Social Science & Medicine 360 (2024) 117301

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Perceptions of impure innovation: Health professionals' experiences and management of stigmatization when working as digital innovators

Michael J. Gill [a,1], Bernard D. Naughton [b,e,1,*], Megan Field [c], Sara E. Shaw [d]

[a] Saïd Business School, University of Oxford, Oxford, UK
[b] School of Pharmacy and Pharmaceutical Sciences, Trinity College Dublin, The University of Dublin, Dublin, Ireland
[c] Independent researcher, UK
[d] The Nuffield Department of Primary Care Health Sciences, The University of Oxford, Oxford, UK
[e] Centre for Pharmaceutical Medicine Research, Kings College London, London, UK

ARTICLE INFO

Handling editor: Medical sociology office

Keywords:
Digital health
Digital work
Innovation
Qualitative research
Professionals
Status
Stigma

ABSTRACT

The healthcare sector has increasingly adopted digital innovations. Nonetheless, medical professionals have also resisted a variety of digital innovations. While the range of factors driving such resistance to innovation are well documented, less clear is how such resistance is experienced and managed by professionals attempting to innovate. We conducted a qualitative study of English and German 'dual-role' professionals, who worked both as clinical practitioners and digital innovators. Inductively theorizing from our interview data, we explain how individual professionals experience different intensities of stigmatization from colleagues when working with digital innovations. We theorize that the more central a dual-role professional is within an organization and the more their innovation deviates from standard professional duties, the more likely the innovation is to be viewed as impure within a professional group and be the target of stigmatization. We identify a range of professional, social, and personal strategies employed by dual-role innovators to manage their experiences of stigmatization and consider the implications for healthcare innovation.

Funding

This project was supported by funding from the Wellcome Trust, Wellcome Institutional Strategic Support Fund (ISSF) (0006375).

1. Introduction

Many digital innovations have been accepted and integrated into healthcare services, spurred on by a range of factors (Budd et al., 2020; Webster, 2020; Yan et al., 2021). Health professionals have also resisted a variety of digitalization projects. For example, the National Health Service (NHS) in the United Kingdom (UK) has historically struggled to adopt eHealth innovation, despite investment from government (Asthana et al., 2019) and mounting evidence of their potential benefits for patients (Citaristi, 2022). For example, Petrakaki et al. (2016) illustrated how some NHS doctors resisted using a nationally shared electronic patient record. There is evidence that such resistance persists (e.g., Bidmead and Marshall, 2020) and is likely to endure.

The range of factors driving individuals to resist innovation within professions broadly (Fidler and Johnson, 1984; Hage, 1999) and healthcare specifically (Currie et al., 2012; Greenhalgh et al., 2017; Schlieter et al., 2022) are well documented. However, little is known about the ways in which individual professionals, who are trying to innovate, cope with or manage resistance. Understanding innovators' responses to resistance is important to better appreciate why certain technologies fail to be implemented effectively. As such, the research question motivating this study asks: 'how do healthcare professional innovators experience and manage resistance to innovation?

To build an explanation of how professionals manage colleagues' resistance to digital innovation, we conducted an inductive and qualitative study of dual-role healthcare professionals working in England or Germany. A dual-role professional in our study describes an individual

* Corresponding author.
E-mail addresses: Michael.Gill@sbs.ox.ac.uk (M.J. Gill), Bernard.Naughton@tcd.ie (B.D. Naughton), field.megan@outlook.com (M. Field), Sara.Shaw@phc.ox.ac.uk (S.E. Shaw).
[1] Joint first authors listed aphabetically * Corresponding author

https://doi.org/10.1016/j.socscimed.2024.117301
Received 31 August 2023; Received in revised form 20 May 2024; Accepted 5 September 2024
Available online 10 September 2024

who worked across clinical practice and digital innovation projects. Primarily, these dual-role healthcare professionals were doctors (junior and senior), but also included allied health professionals.

We theorized inductively from our micro (individual) level data to show how and why different professionals experience different intensities of stigmatization when digitally innovating. We theorized that the more central the professional role within an organization and the more an innovation deviates from standard professional duties, the more likely professionals working with innovation were to be viewed as professionally impure and the target of stigmatization by significant others (e.g., peers within the profession and family members).

Our theorization of professional stigmatization draws on and reconsiders the concept of professional purity (Abbott, 1981). Professional purity refers to the exclusion of nonprofessional issues from practice, typically to maintain the jurisdictional boundaries of a professional group (Abbott, 1988; Faulconbridge, 2015). We use professional purity to explain how certain innovations within a profession can be viewed as threats to these boundaries and thus stigmatized by professionals. Building on studies that show how status is implicated in resistance to healthcare innovation (Petrakaki et al., 2016), we consider how resistance to digitalization can unfold through the stigmatizing of roles that appeared to depart from ostensibly pure duties. By illuminating professionals' experiences of stigmatization and their strategies to manage stigma, we show how digital innovation can be difficult to develop within the medical profession and identify opportunities to foster innovation.

2. Theoretical background

2.1. Resistance to dual-role innovators

Increasingly nuanced theories of innovation emphasize that innovation is not a linear process but, instead, complex and contested, (Fitzgerald et al., 2002; Rogers, 2003) as innovation is often resisted by different groups. Resistance describes a restraining force to maintain the status quo (Piderit, 2000), which manifests in various forms from reduced commitment through to contestation (Bernardi and Wu, 2022; Gill, 2019).

Studies have shown how medical professionals resisted changes they perceived as encroaching on their jurisdictions and threatening their elite status or power (Currie et al., 2012). For instance, healthcare professionals were, initially, resistant to evidence-based medicine and patient safety in healthcare which they perceived as undermining their autonomy until they came to exert control (Martin et al., 2013; Waring, 2007). Similarly, resistance to digital innovation can be understood as potentially weakening professions' control (Galperin, 2020) by reducing organizations' reliance on professionals in the performance of expert tasks and threatening existing practices and relationships (Ziebland et al., 2021). For example, radiologists were found to be more accepting than radiographers of new AI systems, with radiographers viewing innovation as a greater threat to their status (Chen et al., 2021).

Healthcare professionals have themselves encountered resistance when occupying other dual-roles. Such hybrid identities include 'physician executives' in the USA and 'medical-managers' in the UK (Hoff, 2000; Kitchener, 2000; McGivern et al., 2015). As with other forms of innovation, professionals have "historically resisted new ways of organizing professional work that challenged professional dominance and autonomy" (Exworthy et al., 2003; McGivern et al., 2015: 412). This has led to clinical professionals who occupy managerial roles being viewed by some clinicians as emphasizing efficiency and profitability over the "pure professionalism" that values humanity and quality (Noordegraaf, 2015). While doctor-manager roles have become increasingly accepted, some professionals continue to "see the hybridization process as a risk to betray their profession" (Giacomelli, 2020: 1634).

Scholarship has examined the implications of clinical managers and their hybrid identities for the success of IT innovation. Bernardi and Exworthy (2020) found that the extent to which clinical managers are willing to support an innovation depends on the type of innovation, and the extent to which this innovation aligns with the interests of the professional group to which they belong. The authors note that because clinical managers often possess a strong sense of professional collegiality, when an innovation appears to conflict with an institutionalized logic of medical professionalism, they find it more difficult to be proactive innovators. While there is evidence to suggest that healthcare professionals will experience resistance from colleagues when innovating in ways that threaten professional norms or values, we know little about how these healthcare professionals experience or manage such resistance.

2.2. Professionalism and professional purity

Given that resistance to healthcare professionals' attempts to innovate appears to be at least partially shaped by the perception of a threat to 'pure professionalism' (Noordegraaf, 2015), we suggest that professionalism can rest on notions of professional purity. Further, we argue that such purity is maintained through stigmatizing processes. As we argue in this section, some digital health innovations can be viewed by professionals as impure activities that threaten or distract from established and professionally pure roles. Thus, professionals working with certain innovations can be perceived as impure by association, by fellow professionals, and the target of their stigmatization.

Professionalism. Freidson (1994) describes professionalism as the ideology of expertise that sustains a profession. This conception suggests that there is a particular way of thinking or acting as a professional. The notion of professional groups sharing an ideology is linked to Freidson's (2001) description of a shared identity within professional communities, where professionals shape their colleagues' identities (Gill, 2023) particularly in the medical profession (Pratt et al., 2006). The notion of professional communities as sharing identities, values, and viewpoints (Evans, 2008) suggests that stigma will be implicated in professions. This is because, as Falk (2010) points out, stigma builds group solidarity through the distinction of insiders and outsiders. Stigma reduces "a whole and usual person to a *tainted*, discounted one" (Goffman, 2009: 3, emphasis added). We focus on stigma relating to professionals as a distinctive group, or 'professional purity'.

Professional purity. Abbott (1981: 823) introduced the term professional purity to describe "the ability to exclude nonprofessional issues or irrelevant professional issues from practice. Within a given profession, the highest status professionals are those who deal with issues predigested and predefined by a number of colleagues." Here we see the importance of professional colleagues in conferring status and purity. Purity thus describes being "*untainted* by nonprofessional concerns and not threatening to professional expertise" (Light, 1984: 183, emphasis added). We suggest that digital innovation can bring potentially impure knowledge into a professional realm that departs or distracts from established and professionally pure roles.

The extant literature has provided limited theoretical or empirical examination of how professional purity may be utilized *within* a profession. Understanding professionals' experiences of purity and stigma is important because the success of innovations relies on acceptance by medical professionals (Bernardi and Exworthy, 2020; Greenhalgh et al., 2017). Specifically, we seek to understand how dual-role innovators experience and manage resistance that stems from professional purity.

3. Methods

We conducted a qualitative and inductive study (Gioia et al., 2013) to examine how dual-role healthcare professionals experience and manage being stigmatized for working on digital innovation. We situated our study in the UK (England) and Germany, which have similar health systems at different digital health development stages (OECD, 2022).

3.1. Study contexts: Digital health innovation in England and Germany

This study focused on England and Germany, to understand whether the findings are transferable to other western countries at different stages of digital health development. Both countries have some of the largest populations of Western Europe with predominantly public health services (German 11% private, UK 10.5% private) and similar health indicators such as infant mortality, life expectancy, and obesity levels (Comparative Health Policy Library, 2024). Germany has more patients seeking digital health information (63% in Germany vs 57% in UK) and Germany's spend on health is greater than the UK (OECD, 2022). However, UK and Germany stand at 4th and 8th on the global AI index (OECD, 2023). In government digital health, the UK ranks 2nd versus Germany at 26th (OECD, 2023). Our participants' accounts also suggested that England appeared to be more advanced in its digital health innovation journey relative to Germany in terms of supporting infrastructure (summarized in Table 1).

England has a history of poorly performing health information technology projects across and within healthcare services. The National Health Service (NHS) has repeatedly attempted to modernize (Petrakaki et al., 2016). While various digital innovations have been implemented (Petrakaki and Kornelakis, 2016), the success rate of such innovations remains mixed. The NHS failed to achieve the 'National Programme for IT' project's core aim to bring the NHS' use of information technology into the 21st century (Justinia, 2017). A lack of stakeholder involvement was identified as being partly responsible for these failures (Naughton et al., 2023). The UK NHS continues to set digitalization targets it fails to meet, which comes at a significant taxpayer cost (Department of Business, 2014; Naughton and Foss, 2019). According to the UK government, part of this digital implementation problem is due to a lack of 'Digital Healthcare Professional Leaders' (Farrell and Sood, 2020).

The German digital health adoption landscape resembles England's NHS. Digital health adoption in Germany is epitomized by a recent index measuring 17 countries' progress in healthcare digitization in 2019. Germany was ranked second to last (Albert, 2020). Germany has been trying to implement digital patient files, with poor success rates despite the German E-Health Act in 2016 (Albert, 2020). A 2019 act, prescribed applications (DiGA), and COVID-19 may have improved the attitude to the adoption of digital health (Stern et al., 2020). However, issues around DIGA still remain (Lantzsch et al., 2022).

3.2. Participants and data collection

Between 2020 and 2022, we conducted 33 interviews with 31 participants spanning doctors (junior doctors and consultants), nurses, physiotherapists, and pharmacists until theoretical saturation. Participants were mainly dual-role professionals, who worked on a range of different digital innovation projects—summarized in table 2. To protect identities, we refer to participant numbers and describe their digital projects in broad terms.

Interviews lasted 1 hour on average. Our sampling was initially purposive using LinkedIn and emails to contact and then interview dual-role healthcare professionals to understand their experiences of innovating. As participants connected us with fellow dual-role professionals we employed theoretical sampling (Glaser and Strauss, 1967), allowing us to explore tensions between the dual roles performed by the participants, during which time stigma emerged as a key theme. We recorded and transcribed semi-structured interviews on Zoom. Participants provided information and consent forms prior to interviews, in adherence to the authors' university research ethics committee approval.

3.3. Analysis

We draw on Gioia et al.'s (2013) approach to grounded theory articulation. Our analysis was an iterative process through constant comparison that entailed four overlapping steps. First, we read participants' accounts and reports of the various hospitals our participants worked in and associated digitization projects. Second, we coded raw data into first-order concepts in NVivo 12. This meant reviewing transcribed interviews line by line and assigning codes to sections of the text that captured professionals' experiences of working with digital innovations. For example, medical doctors frequently described their digital innovations as being perceived by many colleagues as jeopardizing their fundamental roles in hospitals. As such, 'jeopardizing fundamental roles in hospital' became a first order code. Third, we raised common codes to a more abstract level, such as second-order themes or constructs. For example, our first-order code of 'jeopardizing fundamental roles' was one aspect of a broader construct we called 'Centrality of professional role,' which we used to understand why different types of medical professionals were appraised by colleagues as professionally impure to differing extents. Fig. 1 illustrates our full coding process of progressing from initial codes to three main categories (Gioia et al., 2013). Fourth, as we became confident in our categories, we drew them together to develop an emergent theoretical explanation of professional stigmatization of innovators to understand some of the challenges in implementing digital healthcare innovations and how innovators responded.

3.4. Trustworthiness

We took three steps to ensure trustworthiness (Schwandt et al., 2007). First, multiple members of the research team coded the data, enabling consensus regarding the themes and categories. Second, we presented our findings of professional stigmatization to various medical professionals in an online stakeholder meeting to refine our ideas. Third, interview data supports each of our theoretical categories in the findings section, providing transparency and allowing readers to assess our interpretations.

4. Findings

This section reports on the three categories of professionals' experiences of stigmatization. *1. Appraising professional impurity* explains how professionals can be appraised by their colleagues as working on impure innovation. *2. Stigmatizing mechanisms* considers how individual professionals can be stigmatized, either through the designation of the innovation they worked on as unworthy or derision at their personal choices. *3. Managing professional stigma* discusses the strategies employed by participants to cope with stigma. Participants' particulars are summarized in Table 2.

4.1. Appraising professional impurity linked to innovation

Our participants' experiences of stigmatization were informed by the extent to which they perceived their involvement with an innovation as appraised by colleagues as professionally (im)pure. Pure innovation describes the adoption of a new behavior, idea, or practice that a professional group perceives as aligned with their existing professional norms. For example, participant 19 in our study worked as an English public health doctor and developed a digital innovation that used 'big data' to aid prediction models in epidemiology. Because public health often seeks longer-term health improvements at a population level, participant 19 described how working on their innovative prediction models was an appropriate activity and that their colleagues were interested. They explained "No, no I got no negative comments". This quote suggests that digital innovation in one specialty can be unstigmatized due to specialty professional norms.

In contrast, impure innovation is a new behavior, idea, or practice that is resisted by some members of a professional group because it is perceived as misaligned with professional beliefs and thus an irrelevant professional issue. For example, participant 5 was an English intensive care consultant who worked on a digital innovation involving health

informatics. They described how they were told by a colleague that "all this kind of fancy extracurricular stuff will have to stop" because it was a distraction to their "core job". Participant 5 described how they thought about giving up on digital innovation "a million times," due to such comments. This quote indicates where digital health in a specialty can be stigmatized.

The examples suggest that medical professionals do not seek to stigmatize all digital innovation, but instead stigmatize colleagues who they perceive as not focusing on the standard responsibilities or 'traditional' innovation of their role. We suggest that innovation is not a binary of pure or impure but, instead, that there is a "spectrum of innovation" that at one end has "traditional" innovation like clinical trials that is more acceptable or pure (as noted by P17, an English intensive care consultant). At the other end, digital health innovation "wasn't a norm" and tended to be seen as a deviation from standard roles that "your consultant didn't have to do" (P6, a German medic leading a start-up) and thus more impure.

To understand the extent to which an innovation is deemed pure or impure, we draw attention to two underlying dimensions: *centrality* of clinical role to the professional service and the perceived *deviation* of digital innovation involvement from that clinical role. We explain these dimensions of centrality and deviation with reference to Fig. 2 (Participants' perceptions of stigmatization), which illustrates where all participants sit in terms of the key dimensions of centrality and deviation. Fig. 2 groups participants into one of four categories that relate to their perceived degree of stigmatization: no stigmatization; low stigmatization, low-mid stigmatization, and mid-high stigmatization. Our findings suggest the more central the professional role within an organization and the more an innovation deviated from the standard professional duties of that role, the more likely professionals working with innovation were viewed by colleagues as professionally impure and thus stigmatized. To support how each participant has been categorized, Table 2 provides illustrative quotes.

Centrality. Centrality describes the relative importance of a role for the functioning of a professional service. Certain professionals in our study—notably medical doctors—were viewed within their workplace community as essential and central to the operation of a hospital. Other allied health care professional roles such as pharmacists and physiotherapists were less central in terms of life-saving work, while still performing important roles.

In our study, participants in less central roles received positive or sometimes mixed evaluations of their work on digital innovation from colleagues and experienced low to mid-levels of stigmatization (e.g., participants 13, 21, 24, 25, 27, 28). In contrast, medical doctors, and nurses, who occupied more central roles typically experienced higher levels of stigmatization from colleagues (e.g., participants 1–10, 12, 15–18, 20, 22, 26, 31) largely because colleagues deemed their digital innovation as professionally impure. These higher levels of stigma were typified by participant 2, a German medic, who explained 'If you are not doing that [digital innovation] …. It's like ah, you're not a real doctor anymore. So that's what I heard a lot'. This phrase 'not a real doctor' was repeated by several participants in central roles and demonstrates the stigma they experienced for innovating.

These examples of doctors being stigmatized by colleagues more than other professional groups seemed to hinge, in part, on the centrality of doctors in the running of the hospital, where attention to anything other than their expected roles was perceived as jeopardizing their fundamental responsibilities in hospitals. Doctor's centrality in the operation of hospitals was reflected in many doctors describing how, in most medical specialties, their colleagues thought they should not spend their time on such projects and should, instead, be focused on helping patients. For instance, a German medic with experience across different digital projects explained "*Spending time innovating something is not perceived as something with the same value as practicing actual medicine with a patient*" (P10). Similarly, an English senior leader with oversight of multiple digital health projects explained that "*for some people, they think that being a doctor means that you've got to be seeing a patient in front of you*" (P22). This evidence suggests that focusing one's attention outside clinical duties is discouraged.

The theme of medical doctors providing greater resistance to digital innovation than professionals in less central roles is captured in the account of one physiotherapist describing the different responses from fellow therapists and neurology specialists to a digital innovation: "*the therapists, we took to [developing digital innovation] very quickly. It's been a mixture [of progress] amongst my neurology [medical doctors] colleagues*" (participant 24). Allied health professionals such as physiotherapists did not appear to face the same concerns regarding digital innovation. They described how the "physio profession" was "*used to being quite agile*" when working with innovation (P21, English Physiotherapist working on hospital projects). The centrality of a role in a hospital thus appeared to be an important dimension of professional purity.

Deviation. Deviation describes the extent to which a particular digital innovation departs from the standard expectations regarding innovation in a role. The more novel or unusual the innovation—or the more it differs from the remit of existing (clinical) practice—the greater the degree of deviation. Underlying this idea is the notion that, as explained by an English, experienced, dual-role neurology consultant (P15), medicine is "conservative". Another senior German medic (P7) explained that "*Everything is very conservative, and we are very straightforward we are not looking to the left or the right side*." Such quotes indicate these medical professionals' resistance to deviation.

The notion of certain digital innovations as a deviation from a professional role was established both explicitly and subtly. Some professionals reported how colleagues, in central roles, stated that innovation was not what they should be focused on:

> *"There are a lot of stalwarts in my specialty who think what I'm doing is a complete waste of time"* (P30, English medic in rheumatology digital health).

> *"Kind of remain in your lane and do things [the] conventional way"* (P5, English intensive care consultant working with digital health hospital systems).

Comfort with established, non-digital ways of working helped to explain why innovation was viewed as a deviation from the norm. A German mid-career medic who started a digital health start-up explained:

> *"my experience with like the old generation is, they do not understand, digital, because there are no digital natives, they are afraid of it"* (P8).

Subtly, the absence of digital training or infrastructure emphasized the unusualness of digital innovation in England: *"didn't really have any, any training whatsoever"* (P13). Similarly, "*the digital infrastructure in Germany is far off*" (P12). The degree of deviation was therefore another important dimension of professional purity.

Our findings highlight how dual-role innovators who are central (i.e., medical doctors) and working on novel innovations experienced stigmatization from colleagues. However, there are exceptions. For example, participant 14 is a central medical doctor who worked on a novel digital innovation for consultations but stated that "*I've had low level encouragement or lack of discouragement*." They worked part time in their medical role and were preparing for retirement, which hints that stigmatization is used as a remedial measure to guide individuals through their professional careers. Even in this case, though, participant 14's work was not celebrated but "low level" encouraged, reflecting the idea that many medical professionals often view digital innovation as impure.

4.2. Stigmatizing mechanisms linked to innovation

Two reinforcing mechanisms served to stigmatize professionals deemed as working on impure innovation: deigning innovation unworthy and questioning professional motivations.

4.2.1. Deigning innovation unworthy

Participants described how their clinical colleagues conveyed a sense that their efforts on innovation was unworthy work, and that innovation carried less value than practicing medicine. This is typified in our data by an English medic, working on developing and implementing new digital technologies to predict heart attacks, who described how they were threatened to return to their clinical work:

> *"She [a colleague] came back to me and said we're going to have to stop you from doing your [digital] work."* (P5).

Innovation appeared to be stigmatized because it departed from traditional and pure notions of professionalism. For instance, many professionals detailed how colleagues would openly challenge the value of innovation by questioning the point of innovating and highlighting that it was not what medical professionals did. An English participant working as an academic with a pharmacy background creating digital health education tools explained:

> "*They really didn't see it as being important [Digital health]. They thought that we're not an IT type environment you know you're never going to compete with Google and Apple etc. What's the point of doing it, we're not we're not into exploiting software*" (P25).

Reflecting this idea that digital innovation was professionally impure, stigmatization of innovation occurred as participants' colleagues did not value such innovation. This is illustrated by participant 10's account, who was a junior doctor in a German hospital trying to innovate digitally with telemedicine by using artificial intelligence to process data.

> "*So, I hit this idea of [innovation] […]my boss told me. Nice idea but bin this. Why should we do that? We need to focus short term, midterm, something long term. I don't believe in that and so on so it was immediately taken away this topic or neglected. […] I was not accepted as a team member. So, this is what how I interpreted that at this time, but it's one anecdote on how difficult it can be as a medical doctor, being in the space*."

4.2.2. Deriding professional choices

Professionals reported that they themselves were the target of stigmatization when engaging in digital innovation. This often took the form of unsolicited advice.

> *"I remember one colleague said to me 'don't, you know, don't end up in a cul de sac'"* (P22, English medic).

One participant recalled how a colleague described them when trying to discuss a musculoskeletal digital innovation in a meeting:

> "*they're not proper researchers, they're not proper scientists*" (P30, English medic/academic).

These criticisms appeared to stem from a belief that working on innovation threatened professional purity. An example of which was experienced by a medic who also did digital consulting and was involved in digital health start-ups.

> "*But even when I left [medicine], he said to me 'oh no, money bought you too', and it felt like I'm switching to the dark side now*" (P1, German medic).

Professionals were regularly derided as not being a 'real' professional when working on innovation instead of clinical or established pathways in medicine. Here again we see how notions of purity underlie processes of stigmatization.

> *"I mean that's kind of the reaction you often get when people ask you, because there are like two things happening – 'oh you're a medical doctor, oh you have to be very clever and have to, your grades in school must have been great'. So that's like the first credible you always get. And then it's like 'ah, you're not a real doctor, you're not working in patient care anymore'"* (P2, German medic).

Professionals were often derided even by close family members for their choice to work on innovation instead of practicing medicine (e.g., P5, P7, P16). For instance, an English critical care consultant working in health informatics (P16) noted:

> *"my son, occasionally says mommy's a real doctor and daddy works on computers."*

It was due to such derision that professionals described how the culture and system of professional medicine encouraged conformity to notions of purity and rejected novel innovation.

> *"I think the system breeds it out of you, you get these signals to remain in your lane"* (P5, English medic).

4.3. Managing professional stigma linked to innovation

Our data highlighted how dual-role professionals, primarily medical doctors, managed the process of being appraised as professionally impure and then stigmatized by employing a variety of overlapping strategies. We identified three broad types of strategies: professional, social, and personal, which we elaborate below. These strategies to manage resistance are summarized and illustrated in Table 3.

4.3.1. Professional strategies

Participants who experienced stigma frequently employed strategies that related to their work tasks to manage negative evaluations from their colleagues stemming from the perception of professional impurity. These professional strategies included developing digital innovations by working 'within' or 'around' the existing system so as not to appear to deviate too much from expectations. Participants explained how they could only attempt digital innovation work by building credibility in their chosen clinical roles. A German medic working on digital hospital systems (P12) explained, "*they would need to see you somewhat like an [successful] outlier in order to give you credit and you kind of bring the confidence that you can innovate, but otherwise they would question you probably and your ideas much more*."

Even those participants who did not describe themselves as being stigmatized also worked around the existing system. For example, participant 19 worked in a central role as a medical doctor in English public health and was involved in a closely related innovation concerning epidemiology that was therefore perceived as less deviant. Nonetheless, participant 19 explained that they worked on digital innovation around their clinical role, on evenings "*on top of work stuff*." This suggests that medical professionals do not necessarily seek to stigmatize all digital innovation, but instead stigmatize colleagues who are not focused on the standard responsibilities or 'traditional' innovation of their role. This helps explain why professional strategies to manage resistance were the most salient in our participants' accounts.

Some participants sought to step outside of the traditional system partially or fully. Some secured funding to 'buy out' their time to work on innovation projects. Two doctors studied for a master's degree in prestigious universities (P1 and P5). Rarely, participants moved to new settings where digital work was better supported. Participant 3, a German medic, explained that they felt "very lucky" to have moved to a research focused institute given the limited innovation happening in Germany. A more extreme response was for participants to leave their clinical responsibilities entirely. A German medic (P7) stated that they were "*not going back as I can't be the innovative person I am at the hospital*" and described how leaving "*felt like being free*".

4.3.2. Social strategies

Participants often employed social strategies to manage negative evaluations from their colleagues, either trying to secure guidance and support or attempting to alter views of digital innovation as impure.

To secure guidance from others, participants noted they had received mentoring.

> *"over the years I've had many mentors and they have been very key"* (P19, English medic in epidemiology).

Finding mentors was not always straightforward. Some participants struggled to find support:

> "*I think that was a really difficult thing. I sort of tried to get support from various people*" (P15, English medic in neurology).

Supportive managers or senior leaders provided a way to navigate organizational pressures and helped to consider innovation as more professionally pure: "*like oh my god, this is great as someone believes in what we're doing here*" according to a senior department leader overseeing a variety of digital health projects (P22).

One of the most consistent and valued strategies involved building a network of like-minded people by attending conferences, forming teams, or fostering peer support. Connecting with others appeared to help manage stigma because it provided a support network. Participant 16 was an English intensive care doctor that had been central to the hospital for some time and gained a network of support that allowed them to understand how the organization 'works,' to make it easier to innovate:

> "*I think it helps staying in a place for a while and build your networks and contacts […] it's kind of hard until you know people, it's hard to hard to work out how an organization works, and every organization has its levels of bureaucracy and, you know, you just need to work out what those are and how to make those happen"* (P16).

A different strategy was when our participants attempted to justify innovation to others and challenged criticism. An English medic working on digital patient consultations (P20) explained how they had found some success in providing colleagues with a different reasoning about digital innovation as professionally pure by drawing attention away from the immediate 'firefighting' to longer term needs. Nonetheless, many participants described how hard it was to react to criticism from colleagues in an effective way or even to speak up:

> "*it's so bloody hard to do this … it caused me significant challenges to stick my head above the parapet to sort of say we need to do this … particularly from the kind of clinical colleagues …. why are you doing this, this is not your work*" (P15. English medic).

This social strategy of attempting to convince colleagues or even speak up was not always easy to employ.

4.3.3. Personal strategies

Participants employed strategies that related to themselves to manage negative evaluations from their colleagues. Some sought to avoid or ignore negative evaluations: "*I was already isolating myself very early*" (P4, German medic).

One participant described how they had largely accepted their colleagues' critiques and internalized their negative evaluations and believed they could no longer work on digital innovation in a junior clinical role:

> "*That it's not really your place as that kind of junior person in the team to try and change, particularly to change your processes and try and influence higher ups*" (P15, English medic).

In this case of participant 15, who eventually left their clinical role, found it hard to find mentoring support and to speak up to try and convince their colleagues of the importance of work that was not a traditional clinical role.

In contrast, some participants described how they had stayed in a stigmatized position but that this required persistence and 'grit'.

> "*you know what I say to people now is the key to innovation is persistence, and grit and whether you're going to succeed or not. I mean, of course you have to have a decent idea. But, you know, with two ideas of the same caliber. The one level wins one where the people just don't give up ever even when it looks like it's never ever going to work, you don't give up*" (P17, English medic).

The participants who decided to stay in a stigmatized position had drawn on various sources of support, showing how personal, professional, and social strategies intertwined. For example, a German medic working in dermatology (P6) had taken time away to study at a university and build a support network. An English critical care doctor (P17) acknowledged how a senior colleague had supported them and "*unlocked something with his connections*" to maintain their digital health work.

A final personal strategy that emerged was for participants to focus on their enjoyment of digital innovation itself and seek intrinsic rather than extrinsic validation to become "internally motivated" (P10, German medic). As a German medic (P4) stated, working on digital innovation meant they "*didn't feel so captivated anymore and yes, and it was just like this feeling was growing that it was just the right thing to keep on wanting to understand more, to learn more.*"

5. Discussion

Our study sought to understand how dual-role healthcare professional innovators experience and manage resistance to innovation. We identified that the perception of an innovation as impure by colleagues triggered a process of stigmatization that individuals managed through professional, social, or personal strategies. Our findings support two theoretical contributions. First, to the literature on professional purity by explaining how notions of purity can be applied *within* a profession to generate stigma. Second, to the literature on resistance to innovation by enriching our understanding of professionals' strategies to manage stigma.

5.1. Professional purity and stigma

The extant literature has understood professional purity as a mechanism to maintain the jurisdictional boundaries of a particular professional grouping from wider society (Abbott, 1988; Faulconbridge, 2015), which protects a profession from the encroachment of other occupations (Light, 1984). Our point of departure is to show how professional impurity and associated stigmatization acts as a form of socialization *within* a profession to clarify and defend the boundaries of a role. Our study demonstrated how notions of professional purity do not just keep other occupations from coming 'in' to an established jurisdiction, but also keep professionals from moving 'out'. We have shown how medical doctors experienced stigmatization from their colleagues when in a central clinical position and working on digital innovation that deviated from their traditional roles (illustrated in Fig. 2). Our study suggests that there are overlooked costs of professional purity, which can impede innovation.

Relatedly, our notion of professionally impure innovation and stigmatization offers a different explanation for why some professionals only feel empowered to pursue change when moving to peripheral roles (Huising, 2019) and thus why central actors can be the most inhibited innovators. Furnari (2018) explained how the peripheral position of actors enables them to distance themselves from existing institutional structures and are more likely to innovate because they are "less caught by institutionalized relationships and expectations" (Greenwood et al., 2011: 339). We demonstrated how highly central actors, like medical doctors, become 'caught' through notions of professional purity and the

threat of stigmatization, to a greater extent than less central actors. We showed how professionals may cease to innovate or move out of their profession to pursue innovation. This finding speaks to the unintended consequences of professional purity, which can undermine the profession from within by rejecting or removing innovators. This is potentially damaging not just because it diminishes sources of internal innovation but also because external innovation can require innovators within an organization to translate new ideas to a local context (Gill et al., 2020).

The notion of professional purity offers a novel way to enrich our understanding of how digital innovation often fails in healthcare by illustrating the ways in which purity operates through processes of stigma targeted at both professionals and innovations. This complements and extends existing explanations of why innovating is difficult, which have highlighted, for example, the influence of historical institutions (Bernardi et al., 2019), competing norms and values (Currie, 2012), indeterminacy (Boreham, 1983; Wood et al., 1998), and professionals' attempts to protect their autonomy and control (Exworthy et al., 2003; Ziebland et al., 2021).

5.2. Resistance to innovation and management strategies

Building on scholarship demonstrating that healthcare professionals experience resistance from colleagues when innovating in ways that threaten professional values (Bernardi and Exworthy, 2020), we show how dual-role professionals cope with such resistance. Specifically, we identified categories of professional, social, and personal strategies to manage resistance to digital innovation (summarized in table 3). Dual-role innovators used different combinations of these strategies to sustain innovation in the face of stigma.

Our participants invariably employed these strategies to accommodate and work in or around their existing health systems. The theoretical implications of such accommodation are twofold. First, these strategies help to explain why innovations are often hidden or occur in silos (Wiedner et al., 2020), as many strategies functioned to provide a compromise between a desire to innovate and to remain professionally pure. Second, while digital health technologies can be 'disruptive innovations,' which can disrupt professional power dynamics (Ziebland et al., 2021), they can be reciprocally disrupted by social dynamics that innovators must navigate. We argue that professionals are, not only attempting to innovate in terms of digital technology, but must also innovate socially to develop strategies to navigate the peer pressures they face. We found that these strategies cannot be employed to the same extent by all professionals. Some professionals were unable to find mentors or supportive managers. Individual characteristics appeared to play a role, with some professionals willing to 'speak up' against stigma while others found this difficult. The potential to employ these strategies therefore appears to be constrained by context and individuals' experiences. These constraints point to the challenges of managing professional purity and deepen our explanation of why digital innovation fails.

5.3. Implications

We suggest that being stigmatized by fellow professionals for working with impure innovation is disincentivizing professionals from engaging in digital healthcare innovation. The tensions between clinical and digital roles can create a push-pull dynamic, whereby professionals can be simultaneously pushed away from a stigmatized role and pulled towards an unstigmatized role. For example, professionals working as both doctors and managers believe their manager role can separate them from their peers (Cascón-Pereira et al., 2016). Our study goes further and points out another source of stigmatization: family members of doctors who viewed working on innovation projects as not being 'a real doctor'. This suggests the need to educate and promote the importance of digital healthcare innovation across wider society.

We argue that digital innovators are at a nascent point that other hybrid roles once were. Evidence-based medicine and patient safety in healthcare were initially perceived as undermining professional autonomy until professionals gradually came to exert control (Martin et al., 2013; Waring, 2007). Drawing on the broader hybrid roles literatures (Bresnen et al., 2019; Kurunmäki, 2004; McGivern et al., 2015; Noordegraaf, 2011, 2015; Wallace et al., 2022), we identify key factors in determining digital innovation dual-roles' acceptance by medical professionals: identifying apparent benefits with innovation while not being burdensome (Ziebland et al., 2021); providing forums to foster discussion across professionals (Martin et al., 2013); sustained pressure for reform (Wears and Sutcliffe, 2019); and continued professional control that allows professionals to 'capture' and adapt innovation without threats to their autonomy (Waring, 2007). We contend that if similar factors are present then more types of digital innovation can gradually be accepted. To support the acceptance of dual role professionals digitally innovating, we provide questions to help managers assess the support available to them (see Table 4).

5.4. Limitations and future research

Our study is limited to two different European country contexts and to a specific group (dual-role medical professionals), which led to a small sample size. Nonetheless, this sample allowed us to examine participants' experiences in depth and to develop insights that may be transferable (Schwandt et al., 2007) to other healthcare services with similar contexts. Future research could examine the stigma and associated strategies we identified in countries beyond Western Europe. Further studies could also test which of the strategies we have identified, or others, are most effective for professionals in managing stigmatization under specified conditions.

6. Conclusion

Professional purity is an important element in the functioning of professions (Abbott, 1981). However, in our case, the exclusionary pressures that sustain the conventions of a profession and render it pure also appear to hinder certain forms of innovation. Drawing on a qualitative study of English and German dual role digital innovators we theorized that when in a central clinical position and working on innovation that deviated from their traditional roles, professionals were stigmatized by their peers because they or their work was perceived as impure. Such stigmatization disincentivized professionals from engaging in innovation. We identified strategies employed by professionals to manage stigma that spanned professional, social, and personal levels, while noting that these strategies were constrained by contextual and individual factors. We contend that understanding and addressing stigma is a key factor in determining the acceptance of dual-role digital innovators within the medical profession and thus in supporting digital innovation in healthcare.

CRediT authorship contribution statement

Michael J. Gill: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Bernard D. Naughton:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Megan Field:** Data curation, Formal analysis, Investigation, Writing – review & editing. **Sara E. Shaw:** Conceptualization, Formal analysis, Methodology, Project administration, Writing – review & editing.

Declaration of competing interest

There are no competing interests.

Data availability

The data that has been used is confidential.

APPENDIX

Table 1
Comparison of German and English contexts from participants' accounts

Theme	German examples	English examples
Degree of digital activity and support: German participants described limited digitial innovation and organizatinal support. In contrast, English participants provided many examples of digital projects and organizational support.	'I mean we had quite an acceleration last year with like the pandemic, digitalization coming to the next level, especially in Germany which was not in a good position in digitalization in healthcare.' (P2, German medic) 'I have the feeling that Germany is very old, and very, it's not innovative because we are so well off right, we do not need innovation, because we already have such a high standard' (P8, German medic) 'So there's basically, there were almost no digital health care innovation. I think this is (only) starting now, at least in some institutions in Germany' (P10, German medic)	'the Exec team and the R&D team, who have been like thoughtlessly supportive. I've worked hard to support the innovation that they've been doing and in return they've been very supportive of the work that I've been pushing. I think, you know, it's not been by any means a straightforward journey and I've learnt an awful lot in the process, but I would say from the Exec team and the R&D team it's been very good.' (P5, English medic) 'The board is broadly supportive. But yet still operationally focused. So the person, the executive director I report to has innovation within his remit. And, you know, effectively leans on the fact that we've created this thing called the (ecosystem name removed) as they were just about to try and, like, formalize the structure within the organization and we've got the chief financial officer support around that (P15, English medic)
Digitial infrastrucutre: German participants described lack of infrasturcutre and leadership. In contrast, English participants described increaisngly established infrastrucutre and leadership.	'Yes, we have great momentum in digital health in Germany but we are facing a situation that we see we are far behind other countries and that we are not [a] leader in this technology from digital health' (P11, German Digital Health recruiter) 'Others are excited about it I would say, but at the same time also mention that the digital infrastructure in Germany is far off. I think also some people, they can't even imagine having AI implemented because the health system lacks so much in terms of innovation and digital infrastructure.' (P12, German medic)	'Yeah, so I've found a few mentors. For example from (accelerator unit name removed) and other places, and had a bit of coaching.' (P20, English medic) 'Honestly, no one questions the need for people, like myself any longer it used to be the case, so this there's something called the chief clinical information officers, the CCIO role. […] now there's there's probably very, very few trusts in the in the country, now that do not have at least one CCIO type role and but this wasn't the case 10 years ago. Right when I started, we had a CCL meeting of England or something that'd be like 20 people right, and now the conferences I'm in the thousands of attendees' (P26, English medic)

Table 2
Anonymized list of participants (P), digital innovation (DI) projects, and degree of centrality (C) and deviation (D).

P	Location	Role	Profession	DI Classification	Centrality/ Deviation	Perception of stigma	Experiences of stigma
1	Germany	Dual	MD	Health Apps – Online Consultations Technology	HC/HD	Mid-High	"they [colleagues] said it's [innovation] dehumanising care"
2	Germany	Dual	MD	Health Platform – Medical Information/Education	HC/HD	Mid-High	"sometimes no reaction [to innovation ideas] is negative enough."
3	Germany	Dual	MD	Imaging and AI software	HC/HD	Mid-High	"I'm really trying not to be suppressed by this hierarchy and by this, you know, political thinking [about innovation]".
4	Germany	Dual	MD	Digital Health App – Respiratory Function Monitoring	HC/HD	Mid-High	"they would definitely address it [digital work] and they would definitely say what are you doing, you're not normal"
5	England	Dual	MD	Digital Hospital Systems for Patient Monitoring	HC/HD	Mid-High	"I presented [digital innovation] in a meeting and [a colleague] sort of rolled his eyes and I – so I think that for me just summed-up the kind of skepticism about this work that was out there."
6	Germany	Dual	MD	Dermatology App	HC/HD	Mid-High	"But then, of course, with, with more senior people with maybe attendings who are were more under like skepticism side of things. It remains difficult and they and they, they, they challenge like very fundamental beliefs about like what to do and what not to do with a medical degree […] and if you're not doing what you were expected to do then, like, why did you, why did you like, why did you become a doctor"

(*continued on next page*)

Table 2 (*continued*)

P	Location	Role	Profession	DI Classification	Centrality/ Deviation	Perception of stigma	Experiences of stigma
7	Germany	Dual	MD	Digital Therapeutics - Pain	HC/HD	Mid-High	"This is trash. If a physician is doing something like that. Then he isn't a physician. Oh, isn't isn't a real physician."
8	Germany	Dual	MD	In-Vitro Diagnostic App	HC/HD	Mid-High	"Germany just paid for your medical education about 200,000 to 250,000 K, and you just leaving. And I can completely understand that that people say that, and that I'm not treating patients anymore and not working. Clinically."
9	England	Dual	MD	Healthcare AI	HC/HD	Mid-High	"there was an expectation that [a clinical colleague working on digital innovation] would chip in because things were busy in the hospital"
10	Germany	Dual	MD	Digital General Practice including telemedicine and digital health consulting	HC/HD	Mid-High	"I was recognized as someone who was disturbing in in the environment, and who was too early in [their] career, to bring up new ideas."
11	Germany	Single	Healthcare Recruiter	Recruitment of Digital Health Professionals	N/A	N/A	"the labour environment here in Germany is not ideal to have these dual roles because people are not used to it, because people want to [.] work a hundred percent for one position and these hybrid roles, I think they are new to many people"
12	Germany	Dual	MD	Digital Health Consulting: Digital Hospital Systems	HC/HD	Mid-High	"I would say [digital health is] very low on the priority list and it very much depends on the person in charge of the digital innovation strategy".
13	England	Dual	Physiotherapist	Digital Hospital Systems Projects: Including digitalizing healthcare records	LC/LD	None	"I mean I'm very lucky at the moment I would say that, so far, I've not really had any senior kind of obstruction in terms of digital innovation because I think I've either landed in or have chosen to work and more innovative spaces."
14	England	Dual	MD	Various Digital Hospital System Projects including digital consultations	HC/HD	Low	"I've had low level encouragement or lack of discouragement, I would say [in terms of digital health]."
15	England	Dual	MD	AI Healthcare - Neurology	HC/HD	Mid-High	"The organization who are clinicians and, you know whose job is defined by being clinicians […] it was certainly the case that to be seen to be doing something outside of like just getting your head down and doing the clinical work. […] I can interpret it as like really is a bit of a bit of a challenge to their position like well you feel the need to do this like why, why you're not satisfied enough just doing the clinical work"
16	England	Dual	MD	Health Informatics -Critical Care	HC/HD	Mid-High	"we've kind of built something new and novel and different on the side. And that doesn't quite fit in the model of how things go."
17	England	Dual	MD	Health Informatics – Critical Care	HC/HD	Mid-High	"I feel like I'm a very odd fish in being able to, you know, on that spectrum [working on non-clinical tasks]"
18	England	Dual	MD	Health Informatics – Critical Care	HC/HD	Mid-High	"I certainly was advised by people [colleagues] that I should stop and give up"
19	England	Dual	MD	Big Data – Epidemiology (prediction models)	HC/LD	Low	"overall people were really curious and overall positive and supportive."
20	England	Dual	MD	Digital Patient Consultations	HC/HD	Mid-High	"I think Junior clinical jobs in particular, make that [digital innovation] quite challenging for a number of factors. You know, there's no time allocated to it, you rotate off quickly there's no clear boss, there's no clear process it's difficult to know whether you have even permission to try lot a lot more."
21	England	Dual	Physiotherapist	Digital Hospital Systems Projects – Telemedicine	LC/LD	None	"[doing digital innovation is] not so much of an issue, maybe because I'm quite confident telling people what I'm doing."
22	England	Dual	MD	Leader of Digital Health Network Projects	HC/HD	Mid-High	"Other people's projections and limitations of thinking, […] they think that being a doctor means that you've got to be you be seeing a patient in front of you every however long."
23	England	Dual	Academic/MD	Digital health Apps – Health behavior change	MC/LD	Low	"Not personally … think it is bit frustrating knowing that there is a lot of potential for [innovation]."
24	England	Dual	Academic/ Physiotherapist	Multipurpose Consultation & care app	LC/HD	Low-Mid	"the therapists, we took to it [innovation] very quickly. It's been a mixture amongst my neurology colleagues"
25	England	Dual	Academic/ Pharmacist	Digital Health Apps (Various)	LC/HD	Low-Mid	"there was a stage when it first started that someone just accused me of playing with cartoons" but "positive evaluations" too
26	England	Dual	MD	Digital Health Transformation	HC/HD	Mid-High	"some of the harder things kind of dealing with the organizational politics around these things. Because I don't come with that credibility of 'Oh, he you know, like he's an established researcher with you know X number of publications and. When he speaks, we will listen because he really knows what he mean", so I have to deal with that"

(*continued on next page*)

Table 2 (*continued*)

P	Location	Role	Profession	DI Classification	Centrality/ Deviation	Perception of stigma	Experiences of stigma
27	England	Dual	Manager (Non-digital-innovator)	Leadership of Hospital System Digital Projects	LC/HD	Low-Mid	"I think for those people, you know, they're always going to find resistance, with the people that they work alongside who are employed to do digital and clinical work. And so their life will be quite difficult."
28	England	Dual	Pharmacist	Implementing Electornic-Prescribing Systems	LC/HD	Low-Mid	"Yeah, a lot of people did say to me. 'What the hell are you doing, why are you going for this. are you sure you want to do it [work on digital innovation]? But when I explained that there is all the clinical involvement with [innovation] they were sort of reassured".
29	England	Single	Academic (Non-digital- innovator)	Digital Health Education	N/A	N/A	"I mean you have to be a disrupter to be able to move forward, you know, rapidly, but people don't like disrupters I think generally."
30	England	Dual	Academic/MD	Digital Health - Rheumatology	MC/HD	Mid	"people who are go down very traditional paths […] think that digital innovation is a waste of time."
31	England	Dual	Nurse	Implementing Electronic Prescribing Systems	HC/HD	Mid-High	"asked me to go and ask for real nurse".

Nb. Centrality and deviation can be high (H), Mid (M) or low (H) e.g., high centrality = HC.

Table 3
Participants' strategies to manage resistance to digital innovation

Types of strategies	Strategies to manage resistance	Employed by	Illustrative quote
Professional: actions in relation to work tasks	Building credibility in clinical role to give others' confidence in your digital work	P12, P15, P28	"all the kind of hours and operations in the middle of the night that that entails and an effort, I think, consciously or not, I get I get a bit of useful kudos from that which allows me to interact on equal terms"
	Securing funding to 'buy out' time for digital work/Identifying patrons	P16, P17, P20	"as long as I found funding to cover my salary, then the organization is pretty good nobody really asked me where I am or what I'm doing but just need to make sure there's more money coming in to keep paying my salary" (P16)
	Working around the job; conducting digital innovation work on evenings and weekends	P2, P5, P19	Doing digitial innovation "on top of work stuff." (P19)
	Visiting or working in other settings/hospitals that are supportive of digital innovation	P1, P12, P13, P26	"And in a lot of hospitals and healthcare organizations that are digitized, now there's tends to be more and more internal roles […] I will advise people very early on to start getting involved in these things in to look for opportunities." (P26)
	Leaving clinical work	P2, P4, P8, P10, P15	"I think I left [in part because …] the, the reluctance for innovation of my superiors" (P8)
Social: actions in relation to others	Building a network of like-minded people e.g., attending conferences, forming teams, fostering peer support	P3, P7, P12, P13, P20, P22, P23, P24, P26, P30	"I think finding like a tribe that can support us like makes a massive difference" (P20)
	Finding supportive managers	P1, P5, P6, P9, P18, P28, P31	"the hospital's always going to suck you in unless there's someone who's acting as gatekeeper there" (P9)
	Justifying innovation to others and challenging criticism	P13, P20, P21, P25, P28, P30	"You'd get like comments like, whether that like that's really being a doctor […] just try to listen and propose alternative reasoning, which is, you know, that sort of systematic systemic change, it requires like engagement in stuff beyond the firefight in front of you." (P20)
	Receiving mentoring	P4, P20, P21, P22, P24	"I have had mentor, mentors and I wouldn't have said that they were necessarily named as that. I can think of a couple of people that kind of like we're just really enthusiastic like." (P22)
Personal: actions in relation to the self	Accepting and internalizing stigma	P15	"That it's not really your place as that kind of junior person in the team to try and change, particularly to change your processes and try and influence higher ups" (P15).
	Avoiding or ignoring criticism	P4. P15, P30	"I get really cross [laughs]. And, yeah, and then I have to set up restrain yourself from saying something I regret but then I think about it, and I think just ignore him because, you know". (P30)
	Persisting, 'toughing it out'	P17	"You know what I say to people now is the key to innovation is is persistence, and grit and and whether you're going to succeed or not. I mean, of course you have to have a decent idea. But, you know, with two ideas of the same caliber.The one level wins one where the people just don't give up ever even even when it looks like it's never ever ever going to work, you don't give up." (P17)
	Seeking intrinsic rather than extrinsic validation	P4, P8, P10	"now I'm more sure about myself and sure about my vision, and so now I am more like internally motivated." (P10)

Table 4
Illustrative questions to assess the support available to dual role digital health innovators across professional, social, and personal levels

Types of strategies	Strategies to manage resistance	Questions to consider
Professional: actions in relation to work tasks	Building credibility in clinical role to give others' confidence in your digital work	How is a project affecting/affected by a clinician's credibility? What changes can be made to improve the credibility of a digitial project?
	Securing funding to 'buy out' time for digital work/Identifying patrons	Are there appropriate resources in place to financially support a clinician involved in digital innovation?
	Working around the job; conducting digital innovation work on evenings and weekends	Are clinicians provided with enough time to work on digital projects?
	Visiting or working in other settings/hospitals that are supportive of digital innovation	Are clinicians supported to visit different sites or engage with other teams to develop insights into digital health projects?
Social: actions in relation to others	Building a network of like-minded people e.g., attending conferences, forming teams, fostering peer support	Are there like-minded digital health innovators within the organization to support a project?
	Finding supportive managers	Are there supportive managers or senior champions involved in a project?
	Justifying innovation to others and challenging criticism	Is the project a safe space to suggest new ideas and challenge poor practice?
	Receiving mentoring	Is there adequate mentoring to encourage and guide clinicians involved in digital projects?
Personal: actions in relation to the self	Accepting and internalizing stigma	How does an organization value digital work relative to clinical work?
	Avoiding or ignoring criticism	Are individuals or teams involved in digital work supported in managing criticism?
	Persisting, 'toughing it out'	Are individuals or teams involved in digital work supported through project stages and over time?
	Seeking intrinsic rather than extrinsic validation	Are individuals or teams involved in digital work able to exert some autonomy over the projects they become involved in?

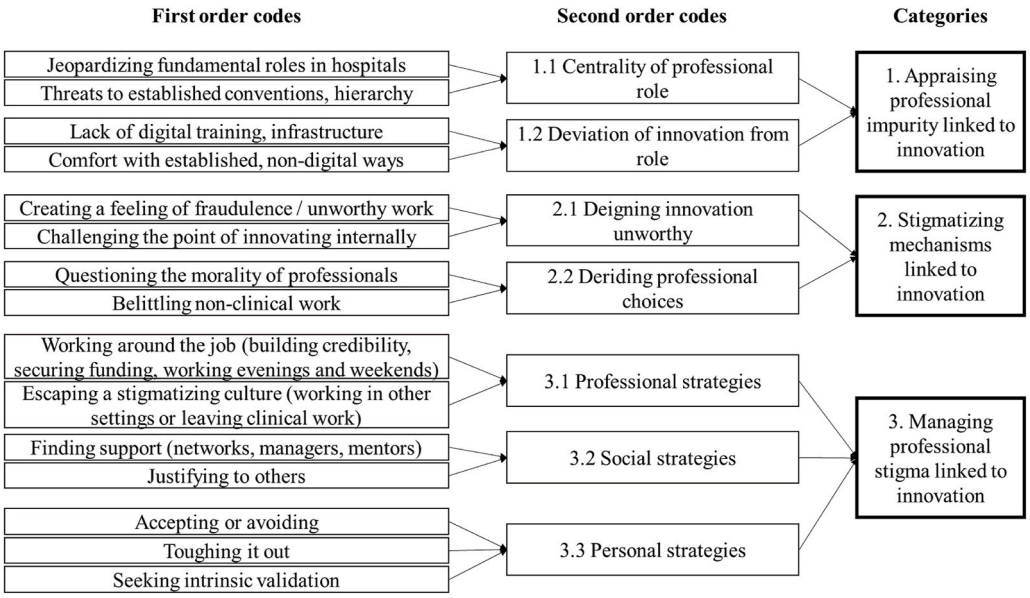

Fig. 1. Data and coding structure

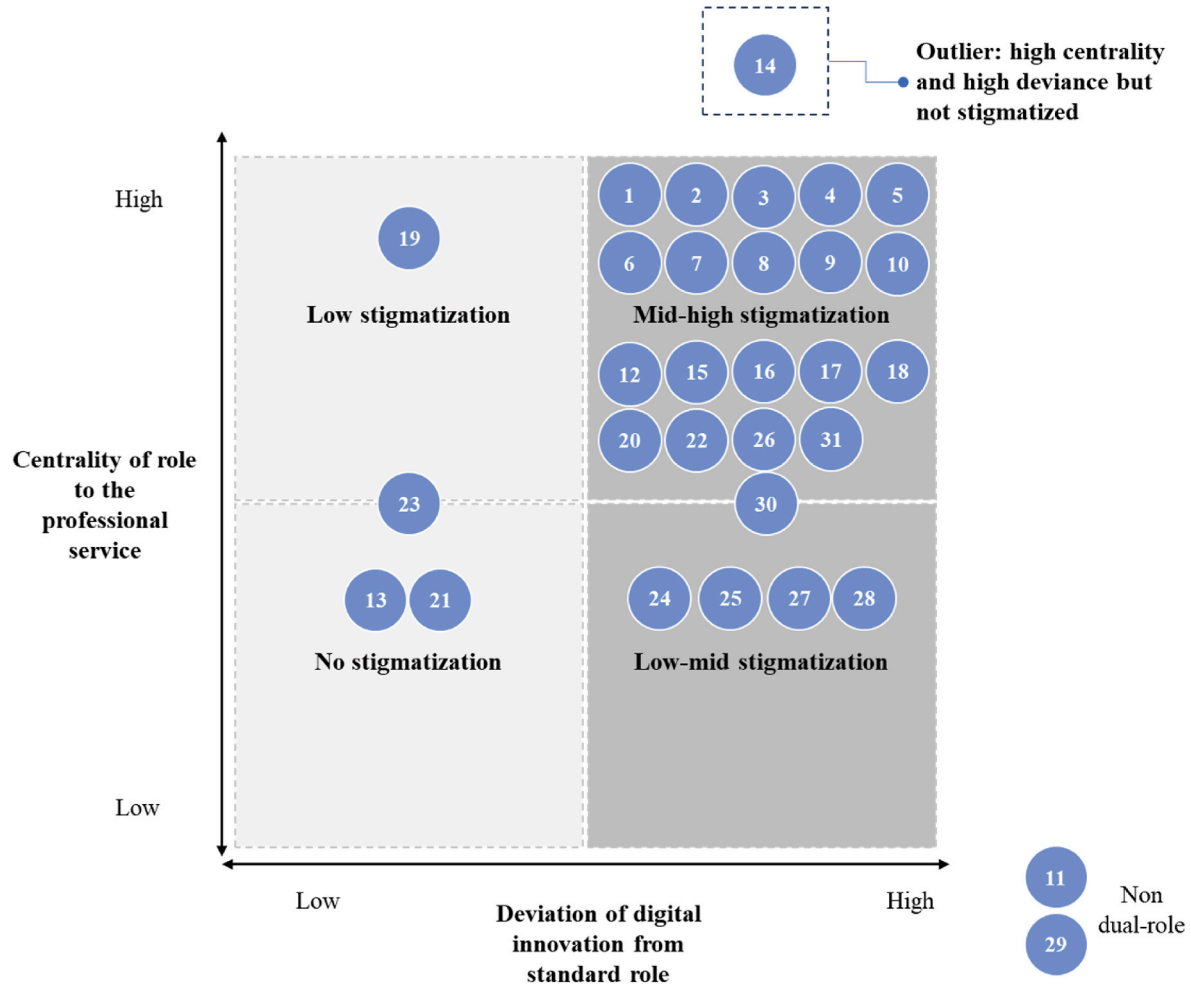

Fig. 2. Participants' perceptions of stigmatization

References

Abbott, A., 1981. Status and status strain in the professions. Am. J. Sociol. 86 (4), 819–835.

Abbott, A., 1988. The system of professions. An essay on the division of expert labor. University of Chicago Press, London.

Albert, H., 2020. What will it take for Germany to embrace digital health? BMJ 370.

Asthana, S., Jones, R., Sheaff, R., 2019. Why does the NHS struggle to adopt eHealth innovations? A review of macro, meso and micro factors. BMC Health Serv. Res. 19 (1), 1–7.

Bernardi, R., Exworthy, M., 2020. Clinical managers' identity at the crossroad of multiple institutional logics in it innovation: the case study of a health care organization in England. Inf. Syst. J. 30 (3), 566–595.

Bernardi, R., Sarker, S., Sahay, S., 2019. The role of affordances in the deinstitutionalization of a dysfunctional health management information system in Kenya: an identity work perspective. MIS Q. 43 (4), 1177–1200.

Bernardi, R., Wu, P.F., 2022. Online health communities and the patient-doctor relationship: an institutional logics perspective. Soc. Sci. Med. 314, 115494.

Bidmead, E., Marshall, A., 2020. Covid-19 and the 'new normal': are remote video consultations here to stay? British Medical Bulletin 135 (1), 16–22. https://doi.org/10.1093/bmb/ldaa025.

Boreham, P., 1983. Indetermination: professional knowledge, organization and control. Socio. Rev. 31 (4), 693–718.

Bresnen, M., Hodgson, D., Bailey, S., Hassard, J., Hyde, P., 2019. Hybrid managers, career narratives and identity work: a contextual analysis of UK healthcare organizations. Hum. Relat. 72 (8), 1341–1368.

Budd, J., Miller, B.S., Manning, E.M., Lampos, V., Zhuang, M., Edelstein, M., Rees, G., Emery, V.C., Stevens, M.M., Keegan, N., 2020. Digital technologies in the public-health response to COVID-19. Nature medicine 26 (8), 1183–1192.

Cascón-Pereira, R., Chillas, S., Hallier, J., 2016. Role-meanings as a critical factor in understanding doctor managers' identity work and different role identities. Soc. Sci. Med. 170, 18–25.

Chen, Y., Stavropoulou, C., Narasinkan, R., Baker, A., Scarbrough, H., 2021. Professionals' responses to the introduction of AI innovations in radiology and their implications for future adoption: a qualitative study. BMC Health Serv. Res. 21 (1), 1–9.

Citaristi, I., 2022. World intellectual property organization—wipo. The Europa Directory of International Organizations 2022. Routledge, pp. 395–398.

Currie, G., Lockett, A., Finn, R., Martin, G., Waring, J., 2012. Institutional work to maintain professional power: recreating the model of medical professionalism. Organ. Stud. 33 (7), 937–962.

Comparative Health Policy, Library., 2024. Comparative Health Policy Germany. Mailman School of Public Health. Columbia University. https://www.publichealth.columbia.edu/research/programs/comparative-health-policy-library/germany-summary.

Currie, W.L., 2012. Institutional isomorphism and change: the national programme for IT–10 years on. J. Inf. Technol. 27 (3), 236–248.

Department of Business, I.a. s., 2014. Improvement Plan. UK Government.

Evans, L., 2008. Professionalism, professionality and the development of education professionals. British Journal of Educational Studies 56 (1), 20–38.

Exworthy, M., Wilkinson, E.K., McColl, A., Moore, M., Roderick, P., Smith, H., Gabbay, J., 2003. The role of performance indicators in changing the autonomy of the general practice profession in the UK. Social science & medicine 56 (7), 1493–1504.

Falk, G., 2010. Stigma: How We Treat Outsiders. Prometheus Books.

Farrell, D., Sood, H., 2020. The NHS Digital Academy–learning from the past to look ahead. Future Healthcare Journal 7 (3), 185.

Faulconbridge, J., 2015. Knowledge and learning in professional service firms. The Oxford Handbook of Professional Service Firms, pp. 425–451.

Fidler, L.A., Johnson, J.D., 1984. Communication and innovation implementation. Acad. Manag. Rev. 9 (4), 704–711.

Fitzgerald, L., Ferlie, E., Wood, M., Hawkins, C., 2002. Interlocking interactions, the diffusion of innovations in health care. Human relations 55 (12), 1429–1449.

Freidson, E., 1994. Professionalism Reborn: Theory, Prophecy and Policy. Polity Press, Cambridge.

Freidson, E., 2001. Professionalism: the Third Logic. Polity Press, London.
Furnari, S., 2018. When does an issue trigger change in a field? A comparative approach to issue frames, field structures and types of field change. Hum. Relat. 71 (3), 321–348.
Galperin, R.V., 2020. Organizational powers: contested innovation and loss of professional jurisdiction in the case of retail medicine. Organ. Sci. 31 (2), 508–534.
Giacomelli, G., 2020. The role of hybrid professionals in the public sector: a review and research synthesis. Publ. Manag. Rev. 22 (11), 1624–1651.
Gill, M.J., 2019. The significance of suffering in organizations: understanding variation in workers' responses to multiple modes of control. Acad. Manag. Rev. 44 (2), 377–404.
Gill, M.J., 2023. Understanding the spread of sustained employee volunteering: how volunteers influence their coworkers' moral identity work. J. Manag. 49 (2), 677–708.
Gill, M.J., McGivern, G., Sturdy, A., Pereira, S., Gill, D.J., Dopson, S., 2020. Negotiating imitation: examining the interactions of consultants and clients to understand institutionalization as translation. Br. J. Manag. 31 (3), 470–486.
Gioia, D.A., Corley, K.G., Hamilton, A.L., 2013. Seeking qualitative rigor in inductive research: notes on the Gioia methodology. Org Research Methods 16 (1), 15–31.
Glaser, B.G., Strauss, A.L., 1967. The Discovery of Grounded Theory; Strategies for Qualitative Research. Aldine, Chicago.
Goffman, E., 2009. Stigma: Notes on the Management of Spoiled Identity. Simon and Schuster.
Greenhalgh, T., Wherton, J., Papoutsi, C., Lynch, J., Hughes, G., Hinder, S., Fahy, N., Procter, R., Shaw, S., 2017. Beyond adoption: a new framework for theorizing and evaluating nonadoption, abandonment, and challenges to the scale-up, spread, and sustainability of health and care technologies. J. Med. Internet Res. 19 (11), e8775.
Greenwood, R., Raynard, M., Kodeih, F., Micelotta, E.R., Lounsbury, M., 2011. Institutional complexity and organizational responses. Acad. Manag. Ann. 5 (1), 317–371.
Hage, J.T., 1999. Organizational innovation and organizational change. Annu. Rev. Sociol. 597–622.
Hoff, T.J., 2000. Professional commitment among US physician executives in managed care. Soc. Sci. Med. 50 (10), 1433–1444.
Huising, R., 2019. Moving off the map: how knowledge of organizational operations empowers and alienates. Organ. Sci. 30 (5), 1054–1075.
Justinia, T., 2017. The UK's National Programme for IT: why was it dismantled? Health Serv Manage Res 30 (1), 2–9.
Kitchener, M., 2000. Thebureaucratization'of professional roles: the case of clinical directors in UK hospitals. Organization 7 (1), 129–154.
Kurunmäki, L., 2004. A hybrid profession—the acquisition of management accounting expertise by medical professionals. Account. Org. Soc. 29 (3–4), 327–347.
Lantzsch, H., Eckhardt, H., Campione, A., Busse, R., Henschke, C., 2022. Digital health applications and the fast-track pathway to public health coverage in Germany: challenges and opportunities based on first results. BMC Health Serv. Res. 22 (1), 1–16.
Light, D.W., 1984. Status, Purity, and Professional" Regression, vol. 90. University of Chicago Press, pp. 182–184.
Martin, G.P., Leslie, M., Minion, J., Willars, J., Dixon-Woods, M., 2013. Between surveillance and subjectification: professionals and the governance of quality and patient safety in English hospitals. Soc. Sci. Med. 99, 80–88.
McGivern, G., Currie, G., Ferlie, E., Fitzgerald, L., Waring, J., 2015. Hybrid manager–professionals'identity work: the maintenance and hybridization of medical professionalism in managerial contexts. Publ. Adm. 93 (2), 412–432.
Naughton, B., Dopson, S., Iakovleva, T., 2023. Responsible impact and the reinforcement of responsible innovation in the public sector ecosystem: cases of digital health innovation. Journal of Responsible Innovation 10 (1).
Naughton, B., Foss, L., 2019. 13. Responsible innovation and commercialisation in the university context: a case study of an academic entrepreneur in digital healthcare. Responsible Innovation in Digital Health: Empowering the Patient 197.
Noordegraaf, M., 2011. Risky business: how professionals and professional fields (must) deal with organizational issues. Organ. Stud. 32 (10), 1349–1371.
Noordegraaf, M., 2015. Hybrid professionalism and beyond:(New) Forms of public professionalism in changing organizational and societal contexts. Journal of professions and organization 2 (2), 187–206.
OECD, 2022. Health Data Governance for the Digital Age. OECD Publishing, Paris.
OECD, 2023. Health at a Glance 2023. OECD Publishing, Paris.
Petrakaki, D., Klecun, E., Cornford, T., 2016. Changes in healthcare professional work afforded by technology: the introduction of a national electronic patient record in an English hospital. Organization 23 (2), 206–226.
Petrakaki, D., Kornelakis, A., 2016. 'We can only request what's in our protocol': technology and work autonomy in healthcare. New Technol. Work. Employ. 31 (3), 223–237.
Piderit, S.K., 2000. Rethinking resistance and recognizing ambivalence: a multidimensional view of attitudes toward an organizational change. Acad. Manag. Rev. 25 (4), 783–794.
Pratt, M.G., Rockmann, K.W., Kaufmann, J.B., 2006. Constructing professional identity: the role of work and identity learning cycles in the customization of identity among medical residents. Acad. Manag. J. 49 (2), 235–262.
Rogers, E.M., 2003. Diffusion of Innovations, fifth ed. Free Press, New York.
Schlieter, H., Marsch, L.A., Whitehouse, D., Otto, L., Londral, A.R., Teepe, G.W., Benedict, M., Ollier, J., Ulmer, T., Gasser, N., 2022. Scale-up of digital innovations in health care: expert commentary on enablers and barriers. J. Med. Internet Res. 24 (3), e24582.
Schwandt, T.A., Lincoln, Y.S., Guba, E.G., 2007. Judging interpretations: but is it rigorous? Trustworthiness and authenticity in naturalistic evaluation. N. Dir. Eval. 2007 (114), 11–25.
Stern, A.D., Matthies, H., Hagen, J., Brönneke, J.B., Debatin, J., 2020. Want to see the future of digital health tools? Look to Germany. Harv. Bus. Rev. 2.
Wallace, M., Reed, M., O'Reilly, D., Tomlinson, M., Morris, J., Deem, R., 2022. Developing Public Service Leaders: Elite Orchestration, Change Agency, Leaderism, and Neoliberalization. Oxford University Press.
Waring, J., 2007. Adaptive regulation or governmentality: patient safety and the changing regulation of medicine. Sociol. Health Illness 29 (2), 163–179.
Wears, R., Sutcliffe, K., 2019. Still not safe: patient safety and the middle-managing of American medicine. Oxford University Press.
Webster, P., 2020. Virtual health care in the era of COVID-19. The lancet 395, 1180–1181, 10231.
Wiedner, R., Croft, C., McGivern, G., 2020. Improvisation during a crisis: hidden innovation in healthcare systems. BMJ leader leader-2020-000259.
Wood, M., Ferlie, E., Fitzgerald, L., 1998. Achieving clinical behaviour change: a case of becoming indeterminate. Social science & medicine 47 (11), 1729–1738.
Yan, Z., Bernardi, R., Huang, N., Chang, Y., 2021. Guest editorial: the bright side and the dark side of digital health. Internet Res. 31 (6), 1993–1999.
Ziebland, S., Hyde, E., Powell, J., 2021. Power, paradox and pessimism: on the unintended consequences of digital health technologies in primary care. Soc. Sci. Med. 289, 114419.