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University Interactions: Forms, Peculiarities and Tensions

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Abstract: Interactions between university and industry or society mainly occur in the form of transfer and/or collaborations. However, both forms have mostly been discussed as transfer thus, the underpinnings of both forms are not often discussed. As a result, the tensions (contradictions, dialectics and paradoxes) embedded in the interactions are also overlooked (not explored). This paper proposes to explore the underpinnings of the both forms of interaction and the tensions therein. Transfer is often linked with incubation and acceleration with concerns around absorption and diffusion of knowledge and through channels such as publications, conferences, teaching and pedagogy, joint research and knowledge networks. It focuses on how to improve the unidirectional flow of knowledge (university to industry) with the aim to reduce rather than accept the tensions. Collaborations on the other hand are often linked to discussion of channels (publications, conferences, teaching and pedagogy, joint research, knowledge networks and civic engagement), and recently community engagement and engaged research. The concern is that channels and not the interaction forms of university-industry relationships are discussed. Also, occasions where interactions are (transactional and relational) discussed, both are discussed through a transfer lens. Accordingly, the paper synthesizes relevant literature to propose a framework for understanding the different interaction forms of university with industry/society. As a result, it unveils the peculiarities and tensions present in interaction forms. Therefore, by distilling existing literature, it puts forward a framework to examine the different interaction forms and address the question: What are the dynamics of the interaction forms for organizing across university and industry? The contribution to knowledge management is that exploring the interaction forms provides an understanding of transfer and collaboration. Such understanding is useful to university policy makers, research funding agencies and researchers. It is also useful to practitioners who want to engage with and utilise university expertise. This paper concludes by arguing that exploring the different forms of interaction ultimately provides understanding of engaged research. The frameworks which accepts the tension equips universities and policy makers on organizing across boundaries.

Keywords: Interactions, singular lens, plural lens, transactional, relational, tensions

1. Introduction

There has been ongoing clamour on the need for interactions of university and industry to address societal problems. Accordingly, the role of the university has been questioned in recent times thus, positioning university and policymaker to defend research funding and in general the relevance of universities in modern times. Therefore, the seemingly primary roles of the university (teaching and research) are no longer satisfactory as societal demands increases. Hence, the concerns by universities and policy makers on how to best interpret and implement the third mission of economic contribution and societal advancement. It pitches universities to take on greater role in economic development, (D'Este and Pate, 2007; Mansfield, 1995; Branscomb et al., 1999; Etzkowitz and Leydesdorff, 2000; Leydesdorff and Meyer, 2003). As a result, the concept of inter-organizational relationships which mainly occurs between firms is being extended across institutional boundaries to address the issue.

The perspective put forward implies organizing across the theory–practice divide whilst maintaining the distinctiveness of each group. The aim here, is to provide a framework for analysing two interaction types (transactional and relational) within university-industry relationship whilst accepting the tensions resulting from the gap in organizing across boundaries. The gap arises due to the dynamic nature of the relationship between both groups - different knowledge type and diverse agendas/interests. Hence, the theory-practice gap and the imminent tensions (contradictions, duality, dialectics and paradoxes) within the gap. As a result, fundamental issues regarding the focus in the relationship becomes heightened depending on interaction types (transactional and relational). However, the debates often fail to discuss the interaction types apart from a few (D'Este et al, 2019; Perkmann & Walsh, 2007; Tyler et al, 2007; Plewa et al, 2005). The discussions that mention interaction types are often found lacking in distinguishing the interaction types. As a result, all forms of relationships that

ensue between university and industry are often viewed through a singular lens (transaction interaction) with less attention to the plural lens (relational interaction).

Addressing the gap in university-industry relationship will require understanding interaction types and the tensions within. The premise is that instead of the sole focus on closing the gap to resolve and eliminate tensions in a singular lens perspective (transactional interaction type), we also explore both (transactional and relational). Here, attention is given to relational interaction through a plural lens. Therefore, moving away from dualism and moving beyond duality, plurality which is relational is showcased. Addressing the theory-practice gap provides opportunities for exploring tension in the gap. As a result, understanding the dynamics of university-industry relationship will require exploring the interaction types (transactional and relational).

Since our premise is moving away from singularity and moving beyond duality, we encapsulate our proposition in the research question - What are the dynamics of the interaction forms for organizing across university and industry?

2. Conceptual Background

The paper proceeds by discussing university-industry collaboration with the intent to explore the peculiarities of interaction types in university-industry relationship. Accordingly, the interaction types are highlighted. Also highlighted is the proposed frameworks for analysis the manifested expression (tensions) present in the interaction forms.

2.1 Organizing across university-industry boundaries

Organizing across boundaries of university and industry provides opportunities for heterogeneous relationship. The relationship also brings to the fore the challenges of organizing across both groups. Most prominent is the general concerns that research is distance from practice with suggestions on how to close or eliminate the gap. Some have suggested maintaining the gap and both groups remain distinct (Kieser & Leiner, 2009; Grey, 2001) while a few suggest that the gap can be bridged while maintaining their distinctiveness (Van de Ven & Johnson, 2006; Nowotny et al., 2001; Hodgkinson & Rousseau, 2009). As a result, fundamental issues regarding the focus in the relationship also becomes heightened depending on interaction types – transactional and relational interactions.

Both interaction forms could occur through same channels however, the differentiation is the lens through which both interactions are viewed. However, discussions on interaction often present the channels of both interactions types through a singular (transfer) lens (see Schartinger et al., 2001, D'Este & Patel, 2007: D'Este et al., 2019; Bekkers & Freitas, 2008; Arza, 2010; Perkamann et al., 2013). Although Perkamann et al. (2013) makes an attempt to differentiate both interactions, engagement (relational) is described in the study as transfer from university to industry. Therefore, studies on collaboration and engagement still fall short by viewing exchange and engagement only from the lens of transfer. Thus, debates on how to close university-industry gap ensues with less attention to meeting dual demands of both parties.

Although the challenges remain imminent, policy makers and universities continue to strive to organize across boundaries of university and industry. However, facilitating organizing and addressing the gap will require addressing the question: What are the dynamics of the interaction forms for organizing across university and industry? Thus, ushering in the discussion on university-industry collaboration and by extension interaction types.

2.2 University- Industry Collaborations

The focus of collaborations is to encourage the exchange of knowledge between any parts of higher educational system and industry (Ankrah & AL-Tabbaa, 2015). Collaboration owes its rise to the case for knowledge and technology being crucial for societal advancement. Accordingly, expectations from society and industry include looking to universities and researchers for approaches that address market failures. Therefore, the interactions between university and industry become opportunities for realising full social returns on R&D investments (Martin & Scott, 2000; Siegel & Zervos, 2002). As a result, policy directions in many economies is a push towards collaborative nature for interactions between university and industry.

Such policies come with scepticism as some argue that it negatively impacts the product of scientific research (Nelson, 2004). It also heightens the fear that quest for competitive advantage by industry may overshadow

intellectual commons and push research towards applied at the expense of basic science (Dasgupta & David, 1994, Florida & Cohen, 1999). Overall, evidence from research shows that greater degree of industry involvement in the collaboration may tend towards ideas that are skewed to benefit industry and less value for university in terms of research quality for publication (Hottenrott & Lawson, 2014). On the other hand, academics who interact with industry claim that it enriches research (Agrawal & Henderson, 2002). The counter claim is important because interaction with industry avails academics opportunities to be involved in research that addresses the demands of industry and university simultanoesly. As a result, neither group requires the intense catch-up requirement when research is devoid of collaborations.

The consequence of the catching-up is that, often, "the academic community is two or three cycles behind practice. "We [practicing managers] are more use to them than they [academic researchers] are to us" (Beech et al., 2010; p: 1347). Such position from practice is because "many articles are written by academic 'producers' for an academic audience that is primarily constituted by other 'producers'" (MacIntosh et al.,2017; p:4). Accordingly, these positions further the debates on the theory versus practice which has also led to studies in the academic-practitioner gap. As a result, addressing the gaps increased field studies to examine and establish evidence of academics and practitioners' co-creation and co-production (see Bansal et al., 2012; Trank, 2014; Rynes & Bartunek, 2017). The importance of these studies not only showcases how both groups may create new knowledge they provide contextualized evidence of bidirectional knowledge flow which occurs when different knowledge types interact.

Although the reasons and the benefits that could be accrued from the interactions of university and industry have been extensively discussed (which is the WHY") what is often missing the "how" and the "what". Thus, more studies are moving towards the channels of interactions of university with industry and activity types (Perkmann & Walsh, 2007; D'Este & Patel, 2007; D'Este et al, 2019). However, discussions on interaction are often approached from the viewpoint of closing the theory-practice gap which is a transfer perspective. Therefore, the discussions often explore the barriers with a focus to lowering them (Bruneel el al., 2010). As a result, the tensions arising from the different paradigms and core interests of both groups are overlooked. However, with collaboration, the relationship exemplified is more egalitarian. Therefore, the main actors (academics and practitioners) come into the relationship with the understanding the both roles are necessarily required for creating new knowledge.

Although D' Este et al (2019) and Perkmann and Walsh (2007) focus on the channels (links) rather than barriers, the meeting of dual demands is not taken into account. Focusing on the channels (links/routes), highlight interaction types (transactional and relational) of the university-industry relationship however, it does not necessarily address dual demands. To address dual demands of both groups requires an alternative approach from lowering barriers or closing the gap. It requires moving beyond exploring the channels of interactions to attending to the inherent tensions in interaction types that become particularly salient in relational interaction. Accordingly, we explore the interaction types.

2.3 Interaction Types
Interactions forms of university-industry relationship are mostly discussed as transactional and the relational (D'Este 2019; Perkmann & Walsh, 2007). However, both forms of interaction are often approached from a singular lens. As a result, the plural lens is not often emphasised especially in relational interaction. The problem here is that the discussions on the relational interaction are often approached from the viewpoint of closing the theory-practice gap and eliminating the tensions in the gap. We explore the interaction types to provide understanding and the distinguishing peculiarities.

2.3.1 Transactional Interaction
The transactional interaction mainly favours the traditional view of university-industry relationship which focuses on closing the gap between theory and practice. The transactional approach takes the lens of knowledge transfer which also occurs in the form of spin-outs /commercialisation. It is mainly concerned about outcomes (Perkmann et al., 2013) thus, it is codified and finite. As a result, it is unidirectional and takes a singular lens thus, it treats knowledge as a tangible commodity that flows from university to industry. The transactional interaction recognises that a gap exists between both parties. However, the main drawback of singular lens which this interaction type embodies is how it addresses the gap. It takes the position of theory versus practice rather than addressing dual demands of both parties. Accordingly, effective translation, transmission and transformation of research comes as foremost suggestions to close the gap. Therefore, university-industry relationship solely

based on transactional interactions displays hierarchical connotation. It seeks to address the gap in terms of dissemination of access from university to industry. However, the main problem in the gap lies in the absence of engagement (Van de Ven & Johnson, 2006).

The transactional interaction of university-industry relationship has not been without benefits. Such benefits extend beyond commercial exploitation (Bishop et al., 2011; Rosenberg, 1991; Florida, 1999; Bercovitz & Feldman, 2007). Concerning transfer, spin-offs are the major forms transfer of breakthroughs move to the industry - research between top professors and the firms they own (Zucker et al., 2002, Bekker & Freitas, 2008). Employment of skilled students and informal relations is significantly important for knowledge mobility to industry. Hence, knowledge transfer literature has had a longstanding in studying the formal and informal channels of university-industry interactions. Formal transactional channels include meetings and conferences, consultancy and contract research, commercialization and spin-outs, training, joint research. The informal channels include personal contacts between academics and industry researchers. However, less attention has been accorded to the unfolding of the dynamics of diverse interaction types.

As a result, transactional interaction often treats channels as silos. Therefore, the relationships in the temporary sequence within and across channels are often left unaddressed (Azagra-Caro et al., 2017). Moreover, the characteristic nature of knowledge in different disciplines is not accounted for in most university-industry relationship studies (Bekker & Freitas, 2008). The omission stems from the premise of the transactional interaction focus – closing the gap. Accordingly, the tensions that arise due to conflicts of distinct knowledge types in university-industry interaction are glossed over. As a result, opportunities for creating new knowledge from harnessing distinct knowledge types are often missed. The distinct knowledge types of both parties are useful in bringing about joint solution neither group would be able to solely provide (Van de Ven & Johnson, 2006).

Studies show that disciplines such as chemistry, biotechnology, engineering and information technology, research cooperation (joint research) channel is the predominant one (Meyer-Krahmerand & Schmoch, 1998; Balconi & Laboranti, 2006). Therefore, learning differs across disciplines and sectors thus, imperative to examine relational interactions across disciplines and channels to unpack underlying patterns (Bekker & Freitas, 2008). Leaning on "interdisciplinarity which is often considered valuable and without the narrow emphasis on the finite outcomes rather it empasises the search for addressing many social and scientific problems (Cedrini &Fontana, 2017; Fontana et al., 2020). Therefore, addressing problems beyond the knowledge on a specific discipline, will require relational interaction within the University (Gibbons et al., 1994). As a result, it necessitates the need to also explore the gap and the tensions which arise from the conflicts in relational interactions. A way of embracing the tensions is to first recognize the dual demands in the relationship thus, accepting complexity in the relationship which is a move away from dualism. Accordingly, it introduces duality, which provides the basis for collaborative relationship.

2.3.2 Relational Interaction

The premise for relational interaction is duality which allows bidirectional knowledge flow. However, duality only does not suffice as it not concerned with understanding the tensions within relational interactions (Schad et al 2016). Duality introduces collaboration but not engagement which is a plural lens and beyond duality.

- Dualism simplifies and reduces.
- Duality embraces complexity.

A further differentiation of the two approaches is the lens through which the tensions are addressed.

- Dualism takes the singularity lens (transfer); thus, by simplifying and reducing, resolutions are attained. The resolutions are expressed as contingency - it is one or the other (either-or; neither-nor).
- Duality takes a plurality lens and embraces complexity; it acknowledges the contradictions but the emphasis is not on understanding the tensions.
- Engagement is collaborative and relational; a learning approach where interactions involve negotiations and understanding whilst maintaining distinctiveness of both sides (Van de Ven & Johnson, 2006)

Moving beyond duality (which is collaborative) and taking a pluralistic relational approach accounts for the inherently dynamic, evolving and interdependent interactions of organizing across university and industry. Moreover, empirical evidence supports that channels of interaction goes beyond patenting and spin-offs (D'Este

& Patel, 2007). Other channels identified in literature include informal contacts, consulting relationships and joint research projects (Arundel & Geuna, 2004; Sequeira & Martin, 1997). A total of nine channels which are identified in Schartinger (2001) could also be classified into five groups: Meetings and conferences, Consultancy and contract research, Creation of physical facilities (includes spin-off, campus laboratories, incubators and cooperative research centres), Training and Joint Research. However, the interaction channels are broadly discussed from the point of resource deployment; and length and formalisation of agreements and an assumed singular lens. As a result, the channels of interaction often pay less attention to the tension and the peculiarities of the plural lens present in relational interaction.

More recent discussions of university-industry relationships on addressing the gap are pointing to relational interaction which favours engagement (Van de Ven & Johnson, 2006, Boyer, 1996). Engagement in the forms of engaged research and community engagement takes a plural lens, embraces complexity and simultaneity. Simultaneity allows for ongoing interactions to attend to dual demands whilst embracing the tensions therein. In engagement synthesis and non-resolutions are expected which are expressed as on-going tensions (dialectics and paradoxes). Engaging dual perspectives (engagement) completely allows knowledge forms from university and industry to interact. It also allows for accepting (not resolving) the tensions whilst seeking to understand the tensions in the gap. It accords each knowledge type full joint participation thus, the uniqueness of both knowledge types is harnessed. Therefore, the interactions of both knowledge types provide opportunities for unique ways to addressing societal problems. As a result, there is no deference to either side thus, tensions are expected and accepted. Accordingly, emphasis is placed on understanding the tensions in the gap. Hence, for relational interaction it becomes necessary to move beyond dualism and duality.

However, relational transaction (duality and engagement) embraces the fluid nature of knowledge. It brings to the fore knowledge interaction and the sequence of creating new knowledge whilst recognising implicit (tacit) and explicit (finite) knowledge. Although both the explicit and implicit is required to fully grasp the sequence of creating knowledge the implicit (tacit) which is fine-grained suffers neglect in transactional interaction. In actual engagement, the focus is not on finite outcomes rather any outcome is viewed as heralding for the next event. As a result, taking on a plural lens favours a processual view which views outcomes as the starting point heralding the next activity (Bizzi & Langley, 2012). Therefore, knowledge creating phenomenon is emphasised rather than the knowledge created. As a result, the gap between theory and practice can be explored by anchoring on the temporal order of events through relational interaction. The argument for such anchor is a call and challenge from process philosophers for alternative representation in a world of fluidity (Van der Ven and Poole 2005; Rescher, 1996). However, what is still found missing in discussions of relational interactions is the tensions within the interaction.

2.4 Implications of Relational Interactions -Tensions
Consequently, the preceding lines of reasoning opens up room for complexity and agency - which may exhibit unintended consequences that emerge as tensions (Jarzabkowski et al., 2019). Tensions are mostly presented in literature within the context of theory versus practice - dualism. Therefore, tensions are rarely expressed in ways that may account for their presence in relational interactions (duality and engagement). As a result, the contradictions, dialectics and paradoxes are often over looked in such interactions. The main thesis here is that tensions are inevitable in relational interactions and should be presented as a dynamic bridge across theory-practice divide. Such proposition allows for tensions in the gaps to be accepted and analysed (Bartunek & Rynes, 2014). It also allows for both synergy of unresolved demands (dialectics) and non-resolution of demands (paradoxes) within interactions (Hargrave & Van de Ven, 2017). Therefore, the pluralistic lens accommodates engagement thus, the tensions provide a major building block for the proposed framework for addressing the research question: What are the dynamics of the interaction forms for organizing across university and industry? (See table).

Framework	Approach	Nature	Expression	Interaction Type
Firm Creation Technology Transfer	Dualism	There are no overlaps thus, unambiguous and decisive contrast with precise boundary (Farjoun, 2010) Does not showcase interplay of social reality	Contingency	Transactional (Market mediated)
Response	Duality	The elements are ontologically inseparable yet contradictory (Smith & Graetz, 2006) It is unable to unpack the complexities of dynamic relations (Farjoun, 2010) The interrelatedness of contradictory elements are highlighted but emphasis is not understand the contradictory inconsistencies and conflicts (Schad et al., 2016)	Contradictions	Relational (personal-based)
Co-production Creating New Knowledge	Engagement	Collaborative and relational; a learning approach where interactions involve negotiations and understanding whilst maintaining distinctiveness of both sides (Van de Ven & Johnson, 2006)	Contradictions Dialectics Paradoxes	

Table 1: Framework showing the lens (approach), nature of the lens and manifested expressions (tensions).

3. Conclusion and Contributions

This conceptual paper shows that although all forms of interaction may go through same channels, the approach and expression of the tensions therein will vary. The framework (see table 1) shows that the lens (approach) through which the channels are viewed have implications as to how policy makers and universities undertake collaborative relationships. As a result, universities and policy makers should become aware that university-industry relationships are facilitated by the interaction type and lens through which the relationship is explored. Also, the processual view for engagement has potential for knowledge creating in which is embedded engaged research and the unfolding relational interaction.

Instead of closing the gap between university and industry, the tensions should be accepted as a dynamic bridge across both boundaries whilst recognising occasions where transactional interactions (transfer lens) is better suited. Accordingly, the plural lens makes room for practice perspective in the university-industry relationship. As a result, it brings into focus the intricacies in the relationship such as the individuals, their actions and interactions. This is important because it provides scholars the opportunity for different levels of analysis to better understand how contradictory positions at organizational and institutional levels engage, manage the tensions that arise whilst gainfully coexisting (Smets et al., 2015). Overall, the paper suggests that the social processes of creating knowledge is imperative to the manner in which university-industry relationship is approached.

However, the approach chosen will depend on conditions of the actors involved in the interaction, types of benefits to target and the risks to be avoided should be considered by policy-makers (Arza, 2010). However, what is unavoidable is that university relationship with industry irrespective of channel has the potential for conflicts (Bruneel, 2010). Therefore, policy tools to support specific channels of interaction under different condition (interaction types) becomes paramount. Accordingly, relational interaction will require organizing across boundary which provides confidence to both parties that the interests of each will be met and allows pursuits that embrace each's goals and objectives (Perkmann & Schildt, 2015). Therefore, it provides opportunity for university and industry to pursue big science whilst advancing the knowledge commons embedded in the interaction. Thus, the argument is that university-industry relationship should embrace a plural approach for collaborative engagement. The argument is important because it allows both institutions to maintain their distinct knowledge types whilst still interacting to create knowledge neither could individually provide.

As a result, the paper contributes to the university-industry literature by providing a framework which acknowledges the complexities, flux, and agency within theory-practice gap and across both institutions. Therefore, providing a differentiation from hybridization ("abandon existing field-level settlements and move early to embrace a previously unfamiliar institutional logic that is relevant for its stakeholders" – Schildt and

Perkmann, 2017; p:143). It also contributes to addressing theory-practice gap by accounting for simultaneity thus, exploring the dynamics of tensions in interaction types. Accordingly, it allows for understanding and explanations that facilitate addressing the theory-practice gap. It also contributes to process literature by exploring intricacies of less studied relational concepts in organizing within the context of university-industry. As a result, the assumptions and contexts that connects both groups (the tensions) are unveiled. Thus, the tensions in the gap pave way for addressing grand societal challenges.

Accordingly, addressing the research question (What are the dynamics of the interaction forms for organizing across university and industry?) not only addresses the gap and thus societal challenges, it also equips universities and policymakers on organizing across boundaries.

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