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A Co-creation Centre for university–industry collaboration – a framework for concept development

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Abstract

It is argued in general that future success in effective innovation creation is built on the ability to connect and manage talent, partnerships and related practical innovation processes. This makes it challenging for a university to develop an ecosystem of knowledge creation. The full benefit from a university can only be obtained if the university and society are organically linked together. The needs of society have to be at the centre of a university's activities, and flexible adjustment to changing needs is necessary but often lacking. Campus management has a major role in the facilitation of multidisciplinary interaction between students, scientists, entrepreneurs and other industry partners that inspire each other with different perspectives on the same subject. One significant tool to support open innovation with diverse stakeholders is to provide supportive spaces with relevant services. This paper aims to identify the requirements of a Co-creation Centre as a concept serving the third role of a university.

The literature review was conducted and, based on the result, this paper proposes a conceptual framework for capturing the key requirements for developing a multiuser Co-creation Centre. The framework consists of the requirements on the demand and supply sides of campus management. The main findings in this paper are that different modes of knowledge conversion have different capabilities to support knowledge co-creation requirements. Knowledge co-creation process requirements in the multiuser Co-creation Centre for university–industry collaboration are best supported by originating "Ba", which means the place where individuals share feelings, emotions, experiences, and mental models and the place where the knowledge-creation process begins. The results contribute to the concept development in campus management and provide a starting point for evaluating the success of multidisciplinary and multi-actor innovation environments.

Keywords: Ba; campus management; Co-creation Centre; spaces and services.

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1. Introduction

It is argued in general that future success in effective innovation creation is built on the ability to connect and manage talent, partnerships and related practical innovation processes. The traditional functions of universities are teaching and research, and universities have operated in relative isolation from society. Etzkowitz (1998) states that in addition to teaching and research, university technology commercialisation has become a key priority of universities. Gallart and Martínez refers the 'Third Mission' as all activities concerned with the generation, use, application and exploitation of knowledge and other university capabilities outside academic environments. This third role of universities and the needs of society have to be at the centre of a university's activities, and flexible adjustment to changing needs is necessary but lacking.

Campus management has a major role in the facilitation of multidisciplinary interaction between students, scientists and entrepreneurs that inspire each other with different perspectives on the same subject. Heijer (2011) points out that policy makers want the campus to support their institutional goals – such as attracting and retaining talent, stimulating innovation and building a community. One significant tool to support open innovation with diverse stakeholders is to provide supportive spaces with relevant services. This paper aims to identify the requirements of a multiuser Co-creation Centre as a concept serving the third role of universities.

Companies need efficient product development capabilities to stay competitive and this requires knowledge that they do not have themselves. They also need to stay on the alert for which technologies are rising and they need to have new talents. Universities need new ideas and resources for research. Open innovation, co-creation and the collective creation of knowledge characterize University–Industry Collaboration, which is later referred as UIC. Being together (as a community), using together (laboratories, talents) and doing together (development, research, innovation, the co-creation of new ideas) can also be linked to UIC. Different parties have different requirements for collaboration. To better understand the different requirements each party has, we take a closer look at different types of knowledge, different knowledge creation processes and different requirements for the openness and verification of knowledge, as well as the requirements for knowledge creation. Those differences needs to be taken into account when developing places and services, and attracting parties to join a Co-creation Centre in a university campus.

A literature review was conducted and this paper proposes a conceptual framework for capturing the key requirements for a multiuser Co-creation Centre, in regard to both the demand and supply side of campus management.

2. Literature review

The scoping review methodology was adopted for its strength in providing a broad, in-depth overview of the existing literature, in addition to developing the framework. The process is not linear but iterative, requiring the researcher to engage with each stage in a reflexive way, and where necessary, repeat steps to ensure that the literature is covered in a comprehensive manner. Arksey and O'Malley's (2005) framework for scoping reviews includes five stages. They were applied in this study in the following way.

The identified research question of how to create a concept for a multiuser Co-creation Centre for UIC guided the research design in subsequent stages and created the ramifications for search strategies. The reviewed literature was identified from the areas of UIC; knowledge transfer and creation, innovation and co-creation. Product development, with a special focus on the process of the idea phase, was also identified as a research area. The subthemes of a knowledge creation model and the importance of trust in tacit knowledge transfer, as well as the spaces and services that support knowledge co-creation, were studied too.

Altogether 210 references were listed including 160 journals, 22 books and 30 conference papers, mostly published after year 2000, exceptions being pioneers Nonaka, Allen and Polanyi. For each category, fifteen references were selected for further study based on inclusion criteria about the ability to increase understanding of knowledge creation requirements supporting the needs for both universities and industry in UIC. In addition five references for product development were chosen in a latter phase of iteration of the scoping review. The study selection involved post hoc inclusion and exclusion criteria. In this phase, the educational and pedagogical literature,

as well as literature of social politics, were excluded. The scope especially involved forms of co-creation with external stakeholders, not internal co-creation within universities.

A data-charting form was developed and used to extract data from each study. The material was analyzed using qualitative content analysis. A knowledge creation model was selected for the conceptual foundation. Data was gathered about the key elements affecting knowledge co-creation in UIC and charted to knowledge creation classifications from the demand and supply sides. Finally the thematic construction provided an overview of the breadth of the literature and the conceptual framework was created.

3. Results of the scoping review

3.1. A place where information is interpreted in order to become knowledge

UIC requires knowledge transfer and co-creation. Knowledge can be divided into tacit and explicit knowledge. The understanding of tacit knowledge has developed mainly via Polanyi (1966) who stated that we can know more than we can tell. Lam (2002) combined an epistemological (tacit–explicit) dimension to an ontological (individual–collective) dimension of knowledge types. Embodied knowledge is "tacit-individual", it is practical "knowing" and requires experience, like riding a horse. Embedded knowledge is "tacit-collective" (organizational know-how). Embrained knowledge is "explicit-individual" (theoretical, scientific). Encoded knowledge is "explicit-collective", like written rules (codified information).

Knowledge is created through interactions amongst individuals or between individuals and their environments. Nonaka and Takeuchi (1995) described the knowledge creation process as a spiral model, where tacit and explicit knowledge are in continuous interaction between individuals through socialization-externalization-combination-internalization.

Nonaka, Konno and Toyama (1998) developed the model further by adding the concept of "Ba" to it. Ba is the context shared by those who interact with each other. There are four types of Ba: originating Ba, dialoguing Ba, systemizing Ba and exercising Ba. Each Ba supports a particular mode of knowledge conversion and offers a platform for a specific step in the knowledge spiral process. Originating Ba is the place where individuals share feelings, emotions, experiences and it is the primarily Ba for sharing tacit knowledge. Dialoguing Ba is the place where individuals' mental models and skills are converted into common terms and concepts and where the conversion of tacit knowledge into explicit knowledge occurs. Systemizing Ba is virtual world rather than a real time and space. It is where new systemic explicit knowledge is created through a combination of various elements of explicit knowledge. Exercising Ba is the place where the conversion of explicit tacit knowledge is facilitated.

Although Ba cannot be taken as a specific description of a knowledge creation space, it gives a useful framework against which various aspects can be compared. Brännback (2003) argues that Ba plays a major role in successful knowledge creation through R&D collaboration between universities and business. In this paper Ba was used as a conceptual foundation.

3.2. The requirements of Ba identified from literature of UIC

Universities have always been an important source of competitive edge for companies. Perkman and Walsh (2011) found out that companies often determine their goals for UIC in terms of generic benefits, such as accessing students or gaining windows on emerging technologies. Perkman and Walsh (2011) also proposed a framework for measuring performance in university–industry alliances. Their proposal is consistent with the literature review made in this study.

Universities and companies have different requirements for the openness and verification of knowledge, as well as the requirements for knowledge creation. The less prior understanding partners have about each other and the more various parties that are involved in collaboration, the more important it is to build common trust and to identify shared objectives. The first steps for UIC with various parties can be supported in originating Ba, which supports

idea generation, tacit knowledge transfer and trust formation. When relationships and trust, as well as an understanding of each other needs, are developed, aspects of dialoguing Ba become more important.

To sum up aspects of UIC in the Ba framework:

- Originating Ba is where new ideas for research projects and concepts for products emerge in UIC.
- Originating Ba is where new technologies emerge in UIC.
- Originating Ba is where the new social networks of specialists are created in UIC.

3.3. The requirements of Ba identified from the literature of product development

Schulze and Hoegl (2006) describe that initial product ideas, in the concept phase, are developed into product specifications. Sounder and Moenaert (1992) state that, in the development phase, the product concept's specifications are translated into design plans and the actual technical development work is carried out.

Schulze and Hoegl (2006) combined understanding of the new product development process with the knowledge creation process. They stress that it is likely that several (or all) knowledge creation modes occur within a single project development phase, and suggest that socialization during the concept phase is positively related to new product success.

To sum up aspects of product development in the Ba framework:
- Originating Ba supports the concept phase but does not support the development phase.
- Dialoguing Ba does not support the concept phase.
- Systemizing Ba supports the development phase.
- Exercising Ba does not support the development phase.

3.4. The requirements of Ba identified from the literature of innovation and co-creation

The term innovation has been adapted to various meanings. Baregheh et al. (2009) analysed some 60 definitions of innovation and proposed innovation to be "the multi-stage process whereby organizations transform ideas into new/improved products, service or processes, in order to advance, compete and differentiate themselves successfully in their marketplace." In the same paper the innovation process is divided into creation, generation, implementation, development and adaption. The front end innovation process is divided into opportunity identification, the identification of customers' needs, idea generation, concept definition and project selection by Trotter and Vauhhan (2012). Hippel (1988) points out that when the required know-how is not available and in-house development can be time consuming and expensive, there can be a high incentive to seek the needed information from professional colleagues. Chesbrough (2006) emphasizes open innovation as a paradigm that assumes that firms can and should use external ideas as well as internal ideas, as the firms look to advance their technology.

Co-creation is defined broadly as the creation of value by consumers, first by Kambil et al. (1996) and later by Zwass (2010). Prahalad and Ramaswamy (2004) state that the high-quality interactions that enable an individual customer to co-create unique experiences with the company are the key to unlocking new sources of competitive advantage. In UIC there are elements that reflect the requirements of knowledge co-creation.

As Schulze and Hoegl (2006) pointed out earlier, it is likely that several or all knowledge creation modes occur within a single project development phase. It would be interesting to investigate both if the tacit knowledge transfer needed for the idea phase of concept development is best supported in originating Ba and if most of the explicit knowledge creation for concept definition is made in dialoguing Ba.

To sum up the aspects of innovation and co-creation in the Ba framework:
- Originating Ba supports new idea generation and opportunity identification.
- Dialoguing Ba supports explicit knowledge co-creation.

3.5. The requirements of Ba identified from the literature of knowledge sharing and trust

Rousseau et al. (1998) define trust as a psychological state comprising the intention to accept vulnerability based upon one party's positive expectations of the intentions or behaviour of another party in situations that are interdependent or risky. Noorderhaven and Harzing (2008) argue that face-to-face social interactions form a communication channel particularly conducive to the transfer of tacit, non-codified knowledge but that intensive social interaction also provides opportunities for the social construction of knowledge in a learning dialogue. Galunic and Rodan (1998) suggest that bringing employees from different subsidiaries together in informal settings may have serendipitous effects and lead to ideas and solutions not previously considered.

According to Bstieler (2006) a higher level of trust clearly differentiates high- and low-performing collaborative relationships in new product development. He also states that trust evolves through the process of a growth of knowledge and understanding of the people with whom one must interact, plus the actual experience of interacting with that party.

To sum up aspects of knowledge sharing and trust in the Ba framework:
- Originating Ba supports trust formation.
- Dialoguing Ba with efficient knowledge sharing is not possible without the trust built in originating Ba.

3.6. The requirements of Ba identified from the literature of spaces and services

The literature of new learning and working environments, services and spaces proposes diverse aspects. The concept of Ba was mentioned earlier and it has attracted many scholars, for example Nenonen (2005). Ba is a shared space for knowledge creation. According to Nonaka et al. (2001) Ba does not necessarily mean but can be a physical space (e.g. an office or multi-location business space), virtual space (e.g. an E-mail, a teleconference), mental space (e.g. shared experiences, ideas, ideals), or any combination of these kinds of space, interaction being the most important aspect. The relation to virtual, physical and social places is important and it emphasizes that virtual places cannot replace the face-to-face communication necessary for tacit knowledge sharing according to Nenonen (2005). Duffy (2008) proposes an alternative typology that he calls 'The Networked Office' to describe these new ways of working that came into being with late twentieth-century knowledge; work supported by ubiquitous networked information technology as mobility and ubiquitous technological connectivity mean that 'the office' is no longer a stable entity in regard to place, given that work can be carried out in multiple kinds of place.

Allen (1977, 2007) concluded that the probability of a pair of people in an organization communicating which each other declines rapidly as the distance between them increases. According to Allen and Henn (2007) getting people to talk to each other is the only truly efficient way of advancing the process of innovation.

The Embodied Creative Processes presented by Kristensen (2004) suggests that there are differences in the requirements of different stages in the creative process. The preparation and elaboration stages typically require a combination of communal and private space. The incubation and insights stages probably require more private space. For example, useful information presented in the nature of objects, artifacts, tables, images, tabletops, etc. can facilitate the process at an implicit level (ibid.).

Thoring et al. (2012) suggested that a creative space should allow interaction and movement so that people and ideas can be grouped and moved. Whiteboards, Post-it notes and coloured pens should be used to encourage visual thinking. A creative space should be beautiful, encourage fun and create an atmosphere of abundance (ibid).

Appel-Meulenbroek (2014) described the metrics for a layout to support knowledge sharing in research environments: visibility (accessibility), placement within the room (accessibility) and centrality in the building. According to Appel-Meulenbroek (2014) the added value of physical workplace to the innovation process remains hard to be proven empirically, however, the visibility of colleagues appears to increase the number of knowledge sharing meetings.

Requirements for services are to support interaction and facilitate trust, such as the services provided by a "champion facilitator", who helps parties to focus on the common goal in a process (Jones and Burgess, 2010; Philip, 2013).

Buzz refers to the information and communication ecology created by face-to-face contacts, the co-presence and co-location of people, and firms within the same industry and place or region. This buzz consists of: specific information and continuous updates of this information; intended and unanticipated learning processes in organized and accidental meetings; the application of the same interpretative schemes; and the mutual understanding of new knowledge and technologies; as well as the shared cultural traditions and habits within a particular technology field, which stimulate the establishment of conventions and other institutional arrangements. Actors continuously contribute to and benefit from the diffusion of information, gossip and news by just 'being there' (Gertler, 1995 in Bathelt, 2010). Laing (2014) states that, as work patterns are increasingly mobile and also often virtualized, organizations and individuals need to provide for events and activities that create community and awareness in physical places. Face-to-face activities in physical settings that are memorable and distinctive become more significant. Workspaces and urban settings need to be designed and managed to allow for many different kinds of special events: parties, lectures, pop-up experiences, meet-ups, and many other kinds of social, cultural and educational activities. The design of these environments needs to support rapidly changing programmes of events, led or curated by different organizations and users.

To sum up aspects of spaces and services in the Ba framework:

- Originating Ba requires spaces and services that support informal interaction and idea creation.
- Dialoguing Ba requires spaces and services that support formal meetings.
- Systemizing Ba is supported by digital platforms.
- Exercising Ba is supported by spaces that support learning-by-doing.

4. A conceptual framework for a Co-creation Centre in a university campus

The basic approach in the framework is the process of knowledge creation due to the fact that it forms a core for all three roles that universities has in society. The framework consists of requirements from the demand and supply side. The requirements arise from analyzing the elements important for knowledge co-creation in UIC. The key factors arising from the literature are mapped in the four types of Ba. Each Ba supports a particular mode of knowledge conversion and offers a platform for a specific step in the knowledge spiral process.

In summary, the requirements for knowledge co-creation in a UIC Co-creation Centre are best supported by originating Ba where:

- Social networks for UIC are developed
- Trust is formatted between UIC partners via face-to-face interaction
- Tacit knowledge is transferred and co-created for the product concept phase and research projects
- New ideas for concepts and research projects are generated
- Emerging technologies are identified

Originating Ba requires spaces and services that support informal interaction and idea creation. Fig. 1 illustrates the requirements for the concept of a Co-creation Centre for university–industry collaboration.

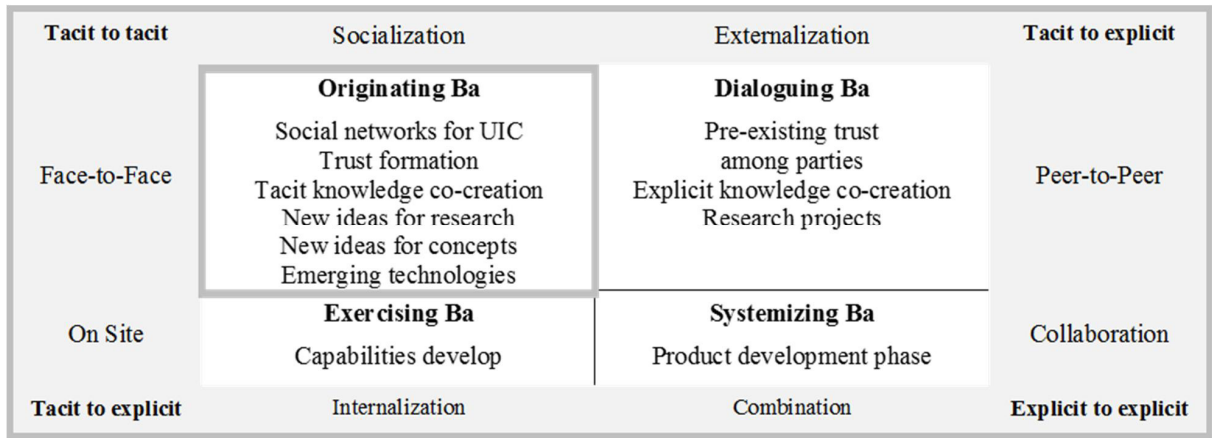| Tacit to tacit	Socialization	Externalization	Tacit to explicit
Face-to-Face	**Originating Ba** Social networks for UIC Trust formation Tacit knowledge co-creation New ideas for research New ideas for concepts Emerging technologies	**Dialoguing Ba** Pre-existing trust among parties Explicit knowledge co-creation Research projects	Peer-to-Peer
On Site	**Exercising Ba** Capabilities develop	**Systemizing Ba** Product development phase	Collaboration
Tacit to explicit	Internalization	Combination	**Explicit to explicit**

Fig. 1. The requirements for the concept of a Co-creation Centre for university–industry collaboration

Originating Ba is supported by spaces and services that support informal interaction – it needs to be a place where tacit knowledge can be transferred and co-created. Based on the thorough scoping review of knowledge creation and innovation processes it can be concluded that the main significance and benefits of a Co-creation Centre concept are gained by developing the concept to serve as an originating Ba. Dialoguing Ba is supported by services and spaces that support formal interaction, and it is a matter of resources how to organize that as one function of a Co-creation Centre.

5. Conclusions

The main findings in this paper are that different modes of knowledge conversion have different capabilities to support the knowledge co-creation requirements of a multiuser Co-creation Centre for university–industry collaboration. Knowledge co-creation process requirements in a UIC Co-creation Centre are best supported by originating Ba, where individuals share feelings, emotions and experiences – it is the primarily Ba for sharing tacit knowledge. Ba can be explained as a concept of space. Requirements for spaces and services can be concluded on this basis. The results contribute to the concept development in campus management and provide a starting point for evaluating the success of multidisciplinary and multi-actor innovation environments at a conceptual level.

A large number of references have been found at the searching stage of the scoping review. In terms of method and research design one can question what proportion of these have relevance to the research question and if the inclusion criteria was met. The validation of the framework is still needed. It will be made by providing opportunities for stakeholders to suggest additional references and provide insights beyond those of the literature. Additionally more empirical data will be gathered from users of the Co-creation Centre in Tampere University of Technology to validate the concept.

In practice the results contribute to the concept development in campus management and provide a starting point not only for developing but also for evaluating the success of multidisciplinary and multi-actor innovation environments in university campuses.

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