/p/book/9781032134796?srsltid=AfmBOooi1hoC5sNB5FUc7uIfCslPdVHlxwQU39uU8mcNX0448FFkFvlp

PRS Legislative Research (2022). Standing Committee Report Summary. Review of Higher Education Institutions

PRS Legislative Research (2024). *Tamil Nadu Budget Analysis 2023-24.* Retrieved from: https://prsindia.org/budgets/states/tamil-nadu-budget-analysis-2024-25

Radcliffe-Brown, A, R. (1952). *Structure and function in primitive society: essays and addresses.* London: Cohen West

Raj Kumar, C. (2018). *The future of Indian universities: Comparative and international perspectives (Ed).* Oxford Scholarship Online. Retrieved from: https://doi.org/10.1093/oso/9780199480654.001.0001

Raud, R. (2016). *Meaning in action: outline of an integral theory of culture.* Polity Publishers

Ravi, S., Gupta, N., and Nagaraj, P. (2019). *Reviving Higher Education in India.* (Research Paper No.112019-01) Retrieved from Brookings India: https://www.brookings.edu/research/reviving-higher-education-in-india/

Reckwitz, A. (2002). The status of the "material" in theories of culture: from "social structure" to "artefacts." *Journal for the Theory of Social Behaviour, 32*(2), 195 – 218. https://doi.org/10.1111/1468-5914.00183

Rees, C, E., Crampton, P, E, S., and Monrouxe, L, V. (2020). Revisioning academic medicine through a constructionist lens. *Academic Medicine, 95*(6), 846 – 50. https://doi.org/10.1097/ACM.0000000000003109

Registrar General and Census Commissioner of India (2024). *Language Atlas.* Retrieved from: https://language.census.gov.in/map/data/showAtlas

Reinholz, D., Matz, R, L., Cole, R., and Apkarian, N. (2019). STEM is not a monolith: a preliminary analysis of variation in STEM disciplinary cultures and implications for change – Meeting Paper. *CBE-Life Sciences Education, 18*, 1-19. Retrieved from: https://www.lifescied.org/doi/pdf/10.1187/cbe.19-02-0038

Rescher, N. (2003). *Epistemology: an introduction to the theory of knowledge.* State University of New York Press.

Reymert, I., Vabo, A., Borlaugh, S, B., and Jungblut, J. (2022). Barriers to attracting the best

researchers: perceptions of academics in economics and physics in three European countries. *Higher Education, 86*(2), 1173 – 1193. https://doi.org/10.1007/s10734-022-00967-w

Rizvi, F., and Gorur, R. (2011). Challenges facing Indian higher education. *Fearless Nadia Occasional Papers, Australia India Institute, 2,* Winter. Retrieved from: https://www.aii.unimelb.edu.au/wp-content/uploads/2019/01/2011-W-V2-Challenges-Facing-Indian-Higher-Education_1.p

Rizvi, F., Lingard, B., and Lavia, J. (2006). Postcolonialism and education: negotiating a contested terrain. *Pedagogy, Culture and Society, 14*(3), 249-262. https://doi.org/10.1080/14681360600891852

Rogers, Y., Scaife, M., & Rizzo, A. (2005). Interdisciplinarity: an emergent or engineered process? In S.
J. Derry., C, D., Schunn., & M, A., Gernsbacher (Eds.), *Interdisciplinary collaboration: an emerging cognitive science.* New York: Psychology Press. doi: https://doi.org/10.4324/9781410613073

Rong, M. (2016). Scientific innovation and knowledge creation can drive social development: a Chinese perspective. *Social Change, 46*(2), 267 – 272. https://doi.org/10.1177/0049085716635407

Rossow, J, P. (2020). Developing a faculty research culture in higher education: a South African perspective. *Bulgarian Comparative Education Society, 18*, 248 – 255. DOI: 10.1080/13600800601175771

Roulston, K (2020). Epistemology and interviews: using interviews in the 21st century. In G. W. Noblit (Ed.), *The Oxford Encyclopaedia of Qualitative Research Methods in Education.* Oxford University Press. Retrieved from: https://www.oxfordreference.com/view/10.1093/acref/9780190643751.001.0001/acref-9780190643751-e-55

Ruscio, K.P. (1987). Many sectors, many professions. In B.R. Clark (Ed.) *The Academic Profession* (pp.331-368). Berkeley, CA: University of California Press

Sackmann, S., & Phillips, M, E. (2004). *One's many cultures: a multiple cultures perspective.* In N, A, Boyacigiller., R, A. Goodman., & M, E, Phillips. Cross Cultures: Insights from Master Teachers. London: Routledge

Sadik, B. (2018). Research output analysis of top six universities of Tamil Nadu, India: A scientometric view. *Library Philosophy and Practice.* Retrieved from: http://digitalcommons.unl.edu/libphilprac/1854

Sagiv, L., and Schwartz, S, H. (2022). Personal values across cultures. *Annual Review of Psychology, 73*, 517 – 546. https://doi.org/10.1146/annurev-psych-020821-125100

Salazar-Clemeña, R, M., and Almonte-Acosta, S. (2007). Developing research culture in Philippine higher education institution: perspectives of university faculty. *UNESCO Forum on Higher Education, Research and Knowledge.* Retrieved from:

https://www.semanticscholar.org/paper/Pres-Developing-Research-Culture-in-Philippine-%3A-of-Salazar-Clemena-Almonte-Acosta/6b670b4aac3f2713db319ea743c158d650b8c82d

Salmi, J. (2009). *The challenge of establishing world-class universities.* Washington, DC: World Bank Publications. Retrieved from: https://openknowledge.worldbank.org/handle/10986/2600?locale-attribute=en

Salto, D, J. (2022). Do academic disciplines matter? An analysis of organizational responses to the accreditation of graduate programs by field of study and sector. *Journal of Higher Education, 84*(3), 569-587. Doi: https://doi.org/10.1007/s10734-021-00789-2

Santhakumar, R., Kaliyaperumal, & Louies, S. (2020). Scientometric profile of the University of Madras, the Mother of South Indian Universities. *DESIDOC Journal of Library and Information Technology, 40*(3), 185-191. doi: 10.14429/djlit.40.03.14844

Saxena, R, P. (1990). Governance of Indian universities: from decay to dynamism? *Higher Education, 20,* 91 – 111. https://doi.org/10.1007/BF00162206

Sawyerr, A. (2004). African universities and the challenge of research capacity development. *Journal of Higher Education in Africa, 2*(1), 213 – 242.

Sengupta, A. (2019). Improving research in India: introducing undergraduate research in higher education. *ORF Issue Brief No. 277.* Observer Research Foundation

Seth, S. (2009). Historical sociology and postcolonial theory. *International Political Sociology, 3*(3), 334 – 338. doi: 10.1111/j.1749-5687.2009.00079_4.x

Schein, E. H. (1984). Coming to a new awareness of organizational culture. *Sloan Management Review, 25*, 3-16. https://sloanreview.mit.edu/article/coming-to-a-new-awareness-of-organizational-culture/

Science Europe (2024). *Research culture: our priorities.* Retrieved from: https://scienceeurope.org/our-priorities/research-culture/

Scripps, S., Ghoshroy, S., Burgess, L., & Marsh, A. (2013). Sharing credit: public historians and scientists reflecting on collaboration. The Public Historian, 35(2), 46 – 71. Retrieved from: https://www.jstor.org/stable/10.1525/tph.2013.35.2.46

Sengupta, A. (2019). *Improving research in India: Introducing undergraduate research in higher education.* ORF Issue Brief. Retrieved from: https://www.orfonline.org/public/uploads/posts/pdf/20230917120102.pdf

Shah, A, M. (2005). Higher education and research: roots of mediocrity. *Economic and Political Weekly, 40*(22), pp. 2234-2242. https://www.jstor.org/stable/4416701

Shah, A., and Lerche, J. (2021). Black lives matter, capital, and ideology: spiraling out from India. *The British Journal of Psychology, 72*(1), 93-105. https://doi.org/10.1111/1468-4446.12815

Sharma, E. (2019). Mushrooming higher education institutions: quality of education and employability. *Annals of Social Sciences and Management Studies, 3*(2), 36 – 37. doi: 10.19080/ASM.2019.03.555607

Shimahara, N. (1970). Enculturation – a reconsideration. *Current Anthropology, 11*(2). Retrieved from: https://www.journals.uchicago.edu/doi/abs/10.1086/201115

Shin, J. C., and Lee, S. J. (2015). Evolution of research universities as a national research system in Korea: accomplishments and challenges. *Higher Education, 70*(2), 187–202. https://doi.org/10.1007/s10734-014-9847-5

Shweder, R, A. (2007). The resolute irresolution of Clifford Geetz. *Common Knowledge, 13*(2), 191 – 2016. doi: 10.1215/0961754X-2007-001

Siddiqui, K (2020). A comparative political economy of China and India: a critical review. In K. Young-Chan (ed). *Understanding China* (pp.31 – 58). Springer International Publishing

Singh, A. (2004). Challenges in higher education. *Economic and Political Weekly, 39*(21), p. 2155 – 2158. Retrieved from: https://www.jstor.org/stable/4415063

Singh, R, J., & Chaudhary, P. (2018). Measuring impact of organisational culture on creativity in higher education. *Quality Assurance in Education, 26*(4), 410-422. https://doi.org/10.1108/QAE-04-2018-0041

Singh, V, K., Uddin, A., & Pinto, D. (2015). Computer science research: the top 100 institutions in India and in the world. *Scientometrics, 104*(2), 529-553. http://dx.doi.org/10.1007/s11192-015-1612-8

Singhal, K., Banshal, S, K., Uddin, A., & Singh, V, K. (2015). A scientometric analysis of computer science research in India. Institute of Electrical and Electronics Engineers. doi: 10.1109/IC3.2015.7346675

Smerek, R, E. (2010). Cultural perspectives of academia: toward a model of cultural complexity. In. J. Smart (Ed). *Higher Education: Handbook of theory and research.* Springer. Doi: 10.1007/978-90-481-8598-6_10

Spivak, G, C. (1988). *Can the subaltern speak?* In C. Nelson and L. Grossberg eds. Marxism and the Interpretation of Culture. London: Macmillan

Sporn, B. (1996). Managing university culture: an analysis of the relationship between institutional culture and management approaches. *Higher Education, 32,* 41-61. https://doi.org/10.1007/BF0013921

Srinivasan, A. (2022). *The Indian Institutes of Technology: a sociology of knowledge perspective.* In M. Priyam (Ed). Reclaiming Public Universities. New Delhi: Routledge India. Retrieved from: https://www.taylorfrancis.com/chapters/edit/10.4324/9781003229384-10/indian-institutes-technology-amrit-srinivasan

Srivastava, V, K. (2017). The state of research culture in Indian universities. *Social Change, 47*(1), 101 – 107, https://doi.org/10.1177/0049085716681914

Srivastava, A., and Chattopadhyay, S. (2022). The Dynamics of Union-State Relations and Higher Education in India. In Eds. S. Chattopadhyay, S. Marginson, and N.V. Varghese (Eds) Changing Higher Education in India, London: Bloomsbury Academic.

Srivastava, A. (2023). *Rethinking education as an economic good: analysing the proliferation of private universities across India.* Retrieved from: https://core.ac.uk/reader/82954420

SRM Institute of Science and Technology (2023a). *Policy on incentives.* Retrieved from: https://webstor.srmist.edu.in/web_assets/downloads/2023/incentives-policy.pdf

SRM Institute of Science and Technology (2023b). *Yearly Status Report 2022-23.* Retrieved from: aqar-2022-23.pdf

SRM Institute of Science and Technology (2024a). *SRM In Focus.* Retrieved from: https://www.srmist.edu.in/about-us/

SRM Institute of Science and Technology (2024b). *SRM Research.* Retrieved from: https://www.srmist.edu.in/research/

Steinhardt, I., Bauer, M., Wunsche, H., and Schimmler, S. (2022). The connection of open science practices and the methodological approach of researchers. *Quality and Quantity, 57*, 3621 – 3636. https://doi.org/10.1007/s11135-022-01524-4

Steward, J. (1962). *Alfred Kroeber 1876 – 1960. Biographical Memoir.* National Academy of Sciences. Washington D.C.

Suarez-Villa, L (2012). *Technocapitalism: a critical perspective on technological innovation and corporatism.* Temple University Press.

Subramanian, N. (2002). Identity politics and social pluralism: political sociology and political change in Tamil Nadu. *Journal of Commonwealth and Comparative Politics, 40*(3), 125-139.

Subramanian, A. (2007). The evolution of institutions in India and its relationship with economic growth. *Oxford Review of Economic Policy, 23*(2), 196 – 220. https://doi.org/10.1093/oxrep/grm014

Subramaniam, B. (2014). *Ghost stories for Darwin: the science of variation and the politics of diversity.* Urbana: University of Illinois Press. Retrieved from: https://www.jstor.org/stable/10.5406/j.ctt6wr5ch

Subramanian, A. (2019). *Building the IITs.* The Caste of Merit: Engineering Education in India. Harvard University Press.

Sudhir, PK., and Murty, S, S. (2020) Excellence in research and innovation in Indian universities: Retrospect and way forward. In P. Mittal and S. Rama Devi Pani (eds). *Reimagining Indian Universities.* Association of Indian Universities: New Delhi

Sujatha, R. (2022). *Madras University to sign pact with the University of Passau.* The Hindu. Retrieved from: https://www.thehindu.com/news/national/tamil-nadu/madras-universitys-journalism-department-signs-pact-with-german-varsity/article65981652.ece

Tamil Nadu State Council for Science and Technology. *About Us.* Retrieved from: https://www.tanscst.tn.gov.in/

Tatarchenko, K. (2019). Thinking algorithmically: from cold war computer science to the socialist information culture. *Historical Studies in the Natural Science, 49*(2), 194 – 225. https://doi.org/10.1525/hsns.2019.49.2.194

Teri, D. (2022). *Madras University, University of Melbourne collaborate for research opportunities.* Indian Express. Retrieved from: https://indianexpress.com/article/education/madras-university-university-of-melbourne-join-hands-for-research-opportunities-8146709/

Terre-Blanche, M. and Durrheim, K. (2006). Histories of the present: social science research in context. In Terre-Blanche, M., Durrheim, K. and Painter, D. (Eds). *Research in practice: applied methods for the social sciences.* 2nd rev. ed. Cape Town: University of Cape Town Press. pp. 1-17.

Terry, G., and Hayfield, N. (2020). Reflexive thematic analysis. In M. Ward, and S. Delamont (Eds.), *Handbook of Qualitative Research in Education* (430-441). (2nd ed). Cheltenham, Gloucestershire: Edward Elgar Publishing Ltd

The Academy of Medical Sciences (2016). *Improving the recognition of team science contributions in biomedical research careers.* Retrieved from: https://acmedsci.ac.uk/file-download/6924621

The Academy of Medical Sciences. (2019). *From innovation to implementation: team science two years on.* Retrieved from: https://acmedsci.ac.uk/file-download/52394024

The Hindu. (2022). *Maharashtra political turmoil updates.* Author. Retrieved from: https://www.thehindu.com/news/national/other-states/maharashtra-political-turmoil-live-updates-june-30-2022/article65584565.ece

The Institutes of Technology Act (1961). Retrieved from: https://www.indiacode.nic.in/handle/123456789/1705?view_type=browseandsam_handle=

The Indian Institute of Technology Bombay (2017). *Supplementary Document – SWOT analysis.* Retrieved from: https://www.iitb.ac.in/sites/www.iitb.ac.in/files/Supplementary%20Document.pdf

The Indian Institute of Technology (2022). *Activity Report 2021-22.* Retrieved from: https://acr.iitbombay.org/wp-content/uploads/2022/12/Fund-Utilization-Report-2021-22CompressPdf.pdf

The Indian Institute of Technology Bombay (2023a). *Industrial Research and Consultancy Centre.* Retrieved from: https://www.ircc.iitb.ac.in/IRCC-Webpage/index.html 4 November 2023

The Indian Institute of Technology Bombay (2023b). *Introduction.* Retrieved from: https://www.iitb.ac.in/about

The Indian Institute of Technology Bombay (2023c). *About Institution of Eminence Scheme.* Retrieved from: https://ioe.iitb.ac.in/about-us

The Indian Institute of Technology Bombay (2023d). *2017-2022 Strategic Plan.* Retrieved from: https://www.iitb.ac.in/sites/www.iitb.ac.in/files/Strategic%20Plan%20%282017-22%29_2.pdf

The Indian Institute of Technology Bombay (2023e). *Institute of Eminence Proposal.* Retrieved from: https://www.iitb.ac.in/sites/www.iitb.ac.in/files/iitb-ioe-proposal.pdf

The Indian Institute of Technology Bombay (2023f). *Staff Handbook.* Retrieved from: https://www.iitb.ac.in/sites/www.iitb.ac.in/files/2023-11/Staff%20handbook.pdf

The Indian Institute of Technology Bombay (2023g). *Industrial Research and Development Unit – Administration.* Retrieved from: https://rnd.iitb.ac.in/message_from_dean

The Royal Society. (2018). Research culture: changing expectations conference report. Retrieved from: https://royalsociety.org/topics-policy/projects/research-culture/changing-expectations/

The Royal Society. (2024). Research culture. Retrieved from: https://royalsociety.org/news-resources/projects/research-culture/

Thelwal, M., Simrick, S., Viney, I., & Van den Besselaar, P. (2023). What is research funding, how does it influence research, and how is it recorded? Key dimensions of variation. *Scientometrics,* 128, 6085 – 6106. https://doi.org/10.1007/s11192-023-04836-w

Thorat, S., and Verma, S. (2021). *Reimagining India's social science research policy.* Economic and Political Weekly, 56(49). Retrieved from: https://www.epw.in/journal/2021/49/special-articles/reimagining-indias-social-science-research-policy.html

Tierney, W. (1988). Organisational culture in higher education: Defining the essentials. *The Journal of Higher Education, 59*(1), 2 – 21. doi: 10.2307/1981868

Tierney, W. G. (2016). Research excellence in Indian higher education: An American perspective. *Social Change, 46*(2), 277–285. https://doi.org/10.1177/0049085716654625

Tierney, W, G., and Sabharwal, N, S. (2017). Academic corruption: culture and trust in Indian higher education, International Journal of Educational Development. *Elsevier, 55,* 30 – 40. Retrieved from: https://ideas.repec.org/a/eee/injoed/v55y2017icp30-40.html

Tijdink, J, K., Schipper, K., Bouter, L, M., Pont, P, M., de Jonge, J., & Smulders, Y, M. (2016). How do scientists perceive the current publication culture? A qualitative focus group interview study among Dutch biomedical researchers. *BMJ Open, 6,* doi:10.1136/bmjopen-2015-008681

Tikekara, A. (2006). *The Cloister's Pale: A biography of the University of Mumbai.* Popular Prakashan

Trainor, L.R., and Bundon, A. (2020). Developing the craft: reflexive accounts of doing reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health,* 13, 705 - 726. https://doi.org/10.1080/2159676X.2020.1840423

Trautman, T, R. (2012). Does India have history? Does history have India? *Comparative Studies in Society and History, 54*(1), 174 – 205, https://www.jstor.org/stable/41428712

Tsung, L., and Clarke, M. (2010). Dilemmas of identity, language, and culture in higher education in China. *Asia Pacific Journal of Education, 30*(1), 57–69. https://doi.org/10.1080/02188790903503593

Tsevtkova, E., and Lomer, S. (2019). Academic excellence as "competitiveness enhancement" in Russian higher education. *International Journal of Comparative Education and Development, 21*(2), 127-144. doi: 10.1108/IJCED-08-2018-0029

Turner, S., and Sullenger, K. (1999). Kuhn in the classroom, Lakatos in the lab: science educators confront the nature-of-science debate. *Science, Technology and Human Values, 24*(1), 5 – 30. https://doi.org/10.1177/016224399902400102

Tylor, E, B. (1871). *Primitive culture: Researches into the development of mythology, philosophy, religion, language, art and custom.* New York: Brentanos.

University of Birmingham (2024). *University of Birmingham supports Government of Maharashtra in tackling priority areas using AI.* Retrieved from: https://www.birmingham.ac.uk/news/2024/university-of-birmingham-supports-government-of-maharashtra-in-tackling-priority-areas-using-ai

University of Madras (1884). *Address Delivered to the Graduates Admitted at the Convocation.* Kessinger Publishing

University of Madras. (2021). *Institutional Strategic Plan 2021-2022.* Retrieved from us: https://www.unom.ac.in/webportal/uploads/university/strategic_plan.pdf

University of Madras. (2023a). *About Us – History and Heritage.* Retrieved from: https://www.unom.ac.in/index.php?route=university/university

University of Madras. (2023b). *University Industry Community Interaction Centre.* Retrieved from: https://www.unom.ac.in/index.php?route=curricular/uicic

University of Madras. (2023c). *National Assessment and Accreditation Council – Cycle 4.* Retrieved from: https://www.unom.ac.in/index.php?route=naac/naac#:~:text=The%20University%20of%20Madras%20submitted,score%203.59%20in%20August%202023.

University of Madras. (2023d). *Self-Study Report for 4th Cycle of Accreditation.* Retrieved from: https://www.unom.ac.in/webportal/uploads/naac/ssr_report.pdf

University of Madras. (2023e). *Madras University Library.* Retrieved from: https://www.unom.ac.in/webportal/uploads/library/mul/

University of Mumbai (2021). *NAAC Report 2021.* Retrieved from: https://old.mu.ac.in/useful-link/naac/

University of Mumbai. (2023a). *About Us.* Retrieved from: https://mu.ac.in/about-us

University of Mumbai (2023b). Vision. Retrieved from: https://mu.ac.in/vision

University of Mumbai (2024a). *Research Administration and Promotion Cell.* Retrieved from: https://mu.ac.in/rapc

University Grants Commission. (1956). *The University Grants Commission Act, 1956 (as modified up to the 20th December, 1985) and Rules and Regulations Under the Act.* New Delhi

University Grants Commission. (1984). *UGC's policy and programme for improvement of research in universities.* Retrieved from: https://www.ugc.ac.in/oldpdf/pub/report/3.pdf

University Grants Commission (2010). *Gazette – UGC Institutions Deemed to Be Universities Regulations, 2010.* Retrieved from: https://www.ugc.gov.in/oldpdf/regulations/gazzeetenglish.pdf

University Grants Commission (2018). *Gazette – UGC regulations on minimum qualifications for appointment of teachers and other academic staff in universities and colleges and measures for the maintenance of standards in higher education.* Retrieved from: https://www.ugc.gov.in/pdfnews/4033931_UGC-Regulation_min_Qualification_Jul2018.pdf

University Grants Commission (2019a). *Promoting the quality of research by faculty and creation of new knowledge and strategies for improving research culture in colleges / universities.* Retrieved from: https://www.ugc.ac.in/pdfnews/5816125_Promoting-and-Improving.pdf

University Grants Commission (2019b). *Annual Report.* Retrieved from: https://www.ugc.ac.in/pdfnews/3060779_UGC-ANNUAL-REPORT--ENGLISH--2018-19.pdf

University Grants Commission. (2019c). STRIDE – Scheme for Trans-disciplinary Research for India's Developing Economy. New Delhi

University Grants Commission (2023). *About Institutions of Eminence.* Retrieved from: https://ioe.ugc.ac.in/

University Grants Commission (2025). *Regulations.* Retrieved from: https://www.ugc.gov.in/regulations

Urvashi, S. (2020). Reimagining crises in the Indian university. *Human Arenas,* 1 – 10. https://doi.org/10.1007/s42087-020-00160-4

Vajpayei, A (2016). *Ashis Nandy: Why Nationalism and Secularism Failed Together.* Reset Dialogues on Civilizations. Retrieved from: https://www.resetdoc.org/story/ashis-nandy-why-nationalism-and-secularism-failed-together/

Välimaa, J. (1998) Culture and identity in higher education research. *Higher Education, 36,* 119–138. https://doi.org/10.1023/A:1003248918874

Varghese, N, V. (2021). *Financing of higher education in India: Public versus private financing of higher education.* University Grants Commission.

Varghese, N, V., & Malik, G. (2019). *Institutional autonomy and governance of higher education institutions in India.* In. The Governance and Management of Universities in Asia. Routledge. Retrieved from: https://www.taylorfrancis.com/chapters/edit/10.4324/9780429427831-4/institutional-autonomy-governance-higher-education-institutions-india-varghese-garima-malik

Vienni-Baptista, B., and Klein, J, T. (2022). *Institutionalizing interdisciplinarity and transdisciplinarity Collaboration across cultures and communities.* Routledge. Retrieved from: https://www.routledge.com/Institutionalizing-Interdisciplinarity-and-Transdisciplinarity-

Collaboration-across-Cultures-and-Communities/Vienni-Baptista-ThompsonKlein/p/book/9780367654344?srsltid=AfmBOortCzZuLX-2OVC0PrIkDGLIzUVVr3bSfU6GeB-RCoCEz_AOt6uS

Vedachalan, N. (2021). India's innovation ecosystem: Mapping the trends. *ORF Issue Brief No. 442.* Observer Research Foundation

Verma, M. (2011). Return of the politics of nativism in Maharashtra. *The Indian Journal of Political Science, 72*(3), 747-758. Retrieved from: https://www.jstor.org/stable/41858848

Vinod, M, J., and Deshpande, M. (2013). *Contemporary political theory.* PH Learning.

Wagner, C, S., and Leydesdorff, L (2005). Network structure, self-organisation, and the growth of international collaboration in science. *Research Policy, 34*(10), 1608-1618. https://doi.org/10.1016/j.respol.2005.08.002

Wagner, C. S., Park, H. W., and Leydesdorff, L. (2015). The continuing growth of global cooperation networks in research: A conundrum for national governments. *PLoS ONE, 10*(7), e0131816–e0131816. https://doi.org/10.1371/journal.pone.0131816

Wallerstein, I. (1990). Culture as the ideological battleground of the modern world-system. *Theory, culture, and society. 7*(2), 31 – 55. https://doi.org/10.1177/02632769000700200

Wallerstein, I. (1994). *Geopolitics and geoculture: essays on the changing world-system.* London: Cambridge University Press.

Wang, B. (2016). The social and historical construction of social constructionism: Prof. KJ Gergen in dialogue. *Culture and Psychology, 22*(4). Retrieved from: DOI: 10.1177/1354067X16663007

Wellcome (2020). *What researchers think about the culture they work in.* Retrieved from: https://wellcome.ac.uk/reports/what-researchers-think-about-research-culture

Williams, R. (1958). *Culture and society 1780–1950.* Chatto and Windus

Williams, R. (1961). *The Long Revolution.* Chatto and Windus

Williams, R. (1976). *Keywords: a vocabulary of culture and society.* London: Croom Helm

Wyatt, A. (2013). Populism and politics in contemporary Tamil Nadu. *Contemporary South Asia, 21*(4), 365-381. Retrieved from: https://doi.org/10.1080/09584935.2013.803036

Wyk, B, V., & Jacobs, A, HM. (2012). Cultural change and the emergence of the knowledge-driven economy. *South African Journal of Higher Education, 26*(2). doi: https://doi.org/10.20853/26-6-219

Xie, Z., & Willett, P. (2012). The development of computer science research in the People's Republic of China 2000-2009: a bibliometric study. Information Development, 29(3), 251 – 264. https://doi.org/10.1177/0266666912458515

Xu, X., Oancea, A and Rose, H. (2021). The impacts of incentives for international publications on

research culture in Chinese humanities and social sciences. *Minerva, 59*(4), 469 – 492. https://doi.org/10.1007/s11024-021-09441-w

Yadav, S. (2024). *How urbanisation – and Hinduisation – stripping India's Indigenous communities of their cultural heritage.* The Conversation. Retrieved from: https://theconversation.com/how-urbanisation-and-hinduisation-is-stripping-indias-indigenous-communities-of-their-cultural-heritage-221176

Yang, L., Ikbal Oldac, Y., & Nkansah, J. O. (2023). What makes scientists collaborate? International collaboration between scientists in traditionally non-central science systems. *Higher Education Research & Development, 43*(1), 243–259. https://doi.org/10.1080/07294360.2023.2218803

Ylijoki, O-H. (2000). Disciplinary cultures and the moral order of studying – a case-study of four Finnish university departments. *Higher Education, 39*, 339 – 362, https://doi.org/10.1023/A:1003920230873

Yokoyama, K. (2014). *Reasoning higher education change: structure, agency and culture.* Peter Lang Edition, Internationaler Verlag Der Wissenschaften

Young, R, A., and Popadiuk, N, E. (2012). Social constructionist theories in vocational psychology. In. *Social Constructionism in Vocational Psychology and Career Development.* DOI:10.1007/978-94-6209-080-4_2

Ylonen, A., Gillespie, H., and Green, A. (2018). Disciplinary differences and other variations in assessment cultures in higher education: exploring variability and inconsistencies in one university in England. *Assessment and Evaluation in Higher Education, 43*(6), 1009 – 1017. doi: 10.1080/02602938.2018.1425369

Zacharewicz, T., Pavon, M, P., Martos, L, A, P., & Lepori, B. (2023). Do funding modes matter? A multilevel analysis of funding allocation mechanisms on university research performance, *Research Evaluation, 32*(3), 545-556. https://doi.org/10.1093/reseval/rvad023

Zhou, H., Guns, R., & Engels, T, C, E. (2022). Are social sciences becoming more interdisciplinary? Evidence from publications 1960-2014. *Journal for Association for Information Science and Technology, 73*(9), 1199 – 1361. https://doi.org/10.1002/asi.24627

APPENDICES

A Participant information sheet

Research culture(s) in India: an exploration of the disciplinary, institutional and system dimensions

PARTICIPANT INFORMATION SHEET

Central University Research Ethics Committee (CUREC) Approval Reference: **CIA-21-233**

1. Why is this research being conducted?

The focus of this study will be to develop an understanding research culture in India at the level of disciplines (namely, computer engineering, history, and biomedical science), higher education institutions (HEIs) and at the regional and national system level.

It will involve semi-structured interviews with researchers and research-leaders in HEIs across Maharashtra and Tamil Nadu and will build on earlier work with HEIs based in Delhi. These interviews will be coupled with discussion with key government actors in the relevant departments for higher education and science and research to explore system-level research culture. Through a 45-minute to an hour-long semi-structured interview, the discussion will cover themes including resourcing, measures and conditions that support excellent research, the role of governance (both institutional and at the level of region / national), mechanisms to nurture talent and other themes research culture that emerge during the discussion. It will focus on the interrelationship between disciplinary research culture, HEIs and at the wider system level.

The study has the potential to make a positive contribution to the Indian research ecosystem through a better understanding of the tensions and opportunities in research culture and identifying the elements in research culture that are distinctive to the Indian context.

2. Why have I been invited to take part?

You have been invited for one or more of the following reasons:

1) You are a current research active member of staff within a university in Maharashtra / Tamil Nadu
2) You are involved in shaping and setting research policy either for a university in Maharashtra / Tamil Nadu or at a state / national level.
3) You have professional expertise and/or interest in research policy and culture as it relates to the Karnataka / Tamil Nadu and/or India wide context.

4) You are a doctoral student (or equivalent research degree) studying in a university in Maharashtra / Tamil Nadu
5) You have previously worked in a university in Maharashtra / Tamil Nadu in the previously identified disciplines

3. Do I have to take part?

No. You can ask questions about the research before deciding whether or not to take part. If you do agree to take part, you may withdraw yourself from the study at any time, without giving a reason, by advising me of this decision. If you do withdraw, any data that contains your responses will be promptly discarded and not form the analysis of this study, up until the point of thesis submission and publication. The thesis will be submitted in 2023.

4. What will happen to me if I take part in the research?

You will be invited to attend one 45-minute interview that will take place on Microsoft Teams, a secure videoconferencing platform or at a pre-arranged meeting place within your university / institution. You will meet me with me as the primary researcher of this study for a semi-structured interview, where we will discuss the key issues associated with the study.

Your responses will be typed up in a password protected laptop and as well as through a password protected, phone-based audio software, which will be analysed at a later time. Your responses will be aggregated into broader themes and categories. Where a quote is to be utilised as part of the publication of findings, your name and affiliated institution will not be attributed in any way. There may be a reference to the distinguishing feature that is indirectly related to your institution and region (i.e. public university).

The interview/session will be conducted in English. However, I am fluent in Tamil and have a limited understanding of Hindi where this may be helpful. You can also ask to pause the interview at any time.

5. Are there any potential risks in taking part?

There may be a small risk that you could be identified when taking part in such study. However, the utmost effort will be made to protect your anonymity. To reduce the risk, your responses will be anonymised and aggregated into broad clusters and themes. If a quote is used, your responses will be pseudonymised. It will be impossible to directly attribute quotes to you.

Your time and effort is very valued in this study. I will ensure that I communicate with you in advance of your interview, with details about logistics and other requirements.

6. Are there any benefits in taking part?

There will be no direct or personal benefit to you from taking part in this research. However, it is hoped that your contributions can make a positive difference to understanding research culture in India.

7. ***What happens to the data provide?***

The information you provide during the study is the **research data**. Any research data from which you can be identified is known as **personal data**.

Personal / sensitive data will be stored electronically, in an encrypted folder that will only be accessed by me and the supervisor of this study for the purposes of this research. The data collected will be stored for 2 years. **Other research data** (including consent forms) will be stored for at least 3 years after publication or public release of the work of the research. Responsible members of the University of Oxford may be given access to data for monitoring and/or audit of the research.

I would like your permission to use anonymised data in future studies, and to share data with other researchers (e.g. in online databases). All personal information that could identify you will be removed or changed before information is shared with other researchers or results are made public.]

8. Will the research be published?

The research may be published in academic publications and journal articles. It will also be published in a DPhil Thesis publication which will be stored in the Department of Education Library, University of Oxford.

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

On successful submission of the thesis, it may be deposited both in print and online in the University archives to facilitate its use in future research. If so, the thesis will be openly accessible.

9. Who has reviewed this study?

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee (Reference number: CIA-21-233).

10. Who do I contact if I have a concern about the study or I wish to complain?

If you have a concern about any aspect of this study, please contact Minto Felix at jenith.jothifelix@education.ox.ac.uk. Alternatively, you can contact my supervisors, Professor Alis Oancea at alis.oancea@education.ox.ac.uk or Professor Simon Marginson at simon.marginson@education.ox.ac.uk and we will collectively do our best to answer your query. I/we will acknowledge your concern within 5 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Departmental Research Ethics Committee of the Department of Education at the University of Oxford who will seek to resolve the matter as soon as possible.

11. Data Protection

The University of Oxford is the data controller with respect to your personal data, and as such will determine how your personal data is used in the study.

The University will process your personal data for the purpose of the research outlined above. Research is a task that is performed in the public interest.

Further information about your rights with respect to your personal data is available from http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/.

12. Further Information and Contact Details

If you would like to discuss the research with someone beforehand (or if you have questions afterwards), please contact:

Minto Felix
Department of Education
15 Norham Gardens, OX2 6PY
University email: jenith.jothifelix@education.ox.ac.uk

B Participant consent form

PARTICIPANT CONSENT FORM

Central University Research Ethics Committee (CUREC) Approval Reference: **CIA-21-233**

Research culture(s) in India: an exploration of the disciplinary, institutional and system dimensions

The focus of this study will be to develop an understanding research culture in India at the level of disciplines (namely, computer engineering, history, and biomedical science), higher education institutions (HEIs) and at the regional and national system level. It will involve semi-structured interviews (between 45 minutes and 1-hour) with researchers and research-leaders in HEIs across Maharashtra and Tamil Nadu. These interviews will be coupled with discussion with key government actors in the relevant departments for higher education and science and research to explore system-level research culture.

		Please initial each box
1	I confirm that I have read and understand the information sheet version_____dated _____ for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2	I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, and without any adverse consequences or penalty.	☐
3	I understand that research data collected during the study may be looked at by authorised people outside the research team. I give permission for these individuals to access my data.	☐
4	I understand that this project has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee.	☐
5	I understand who will have access to personal data provided, how the data will be stored and what will happen to the data at the end of the project.	☐
6	I understand how this research will be written up and published.	☐
7	I understand how to raise a concern or make a complaint.	☐
12 c	[Where relevant] I agree to the use of pseudo anonymised quotes in research outputs. In providing my quote, my affiliated institution or role will not be identified.	☐

_____	dd / mm / yyyy	_____
Name of Participant	Date	Signature

_____	dd / mm / yyyy	_____
Name of person taking consent	Date	Signature

C Ethical approval

CUREC approval CIA-21-233

Dear Minto,

'Research culture(s) in India: an exploration of the disciplinary, institutional and system dimensions'

The above application has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, based on the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

Please continue to follow all current guidance issued by CUREC during the pandemic, notably COVID-19: CUREC guidance on research involving human participants, https://researchsupport.admin.ox.ac.uk/governance/ethics/coronavirus

Please follow the guidance on online data collection and research methods issued by the University,

(1) https://researchsupport.admin.ox.ac.uk/covid-19/data#collapse2299911

(2) https://infosec.web.ox.ac.uk/article/guidelines-for-using-zoom

If relevant, please also check the CUREC website for their best practice research guides, https://researchsupport.admin.ox.ac.uk/governance/ethics/resources/bpg

Stay safe,

Yours sincerely,

Pinar

Pinar Kolancali

Researcher in Child Development and Learning

Departmental Research Ethics Committee Member

15 Norham Gardens, Oxford OX2 6PY

Email: pinar.kolancali@education.ox.ac.uk

D HEI interview schedule

Commence interview

Introduction

- Welcome and outline the purpose of the study
- Confirm that the conversation is confidential and that you are recording the notes for transcription purpose
- Clarify any questions and set out time length for discussion. Remind participants that they can withdraw their involvement at any point during the discussion.
- Obtain verbal consent on record if not previously provided in written form

Demographic questions

- Role –
- Discipline –
- Department Institution –
- Years of service –

Disciplinary research culture

- Define disciplinary research culture – *In disciplines, researchers work within a common set of languages, norms, and traditions; they become a professional community who enforce these norms among emerging scholars.*

- What are methods and ways of working in your discipline?
- Are there particular ways that you interact and communicate with each other in your discipline? Can you describe these please?
- How are you supported and nurtured in your discipline?
- In what ways, are your disciplinary norms similar or different from other disciplines?
- Who do you collaborate with? Is it national? Is it local?
    - Explore institutional-level collaborations (within and across departments)
- What are the enabling aspects of your disciplinary research culture? Discuss examples
- What are challenges and barriers in your disciplinary research culture? Discuss examples

- We will now focus on key elements within HEI research culture.

HEI research culture

- Define HEI research culture – *HEI research culture concerns the values, ideals, and beliefs about research within an institution or within an organisational unit (i.e. faculty, department).*

- In general terms, how would you describe your institution's research culture?
- Does your institution / department have a research strategy and vision? What does it comprise of? How is it implemented?
    - Examples of activities

- How important is research to your institution / department? Why / why not?
- What kind of resources and supports are available to you / provided by your institution?
- What are the expectations of researchers? How is it expressed?
- How does your institution / department / sector attract talent? Describe mechanisms and strategies. Discuss examples
- How does your institution / department / sector develop and nurture emerging talent?
    - PhDs / post-docs – training and support

- What are your experiences at your institution / department / sector in relation to academic freedom in undertaking research?
- Hoes does your institution / department / sector define (i) local excellence and (ii) global excellence? How are these measured?
- How does your institution go about building relationships with the outside world (i.e. with other institutions, etc.)? To what extent are collaborations encouraged and supported?
- How would you describe the nature and strength of your institution's relationship with state and central levels of government?
    - What is effective about these relationships? What could be improved?
- What is the role of internationalisation in your research culture?

System research culture

- Define system-level research culture – Consists of a range of concepts, behaviours, instruments and other factors that are practised in the national and/or regional scale. It relates to the contribution of research to national economic and social development, the undertaking of research in an ethical manner, scientific integrity, and the role of governance and regulation of the research enterprise.

- What is the role of the central government to supporting research?
    - Explore views on the importance of research to central government
- What is the role of the Tamil Nadu / Maharashtra government to supporting research?
    - Explore views on the importance of research to Tamil Nadu / Maharashtra
- Of all the things state and central government could do, what would be of value to enhancing research culture?
- Are there features that are important to the culture of research (e.g. languages, customs, values)? How is this expressed?

Concluding comments:

- Is there anything else that you would like to convey in relation to research culture as related to X higher education institution, X discipline or about the system more generally?
- Thank participants for their time

End

E Government and civil society interview schedule

Commence interview

Introduction

- Welcome and outline the purpose of the study
- Confirm that the conversation is confidential and that you are recording the notes for transcription purpose
- Clarify any questions and set out time length for discussion. Remind participants that they can withdraw their involvement at any point during the discussion.
- Obtain verbal consent on record if not previously provided in written form

Demographic questions

- Role –
- Government department (for government officials) –
- Central or regional level of government
- Years of service –

System-level research culture

- Define system-level research culture – Consists of a range of concepts, behaviours, instruments and other factors that are practised in the national and/or regional scale. It relates to the contribution of research to national economic and social development, the undertaking of research in an ethical manner, scientific integrity, and the role of governance and regulation of the research enterprise.

- What are the goals of research culture within the system (either central or within Maharashtra / Tamil Nadu?)
- What are the differences in research culture between regions and across India? What are the similarities?
- What are the enabling features of research culture at the system-level?
- What are the disabling features of research culture at the system-level?
- How do different elements of research culture (i.e. talent, academic autonomy, etc.) interact with each other at the system level?
- Discuss the role of geography, language, globalization, bureaucratic capacity and other key issues in relation to research culture?
- What are the critical features of research culture in the regional and/or national context?
    - Explore opportunities for change and improvement.

Interaction between systems and HEI research culture*:*

- Define HEI research culture – *HEI research culture concerns the values, ideals, and beliefs about research within an institution or within an organisational unit (i.e. faculty, department).*

- How would you describe the nature and strength of the relationship between state and central levels of government with HEIs?
    - What is effective about these relationships? What could be improved?
- What are the expectations of researchers at the system-level? How is it expressed in institutions?
- How does the system support HEIs to attract and nurture emerging talent?
- What is effective and could be improved about the level of resources and supports that provided to HEIs?
- Hoes does the system define (i) local excellence and (ii) global excellence for HEIs? What works well and could be improved about these measures?
- What is the role of internationalisation in your research culture?

Concluding comments:

- Is there anything else that you would like to convey in relation to system-level research culture?
- Thank participants for their time.

End