Boundary Spanning Roles in Cross-border University-Industry Collaboration: the Case of Chinese Multinational Corporations

Simone Corsi

Loughborough University

Xiaolan Fu*

University of Oxford

Cintia Külzer Sacilotto**

Singapore Management University

*** Corresponding Author.** Technology and Management Centre for Development, Department of International Development, University of Oxford, 3 Mansfield Road, Oxford, OX1 3TB, UK. Email: xiaolan.fu@qeh.ox.ac.uk. Tel: +44 (0) 1865 281836.

** The authors are listed in alphabetical order. They contributed equally to the study.

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Abstract

This paper contributes to open innovation (OI) and boundary spanning literatures by providing a first understanding of industry-based boundary spanners in university-industry (U-I) collaboration through case studies of Chinese multinational corporations (MNCs) and their international OI platforms. Organisational roles created by these platforms within the MNCs and their activity of bridging between organisations are examined. The analysis of 25 in-depth interviews in two MNCs located in 8 countries, along with internal documents, sheds light on U-I collaboration practices implemented by Chinese MNCs. Two new boundary spanning roles are identified: *Dual Cultural Bridger* – as these OI platforms bridge organisational and national cultural gaps to prevent and solve problems in the collaborative process; and *International Network Enhancer* - as these OI platforms act as trust building and local knowledge listening posts for the MNC's global network. Managerial and policy implications are provided.

Keywords: boundary spanning, open innovation, university-industry collaboration, intermediary, China, multinational corporation

1. Introduction

China's policymakers have encouraged MNCs' internationalisation efforts for about 20 years, since the first wave of the *Going Global* strategy. More recently this has been strengthened by the *Belt and Road Initiative* (BRI), which aims at increasing China's global relevance and interconnectedness with the rest of the world through infrastructure development, trade and S&T collaboration. Chinese MNCs are encouraged to leverage BRI in order to forge and develop new collaborative relationships with their counterparts along the *New Silk Road*. Innovation collaboration along the New Silk Road is one of the areas that may have an important impact for both China and the host countries.

In this paper we study the case of two leading Chinese MNCs in their attempt to engage in open innovation (OI) with global partners and universities with the aim of fostering their technological catch-up. While university-industry (U-I) collaboration management practices have been widely investigated (Perkmann et al., 2013), studies have mostly focused on how universities manage collaborations with industry by establishing intermediary roles (Comacchio et al., 2012). Furthermore, the increasing dispersion of knowledge resulting in more international research and development (R&D) collaboration calls for a more in-depth investigation into the so-far neglected international dimension of U-I collaboration. Framing the experience of our focal MNCs in a U-I collaboration context, we reveal how it relied on an internally created boundary spanning role to create and manage relationships with culturally and geographically distant university partners.

By building on OI, U-I collaboration and boundary spanning literatures, this paper studies the international research collaboration programme of two Chinese MNCs. Specifically, we look at the dynamics of collaboration through the lens of an organisational role – *Innovation Collaboration Manager* (ICM) that the companies created in order to foster international research collaborations and ecosystems. We aim to address the identified research gaps by answering the following research questions: *How do Chinese MNCs organise for international U-I collaboration? What organisational roles do their OI platforms and ICMs play in their cross-border innovation collaboration? Are their boundary spanners' roles different from that reported in the literature in the context of universities?*

Through the analysis of 25 semi-structured in-depth interviews carried out in two MNCs in 8 countries where our focal companies have collaborations with universities, and through their triangulation with secondary data, we offer a first understanding into company-based boundary spanning roles in the context of international U-I collaboration. The contribution of this paper is twofold. First, we contribute to the OI literature by providing a better understanding of companies' managerial practices and intermediation arrangements for collaboration with universities based on the concept of boundary spanning. Second, we provide an initial understanding of how emerging MNCs (EMNCs) address the cultural and international network issues they face in R&D collaboration with university partners in advanced economies. In doing so, we identify two new boundary spanning roles - *Dual Cultural Bridger* and *International Network Enhancer* - that are pivotal for international U-I

collaborations. Finally, findings from this research offer useful insights on how Chinese MNCs innovatively manage the challenging international U-I collaboration on the New Silk Road.

2. Literature Review and Theoretical Framework

2.1 *Managing International University-Industry Collaboration*

Universities have been recognised as important sources of knowledge and innovation for industry (Etzkowitz and Leydesdorff, 2000; Lundvall, 2010). Companies have been looking at universities as collaborators able to generate cutting-edge knowledge that could be industrially adapted and commercially exploited by them. From a firm perspective, in a U-I collaboration, companies scout and source knowledge or innovation from outside their boundaries and capitalize on it through further development in order to gain a competitive advantage on the market, in a process that has been defined as inbound OI (Gassmann and Enkel, 2004; Chesbrough, 2006; Perkmann and Walsh, 2007). The university perspective is instead usually framed within the broader concept of academic engagement (Perkmann et al., 2013) or entrepreneurial university (Clark, 1998), which study how universities cooperate with industry in order to foster innovation and, in turn, economic development.

This area of study has focused on identifying challenges (and potential solutions) that may hamper this type of collaborations (Hughes and Kitson, 2012). Amongst these, scholars have pointed at divergent goals, managerial practices and incentives that set universities and industry apart, delineating an organisational culture gap (D'Este and Patel, 2007). In order to address this gap, universities have developed organisational solutions with the aim of intermediating between themselves and industrial partners. Accordingly, academic literature has investigated this phenomenon by studying para-academic organisations such as Technology Transfer Offices and university incubators (Golob, 2006; Comacchio et al., 2012; Villani et al., 2017) or para-academic roles within or associated with universities (Youtie and Shapira, 2008), often referred to as boundary spanners (Comacchio et al., 2012; Chau et al., 2017). While the university's response to these challenges has been widely studied, the industry's response on how its collaboration with universities can be mediated is still very limited.

Despite strong internationalisation of the higher education sector, previous research has mostly focused on international academic collaboration rather than U-I collaboration (Chen et al., 2019). Assuming a firm perspective, one that sees MNCs strive to access cutting-edge knowledge and commercialising innovations globally, it is difficult to neglect the importance of leading research institutions like universities, and their role for MNCs' inbound OI processes (West et al., 2014; Jin et al., 2011; Liefner et al., 2019).

It is equally difficult to neglect the potential challenges associated with international U-I collaboration. U-I collaborations flourish within spatially bounded areas due to localised knowledge spillovers (D'Este et al., 2013). To engage in international U-I collaborations,

MNCs have to overcome geographical distance and restricted knowledge spillovers. Academic excellence alone is not a guarantee for R&D investment attraction or U-I collaboration (Broström et al., 2009). Although some challenges faced by EMNCs engaged in U-I may overlap with those seen in traditionally studied domestic U-I collaborations, the international dimension inevitably adds further complications. For example, international U-I collaboration of Chinese MNCs are affected by a cultural gap between home and host country in terms ofinstitutions, language and business practices (Fu and Li, 2016). While this seems to be in line with previous studies on the impact of national culture on R&D internationalisation (Jones and Davis, 2000), the way MNCs mitigate it through organisational roles remains largely unexplored. This is especially true for EMNCs given the higher cultural distance they most likely have from advanced countries in terms of, for example, economic and administrative institutions and laws (Marquis and Raynard, 2015).

2.2 *Boundary Spanning Roles in International U-I Collaborations*

Boundary spanning is defined as brokering information by facilitating and managing knowledge inflows and outflows between two organisations (Tushman, 1977; Tushman and Scanlan, 1981). Several studies have looked at the roles of boundary spanners in different industries or contexts (See Table 1 for a summary). Ancona and Caldwell (1992) identified and categorized four boundary spanning roles including to bridge, filter and mediate the exchange of information between an organisation and its external environment, as well as coordinating and intermediating their collaboration.

-----Table 1 about here-----

The role of industry-based boundary spanners may be similar to those of OI managers previously identified in literature. Building on leadership literature, Ollila and Yström (2017) identify emerging roles that are played by senior managers in facilitating innovation in an open and collaborative environment. They stress the importance of the role of OI managers not only in facilitating a transaction-based knowledge flow between two or more organisations but also in leveraging a more holistic approach to collaboration based on their social and relational skills.

Adopting an approach used by Johnson and Duxbury (2010), we study how EMNCs-based boundary spanners working on U-I partnerships differ from existing roles or functions of boundary spanners identified in the literature. There are four areas or roles that have been discussed in previous studies and are of interest for our study: *bridge organisational differences*, *problem-solving*, *trust-building*, *creation of local networks*. Dissimilarities and misalignment between university and industry's aims and cultures have long been pointed at as the main reason for troubling U-I research collaborations (Perkmann et al., 2013). University-based intermediaries or boundary-spanners are suggested as possible means for smoothing some of these frictions (Lee et al., 2010; Comacchio et al., 2012; Huyghe et al., 2014; Takanashi and Lee, 2019). For example, in their study of a Japanese university collaboration dynamics with industry, Takanashi and Lee (2019) define boundary spanning

leadership as the ability to align strategies of university and industry within the context of their collaboration. This is obtained through an effective relief of 'potential tensions and conflicts' as well as the solving of problems arising from the collaboration. In the context of the UK, Rosli et al. (2018) describe boundary spanners as facilitators that solve problems caused by organisational or cultural differences between university and industry. Problem-solving is also one of 4 main roles identified by Weerts and Sandmann (2010), Bansal et al. (2012) and Takanashi and Lee (2019).

The facilitation of a communication flow is key to foster the building of social capital based on trust between the parties involved (Fleming and Waguespack, 2007; Comacchio et al., 2012). Boundary spanners are essential to create a long-term trust-based relationship between the university and the business that in turn has the potential to convert knowledge generated through a research collaboration into impactful commercialization (Pertuze et al., 2010). The social capital developed by university-based boundary spanners is based on their ability to perform both internal (for example across departments) and external boundary spanning activity. In doing so, they assume a role of local network creator, connecting several academics or university subunits with as many external stakeholders (Huyghe et al., 2014; Scott et al., 2019). Through their activity of fostering collaboration with industrial partners, boundary spanners facilitate the creation of local innovation clusters in a British university (Scott et al., 2019). Boundary spanning activity of university-based roles is crucial for the creation of university-centred innovation ecosystems (Youtie and Shapira, 2008; and Schaeffer and Matt, 2016) Universities are defined as knowledge-hubs whose boundary spanners coordinate and manage collaborations for fostering local innovation and development (Bansal et al., 2012).

While we expect our boundary spanners to perform similar functions as identified in the previous regional or national U-I collaborations, we anticipate that differences or new tasks will be identified as a consequence of the international nature of our case studies.

3. Methodology and Data

Given the research questions and the gap in the field, we adopt an exploratory case study approach (Yin, 2017). Case studies are particularly indicated to explore new areas of study and to respond to the *how* questions, as they offer in-depth insights into the investigated contemporary phenomena (Eisenhardt, 1989; Yin, 2017). Two leading Chinese MNCs, Yangshuo and Island, in the electronic and electrical equipment industries are selected for in-depth case study. These two companies have not only grown rapidly to be global leaders in their industries, representing exemplar cases of Chinese MNCs, but also are among the very few Chinese MNCs that have set up dedicated open innovation programs/platforms. Therefore, the choice of these two cases is mainly driven by characteristics of exceptionality (Galunic and Eisenhardt, 2001; Siggelkow, 2007). Finally, as we are particularly interested in identifying the role of boundary spanners, we adopt an embedded exploratory case study design, focusing on collaboration managers located in headquarters and foreign subsidiaries of the two EMNCs as our unit of analysis.

The cases: Yangshuo and Island

Yangshuo was founded in the south of China at the end of 1980s. It started its international operations in developing countries in Southeast Asia at the end of the 1990s, and in advanced markets at the turn of the century. Nowadays, Yangshuo is one of the most important world players in its industry, with 16 R&D centres worldwide. Island was founded in the north of China in mid-1980s. It started to export to international markets in 1990 and later internationalized operations globally. Nowadays, it is one of the most famous brands and a global leader in its industry.

Yangshuo began to build its open collaborative innovation framework in 1999. In 2010 Yangshuo set up its OI Platform, the Yangshuo Innovation Platform (YIP) with the aim of fostering research collaboration between the company and external partners around the world. YIP adopts a systematic approach to allow Yangshuo's engineers to collaborate with researchers at top universities and business partners, both domestic and foreign. By the end of 2016, YIP had facilitated inter-organisational collaborations with more than 200 universities in 29 countries, and supported almost 7,000 research projects that are funded by Yangshuo. In order to manage the complex dynamics underlying these collaborative partnerships, YIP has created two types of collaboration managers (CM): *Headquarters Collaboration Manager* (HCM), responsible for the administrative implementation of the projects; and *Local Collaboration Manager* (LCM), responsible for the development and maintainance of relationships with external partners.

Island set up its open innovation centre in 2009. It upgraded this centre and built up an online open innovation platform, Island Innovation Platform (IIP) in 2012. Over the years, the functions of IIP expanded from meeting internal research needs and search and match external innovation resources to developing expert communities, understanding user needs, and carrying out market intelligence and trends analysis. They have helped to create more than 1,000 collaborative innovation projects and contributed to about half of the product or process innovations of the company group. They also developed active and large expert communities including industry and academic experts and solution providers globally.

While both are global industry leaders, Island mainly produces consumer products while Yangshuo mainly provides large equipments and technology solutions to business customers. Both companies have a strong focus on R&D and OI, as exemplified by Island's CEO statement "The world is our human resource department" and by Yangshuo's consistently ranking as the world's top R&D investors in recent years. IIP focuses more on user innovation and on mature technologies that can be used by industries immediately, while YIP also emphasizes on basic research and collaboration with universities, and invest more heavily in R&D. Such similarities and differences between the two companies help us to identify patterns that are relevant in a wider context.

For the data collection, a total of 25 interviews were carried out in two MNCs. The interviewees include 18 collaboration managers, 4 senior staff in the two MNCs, 3 external

partners and experts based in Europe, Asia, North America and China. The sample is selected according to their geographical location and functions, as well as bringing both internal and external perspectives. One-hour long semi-structured interviews were conducted in China and seven other countries in 2017, 2018 and 2020 (Table 2), supplemented by other documents such as internal reports, published papers and company websites, as well as one author's five-year longitudinal study of the YIP and other formal and informal interviews with the CMs.

-----Table 2 about here-----

4. Findings and Discussion: Two New Boundary Spanning Roles

Despite there being large overlap between previous research on the roles of boundary spanners and our empirical data resulting from interviews, we could find two roles new to the literature where our boundary spanners performed a set of tasks that we describe below and summarise, and provide additional quotes, in Figure 1 and Figure 2.

----------Insert Figure 1 and 2 about here ----------

4.1 The Dual Cultural Bridger

As expected from previous literature on U-I collaboration, interviewees repeatedly stressed their role in bridging cultural differences on two levels: one organisational and one national. As such, they have to rely on their dual embeddedness (Achcaoucaou et al., 2014), being part of a foreign organisation but embedded in the local context. We found that LCMs rely on their dual embeddedness in order to prevent and solve problems occurring while interacting with foreign universities.

LCMs view themselves as *'the main interface into the academia, industry and startup community, representing all business aspects of Yangshuo, across all technology domains to seek-out new talent, new unique innovations and bring said attributes to the notice of Yangshuo - LCM 5*

On one side, LCMs have to be able to bridge between university and industry, trying to facilitate mutual understanding between two parties whose goals and objectives are not aligned. Large firms prioritize rapid progress and seek holistic solutions, while academia prioritizes novel research outcomes and development of expertise in a single discipline. This is a well-known issue. We found that LCMs serve to bridge this gap through - "Bridge Organisational Differences" (Figure 1). For example, a LCM in country 5 reported below,

"A large technology company such as Yangshuo has to make and sell products for customers and a university has to research and educate students. [...] The role of an LCM is to try to bring those two belief systems together." - LCM 5

According to a manager at its headquarter, "*LCMs have very good understanding of the differences in R&D process between universities and the industry, eg., the differences in R&D process, milestones, time pace, testing, resource management, and attitudes towards changes and shocks*."

On the other side, difficulties can arise from national cultural distances. Literature on best practices on how to work in China is well developed, but Chinese MNCs that established collaborations with foreign universities in advanced countries is a relatively new phenomenon. As such, companies or universities have limited experience on how to manage a geographic, language and overall cultural distance that may create friction. This is exemplified below in quotes from LCMs based in country 3, as well as in countries 5 and 6 in Figure 1 - "Bridge National Cultural Distance".

"You must be a diplomat, build bridges, there are big cultural gaps, there is one cultural gap between China and Country 3. They are very different cultures, ways of expressing, ways of explaining and ways of working. And many times there is not so much understanding on both sides. So they need guidance." - LCM 3

With the addition of this layer of cultural distance, U-I collaboration is even harder and the roles of LCMs become more important. LCMs may have to mediate between two cultures that are far apart both in terms of different business practices and of institutional environments. For example, a LCM in country 3 said;

"It may be the first time the partner has worked with a Chinese headquartered company. They need help to understand who Yangshuo is, how Yangshuo operates and how best to have a discussion with Yangshuo. [...] It may be the first time the Yangshuo colleague has worked with a European company or university, so helping them understand how they will behave and what to expect is useful. In fact, this behaviour often makes the difference whether a successful project can be started, or just an interesting conversation is made." - LCM 3

In such a complex and potentially conflicted environment, LCMs' leverage their dual embeddedness in order to reduce the risk of incurring problems due to lack of understanding, prior to starting a collaboration, as well as minimising the impact of them during the collaboration. In an initial introductory phase, LCMs' role is to make sure each party understands what to expect from the other, or at least to minimize the risk of confusion in order to prevent problems in a prospective collaboration. The establishment of LCMs' role allowed Yangshuo to performe that function by meeting with academics in person in order to convey its objectives and priorities at the outset of the collaboration. This is well explained by interviewees in countries 3 and 6 below and further in Figure 1 - "Prevent Problems".

"My job is to go down there and say: 'are these guys the kind of guys that we are ok to work with? Are they capable of delivering? Do they have the right kind of skills, the right kind of attitude, the right kind of resources to do a project with Yangshuo?'" - LCM 3

"They [academics] do not know Yangshuo's direction and how to collaborate with us. Face-to-face meetings ensure understanding and increase chances for a successful collaboration" - LCM 6

However, while meetings help, problems inevitably happen during complex collaborative research projects and LCMs need to step in and try to solve them. These problems can arise from simple misunderstandings based on a typical U-I disagreement on what parties consider to be an acceptable outcome, such as reported in quotes from an interviewee in country 5 below and in Figure 1 - "Solve Problems" -, where the LCM had to act as a mediator.

"LCMs speak to one party, or the other, or both, but separately […] and many times that solves the problem because they really understand what was possible or what both parties want to achieve" - LCM 5

This first role sheds light on how industry-based boundary spanners can mediate cultural differences while leveraging their dual embeddedness. They are in fact part of an MNC and share their culture, but they are also able to interpret local behaviour, customs, as well as being aware of local laws. LCMs leverage this in order to carry out their function of reducing cultural distance between Yangshuo and their partners while they collaborate on joint research projects. Consistent with Fu and Li (2016), we confirm the presence of a country-culture effect in Chinese organisations collaborating with foreign universities. It appears though that this culture effect is not associated with a common cultural and administrative misalignment between the West and China and its impact on management practices and styles. This misalignment is often the source of the problems that LCMs have to anticipate and solve. In contrast to previous literature on U-I collaboration where the focus of boundary spanning is on information and knowledge exchange (Youtie and Shapira, 2008), our findings point to a pronounced importance of the social dimension as a means to navigate complex collaborative dynamics. This relates to the importance of social capital in OI settings for managing collaborations (Ollila and Yström, 2017) and contributes to this area by studying the specific case of collaborations with universities.

4.2 The International Network Enhancer

This role deals with creating, extending and maintaining local networks to serve a global EMNC. At YIP, CMs especially the LCMs, are responsible for enhancing the network with local partners in a specific geographic area. Their responsibilities mainly consist of building trust through interpersonal interactions locally and their knowledge of and reputation in the local innovation system, leveraging their network to develop the innovation ecosystem of the company, including source potential partners and maintaining the relationship with academics, their institutions and other non-academic partners. While being employed by Yangshuo, they often seen themselves as representatives of the local innovation ecosystem. LCMs use inclusive expressions such as in *"that is the way we do business here"* in their discussions with the headquarters, positioning themselves as part of the local ecosystem.

Their focus is on ensuring a fruitful connection between their organisation and the external environment, *"support*(ing) *both sides, not one"* (LCM 3) . Moreover, "*through the demonstration effect of a successful project, they will develop more collaboration between the company and the local partners, and persuade the headquarter's further investment into the host country, including set up joint research labs*" (YIP Director).

Similarly, at IIP, the innovation ecosystem development and relationship management functions are carried out by both its CMs at the headquarter and staff in its four overseas innovation centres.

"*Trust is very important in establishing cooperation and also important for its success. We cannot gain such trust through telephone. Interpersonal interaction is essential. Our staff in the overseas innovation centres visit our potential partners to build up such trust. Moreover, they are well established members of the innovation community in foreign countries and engaged with building international collaboration for some years. This also helps us to gain trust and enter into the local innovation ecosystem*" (IIP Director).

The benefits are shared by CMs below, and supported by interviews in country 3 in Figure 2 – "Build Trust":

"*There was a foreign company that did not respond to our emails initially. Our colleague in an overseas innovation centre visited them. They started to cooperate with us, and after a few years, they set up two joint ventures with our company*". – CM 20

"*There was a Country 2 SME supplier that collaborated with us on our products. But a technology it had was also useful to our other product lines. We recommended them to other business departments in our group. Later we even found local production and financial resources for them. They built up their own subsidiary in China later*". – CM 22

These evidences suggest that the CMs, especially within a locally enhanced network, are needed to build trust and provide comfort to potential partners. The importance of strong ties in creative processes, particularly when dealing with external collaborations, is well documented and widely accepted in the network literature (Krackhardt, 1992; Rost, 2011). Understanding that boundary spanners in EMNCs need to perform such a role to engage with foreign universities is new. CMs needed to create strong interpersonal ties, build trust and maintain a reputation with local universities. At the same time, CMs needed to transfer this 'wealth' to their second network, the one made by the constellation of MNCs' subsidiaries and headquarters that will benefit from the first network.

It is the international nature of this task that makes LCMs' role leveraging local networks for the development of collaborative innovations with a global remit. Opportunities for collaborations are spotted while consulting for knowledge pockets (Gassmann and Von Zedtwitz, 1998), using their network to learn about technological updates from potential partners in order to progress in technologies and areas of mutual interest in a global rather

than local context - as is well reported in interviews in countries 2 and 5 below and in countries 2 and 3 in Figure 2 - "Listening Outpost".

"When they hired me, the first time I went to visit the professors, they were so happy, - 'We finally have someone local, so we can talk to. We can reach out'' - LCM 2

"If Yangshuo have colleagues in Finland or Sweden that want to do work with universities in Country 5 because they come across some breakthrough technology published in a paper, but they have no relationship with professors there, collaboration managers can help them to set up the dialogues, the conversations" - LCM 5

The adoption of an international perspective in U-I collaboration allows us to describe industry-based boundary spanners as local knowledge listening posts for the MNC's global network, introducing an R&D internationalisation perspective. This double network approach (Zanfei, 2000) based on the newly identified dual role of LCMs allows Yangshuo to reduce both its liability of outsidership and of foreignness (Johanson and Vahlne, 2009) and, as such, introduces original evidence for the importance of network relationships with local universities for the internationalisation process of EMNCs' R&D.

Traditional roles of boundary spanning activity include searching for new external sources of infomation on behalf of their organisation. In the case of YIP's LCMs, this means a constant reaching out to their local network to develop new collaboration opportunities through cross-cultural bridging. This is described by LCMs in country 1 and in China as reported in Figure 2 - " Expand Network". This is also a basic function of IIP, which uses a combination of web data mining, global expert community and user forum feedbacks, and overseas R&D centre experts's opinion to identify directions of future technological change in its industry.

On the other hand, relationships with local partners can deteriorate due to misunderstandings or technical problems. One important task of LCMs is to deal with the disputes in a way that saves the project. If the project is not saveable, LCMs have the responsibility of maintaining the relationship with the local partner and ensuring that Yangshuo remains as reputable and trustworthy organisation. Being part of a local network, "Maintain In-Country Reputation" is very important for Yangshuo as reported by LCMs in countries 1 (below) and 4 in Figure 2-.

"If the collaboration has a problem, that may damage our company's image and the brand name so this relationship maintenance and risk management is important"- LCM 1

"*When there are bigger disagreements which need to bring up to a higher level of management for resolution, LCMs will often act as representatives of the partners of the company, providing point of views or arguments from the partners' perspectives into the decision making process. This helps us to make decision based on multiple stakeholders' perspectives instead of only considering one side's perspective*", according to YIP Director.

IIP Director conveys a similar message. "*The game rules sometimes are different in different countries. For example, in a foreign country costs are charged by hours input, while in China we judge by outcome. Sometimes our foreign partners require upfront payment but we normally pay against deliverables. Staff of IIP will explain to our internal staff such differences so that we can collaborate, or sometimes safeguard the reputation of Island as a responsible global player*."

5. Conclusions

Studying the implementation of OI programs in two Chinese MNCs provides two contributions. First, it offers insight into OI management practices in a U-I collaborative context from an industry perspective. By adopting a firm's perspective, while it confirms the typical challenges of U-I collaborations (Perkmann et al., 2013), it provides a first understanding into industry-based roles that are created to facilitate such collaborations. CMs are industry-based boundary spanners that act as intermediaries between the academic and the industrial world, bridging organisational cultural gaps and thus performing a role that so far, according to the literature, has been covered by university-based boundary spanners (Comacchio et al., 2012).

Second, it introduces a scarcely investigated international dimension into the U-I phenomenon. Analysing the cases of YIP and IIP allowed us to identify two new-to-the-literature roles of boundary spanning activity in relation to U-I: *Dual Cultural Bridger* and *International Network Enhancer*. This study provides empirical evidence of how EMNCs can reduce cultural distances between themselves and the local university partners by the establishment of *ad hoc* roles. It also presents a case for the importance of network relationships with local universities for the internationalisation of EMNCs' R&D.

This study has important policy implications. The need for cultural mediation between Chinese and foreign universities puts further pressure on an already often difficult relationship between industry and academia. Furthermore, while large Chinese MNCs can experiment with organisational innovation and rely on a generous availability of resources, smaller and less resourceful firms may not be in a position to do so. Chinese government, in partnership with governments of technologically advanced economies, should promote policies to address this gap by providing platforms of collaboration through which domestic firms can cooperate with foreign universities in order to fill a technological gap or gain a competitive advantage. These policies should be integrated within the broader BRI in order to facilitate technology exchange amongst the countries involved. Technology exchange only works when there is a reciprocal benefit, so governments of countries participating in the BRI should take into account risks and benefits associated with the initiative and support their universities (and technology organisations) in order to ensure this reciprocity.

This study has limitations that should be overcome by future research. Although this study has examined the roles played by company OI programs/platforms in several countries along the New Silk Road, caution shall be taken to generalise it to a model for or from the New Silk

Road. Future studies should focus on specific groups of countries (characterized by different degrees of cultural distance) in order to offer a more in-depth understanding of cultural issues in international U-I collaboration.

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Table 1 Examples of boundary spanning roles/functions typologies.

Authors (year)	Area of Study	Boundary spanner roles/functions
Ancona and Caldwell (1992)	Product Development Teams	*Ambassador, Task coordinator, Scout, Guard*
Bettencourt et al., (2005)	Retail Banking	*External representation, Internal influence, Service delivery*
Weerts and Sandmann, (2010)	Education	*Community-based problem solver, Technical expert, Internal engagement advocate, Engagement champion*
Pilbeam and Jamieson, (2010)	Education	*Communicating, Networking, Information Conduit, Composure*
Johnson and Duxbury, (2010)	Expatriates	*Relationship building, Shaping, Intelligence gathering, Delivering, Coordinating/Negotiating, Guarding, Information gathering, Representing, Intermediary*
Sturdy and Wright, (2011)	Management Consultancy	*Gatekeeper, Broker, Partner*
Williams, (2012)	Public Management	*Reticulist, Interpreter/Communicator, Coordinator, Entrepreneur*
Comacchio et al. (2012)	Technology Transfer Offices	*Scanning and selection of R&D opportunities, Bridge building, Semantic translation of domain specific knowledge, Co-creation of new knowledge*
Curnin and Owen, (2014)	Emergency Management	*Representative, Communicator, Networker, Legitimate enabler, Information conduit, Information analyst, Resource coordinator, Organisational expert, Domain expert*
Nederhand et al., (2019)	Citizen-state Interaction	*Entrepreneurial strategy, Mediating strategy, Hierarchical strategy*

Table 2 List of interviews carried out in 2017, 2018 and 2020.

#	Role	Location	MNC
1	LCM	1	1
2	LCM	2	1
3	LCM	3	1
4	LCM	4	1
5	LCM	5	1
6	LCM	6	1
7	LCM	7	1
8	HCM	China	1
9	HCM	China	1
10	HCM	China	1
11	HCM	China	1
12	HCM	China	1
13	LCM	China	1
14	YIP Director	China	1
15	Principal Investigator	China	1
16	Yangshuo Senior Manager	China	1
17	External Partner	China	1
18	Principal Investigator	China	1
19	IIP Director	China	2
20	CM	China	2
21	CM	China	2
22	CM	China	2
23	CM	China	2
24	CM	China	2
25	External Expert	China	2

Notes: Countries where the interviewees are based include Canada, China, Germany, Ireland, Japan, Singapore, United Kingdom, USA.

Figure 1 Functions of the Dual Cultural Bridger role (additional quotes).

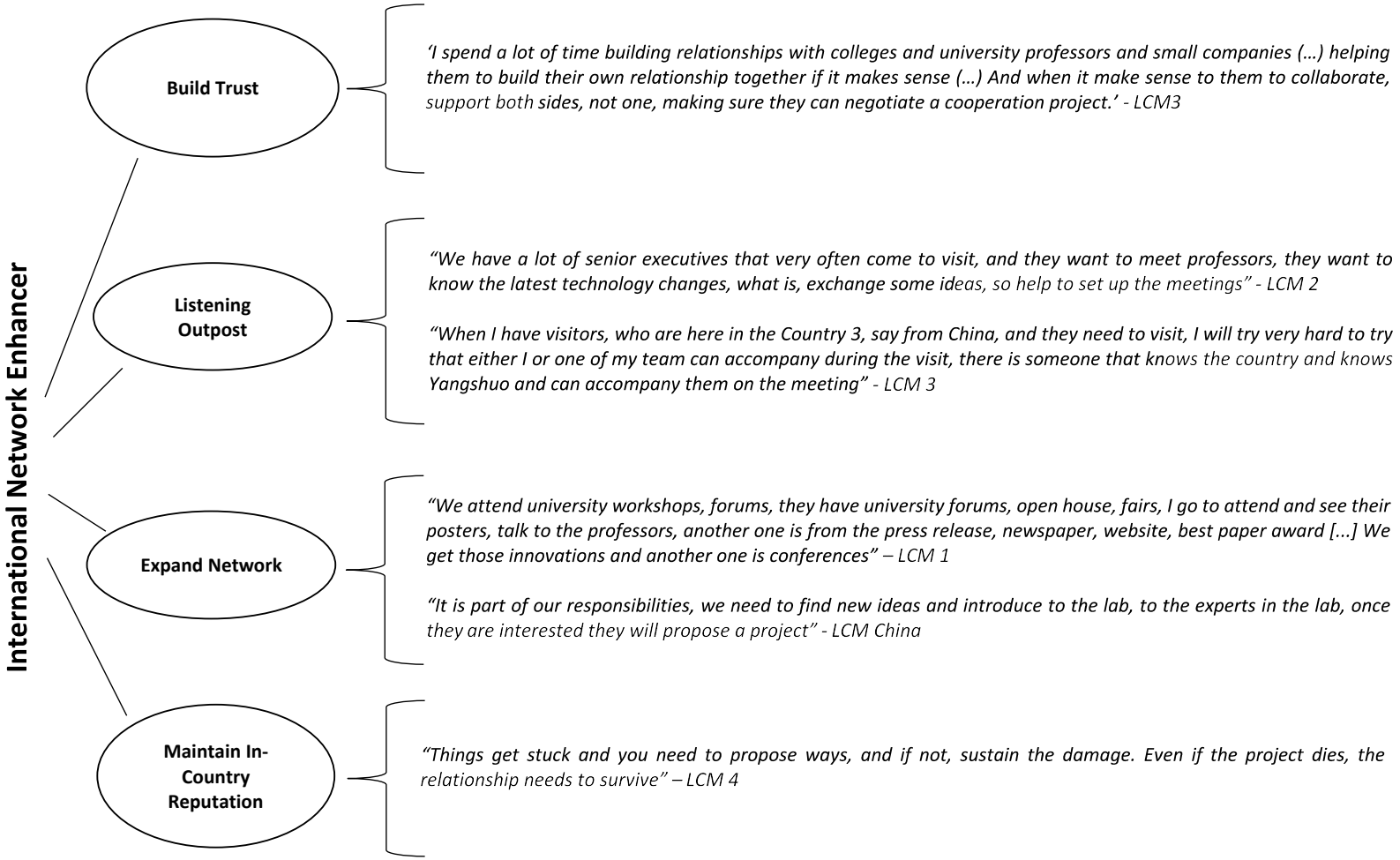

Figure 2 Functions of the International Network Enhancer role (additional quotes).