

Knowledge Transfer and Disseminative Capacity:

A review and propositions for further research on academic knowledge transfer¹

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***Abstract:** The process of knowledge transfer is extensively studied from a variety of theoretical orientations. In this study the authors adopt a communication theory point of view as their orientation and focus on the dissemination capacity. After a review of the literature the authors focus on the disseminative capacity of universities and formulate four propositions that give directions for further research.*

In the present day knowledge economy knowledge is a source of competitive advantage for companies (Grant, 1996; Argote & Ingram, 2000). This knowledge can be generated by the company itself (Nonaka & Taguchi, 1995) or it can be acquired from a “knowledge source” (Cohen & Levinthal, 1990; Tsai, 2001). Many organizations take on the role of knowledge source: e.g. universities (Mowery & Sampat, 2005), companies in their role either “supplier” (Kotabe, Martin & Domoto, 2003), “customer” (Gibbert, Liebold & Probst, 2002) or even as “competitor” (Darr & Kurzberg, 2000). Transfer of knowledge is the process of giving other access to and exchanging (proprietary) knowledge. This process of knowledge transfer is described by Szulanski (1996) as the “dyadic exchange of organizational knowledge between a source and a recipient unit in which the identity of the recipient matters” (p.28). The overall objective of this study is to contribute to the effectiveness of technology transfer activities of universities and focus on the determinants of the university as a source of knowledge that enables it to transfer this to others (“disseminative capacity”).

This contribution has the following structure: first a theoretical framework for studying university technology transfer is presented, then in the second part an overview of the disseminative capacity in the literature is given and it ends with an analysis of disseminative capacity and its implications

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for university technology transfer.

University Knowledge transfer: a communication perspective

The transfer of knowledge from university to companies is a major issue for policy makers, theory development and (business) practice. A major issue for concern is the problematic connection between the *exploration activities of universities* and the *exploitation activities of companies* (e.g. Ambos et al., 2008); an issue often referred to as the “European knowledge paradox” meaning that Europe develops new knowledge of a similar quality and quantity as the US and Japan, but lacks behind when it comes to exploiting the knowledge and bringing it to the market (e.g. Dosi et al., 2006). To be able to bring knowledge to the market universities need to be or become more entrepreneurial and to be more effective in knowledge transfer. Rothhaermel et al. (2007) mention these issues as important streams that has emerged in the research on university entrepreneurship.

Knowledge transfer can be conceptualised in many different ways: as an entrepreneurial process (Dakin & Lindsey, 1991), as a diffusion process (Rogers, 1995), a valorisation process (Leloux, Groen & Van der Sijde, 2009) or as a communication process (Szulanski, 1996). In this contribution knowledge transfer is regarded as a communication process in which knowledge is exchanged between universities and enterprises of any size. It also is an interactive and iterative process, where the roles of “sender” and “receiver” alternate (Easteby-Smith et al., 2008; Lin et al., 2005). In a communication approach to knowledge transfer the capacity to send knowledge to others (the dissemination capacity) is crucial, although neglected until recently in the literature.

Knowledge transfer is characterised, according to Zellmer-Bruhn (2003) by false starts and wrong interpretations, which is rooted in the fact that the actors involved in the process have or may have incomplete and asymmetric information on both the knowledge and the other actor(s) involved (Lin et al., 2005) It is a complex process and to be successful the sending “actor” (university) needs to “wrap” and “distributes” its knowledge in such a manner that the receiving “actor” (market, company) can understand, absorb and use the knowledge (“absorptive capacity”; e.g. Cohen & Levinthal, 1990; Zahra & George, 2002; Todorova & Durisin, 2007). The sender must be able to disseminate the knowledge (Jongbloed & Van der Sijde, 2008a,b). Parent et al. (2007) describe this capacity as “the ability to contextualize, format, adapt, translate and diffuse knowledge through a social and/or technological network and to build commitment from stakeholders” (p 87; see also: Reagans & McEvily, 2003, and Tang et al., 2009). Minbaeva and Michailova (2004; Minbaeva, 2007) add “ability” and “willingness” as characteristics of the actors and the organisation to this ability.

This contribution focuses on research into the dissemination capacity of universities, their capacity to shape knowledge towards the needs of different target groups (industry versus SME, knowledge developing versus knowledge using companies, university spin-offs versus other knowledge intensive companies). Recognizing that hardly any research has been carried out with regard to universities the next section focuses on this disseminative capacity in general.

Defining Disseminative Capacity

In Table 1 definitions of knowledge transfer and/or disseminative capacity found in the literature are listed. Szulanski (1996) introduces a much quoted definition of knowledge transfer (see earlier in the paper; Google Scholar indicates that this article is quoted in 2972 other articles, an average of over 200 quotes annually since it was published) with elements as the characteristics of the knowledge, the source, the recipient and the context. Bapuji and Crossan (2005) use a dissemination capacity definition: *'the ability of a firm to externalize organizational knowledge and acquire legitimacy for organizational knowledge'*. Parent et al. (2007) describe this capacity as *'the ability to contextualize, format, adapt, translate and diffuse knowledge through a social and/or technological network and to build commitment from stakeholders'*. Reagans and McEvily (2003) discuss the features as tie strength and social cohesion; both tie strength and social cohesion are positively related with the ease of knowledge transfer. The network in which the organization operates is important in the process of transfer; most descriptions quoted in Table 1 incorporate elements of networks and networking.

Joshi, Sarker and Sarker (2007) emphasize the source's capability, credibility and extent of communication that play a role in determining the extent of knowledge transferred to recipients. Gupta and Govindarajan (2000) introduce a "knowledge flow" definition that complements Joshi et al.'s description: *'knowledge flow is a function of the following five factors: value of the source unit's knowledge stock, motivational disposition of the source unit, existence and richness of transmission channels, motivational disposition of the target unit, and absorptive capacity of the target'*. The source's capability and credibility are important aspects of the process of knowledge transfer and therefore of the disseminative capacity.

Ruggles (1997) discusses the process of "codification" in which knowledge is "translated" into a code that can be transferred. Martin and Salomon (2003) mention this articulation, while Oppat (2009) labels it as "encoding". Mu et al. (2010) summarize this as: *'the ability of people to efficiently, effectively and convincingly codify, articulate and communicate, spread knowledge in a way that other people can understand accurately, and finely, tactically put learning into practice'*.

According to Carlos & Park (undated) and Mu et al. (2010) knowledge transfer should have

a purpose (or in entrepreneurial terms: create value for the sender) either a commercial or/and learning outcome can be purposes of dissemination. In some situations these purposes can be mixed.

Based on the review of the literature we define dissemination capacity as: *'the capacity of an organization or institute to transform its knowledge into value for other actors in its network with a commercial and/or learning purpose'*. Core elements in this definition are “purpose”, “transformation of knowledge”, “value for other actors” and “network”. In the next section these core elements are elaborated for the context of university knowledge transfer.

Table 1: Definitions of disseminative capacity

Author:	Definitions:
Szulanski (1996)	There are four sets of factors likely to influence the difficulty of knowledge transfer: characteristics of the knowledge transferred (causal ambiguity and unprovenness), of the source (lack of motivation and not perceived as reliable), <i>of the recipient (lack of motivation & lack of absorptive capacity & lack of retentive capacity)</i> , and of the context in which the transfer takes place (barren organizational context and arduous relationship).
Ruggles (1997)	Codification is the process by which knowledge is represented in a code that can be transferred.
Gupta & Govindarajan (2000)	Knowledge flow is a function of the following five factors: value of the source unit's knowledge stock, motivational disposition of the source unit, existence and richness of transmission channels, motivational disposition of the target unit, and absorptive capacity of the target.
Martin & Salomon (2003)	We define source transfer capacity (STC) as the ability of a firm (or the relevant business unit within it) to articulate uses of it's own knowledge, assess the needs and capabilities of the potential recipient thereof, and transmit knowledge so that it can be put to use in another location.
Reagans & McEvily (2003)	Tie strength is positively associated with the ease of knowledge transfer. Social cohesion around a relationship affects the willingness and motivation of individuals to invest time, energy, and effort in sharing knowledge with others.
Liao, Welsch & Stoica (2003)	Knowledge dissemination involves the communication of the generated knowledge to all relevant departments and individuals.
Bapuji & Crossan (2005)	The ability of a firm to externalize organizational knowledge and acquire legitimacy for organizational knowledge.
Carlos & Park (not dated)	The ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends.
Minbaeva (2004 & 2007)	The ability (<i>well developed abilities to articulate and communicate knowledge</i>) and motivation (<i>the greater an individual's influence on the work carried out, how it is done, and by whom, the greater the sense of responsibility the individual tends to feel for these decisions and the greater commitment knowledge senders exhibit</i>) and the willingness of organizational actors to transfer knowledge where

	and when it is needed in the organization.
Joshi, Sarker, & Sarker, (2007)	Source's capability, credibility and extent of communication plays an important role in determining the extent of knowledge transferred to recipients.
Parent, Roy & St-Jacques (2007)	The ability to contextualize, format, adapt, translate and diffuse knowledge through a social and/or technological network and to build commitment from stakeholders.
Oppat (2009)	The ability to decontextualize knowledge, ability to encode knowledge, ability to design an appropriate communication approach.
Mu, Tang & MacLachlan (2010)	The ability of people to efficiently, effectively and convincingly codify, articulate and communicate, spread knowledge in a way that other people can understand accurately, and finely, tactically put learning into practice.

Purpose of knowledge transfer

Universities have in most countries three tasks by law: education, research and service to the community. This last task is formulated differently by different universities: technology transfer, exploitation of public sector research, exploitation of intellectual property (cf. Cuyvers & Zimmermann, 2002), commercialisation of research (cf. Van der Sijde & Cuyvers, 2003), the “third leg” activity of the university, contract research and strategic alliances, university outreach, university – region interaction (cf. Van der Sijde & Kekale, 2002) and science marketing (cf. Baake, 2002), or an expanded developmental periphery as coined by Clark (1998). In this contribution all these activities are captured under the label “technology transfer”. Although it is a legal task, it needs objectives – just as research and education. Hameri (1996) summarizes the results of the technology transfer in this respect as “an errand with no clear understanding of the outcome”. Carlos and Park (n.d.) and Mu et al. (2010) emphasize that this activity needs an objective. Theoretically, in view of the objectives with regard to education and research, technology transfer could have two major groups of objectives for knowledge transfer:

- (1) For financial gain: In his discussion on entrepreneurial universities Clark (1998) mentions that these universities have a diversified funding base. Revenues coming from technology transfer might add to the income stream.
- (2) For knowledge gain and learning: The process of knowledge transfer is an interactive process (“knowledge circulates”, Van Vliet & Slotman, 2006) in which the involved actors learn from each other in this process.

From a study on the objectives of Dutch universities on the objectives with regard to technology transfer (Kuiken, in preparation) it becomes clear that there are “degrees” to which these objectives are made clear – leading towards ambiguity with regard to policy and its objectives with regard to

technology transfer to third parties. This leads us to the following proposition:

Proposition: The degree of ambiguity in (university) policy and objectives regarding valorisation of its knowledge as *perceived* by the target group of organisations for the knowledge to be transferred, determines success.

Transformation of knowledge

In most situations, knowledge is distributed and scattered in different locations, embedded into different artefacts and procedures, and stored into different mediums (Bhatt, 2001). It is difficult to send knowledge to other actors, especially when the actors use other artefacts, procedures and mediums. Therefore, an organization has to choose to employ similar codification standards and programming schemes, or make use of predefined templates and schemas to present data, information and knowledge (Bhatt, 2001). Codification means the expression of knowledge in a standardized, fixed form (Håkanson, 2007). Gold et al. (2001) refers to this process as conversion: knowledge of many individuals can become useful. Without common representation standards, no consistency or common dialogue of knowledge would exist (Gold, 2001). There are a lot of possibilities to codify knowledge. Bhatt (2001) mentions prints, disks and optical media. Baskerville and Dulipovici (2006) list narratives, embedding knowledge systems and knowledge models. During the last decades, the two concepts codification and articulation have been used synonymously, however there is a little difference. Articulation presupposes codification, because knowledge can be articulated without codification, however knowledge cannot be codified without articulation (Håkanson, 2007).

There are some advantages of codification. Gold et. al (2001) mention the reduction of redundancy, enhancement of consistent presentation and the improvement of efficiency by eliminating excessive volume. Zollo and Winter (2002) add the opportunity of codification to see the weaknesses and the strengths of the currently available routines, and to change them when it is necessary. These advantages do not come for free. Zollo and Winter (2002) mention direct and indirect disadvantages. Direct costs include time, resources and the managerial attention to be invested in the development and updating of task-specific tools. Indirect costs include a possible increase in the rate of 'misfire' or inappropriate application of the routine if the codification is performed poorly, and the more general increase in organizational inertia consequent to the formalization and structuring of the task execution (Zollo & Winter, 2002). When the knowledge isn't codified in a standardized, fixed form, it has to be adapted to send the knowledge in a efficient

way. The degree in which this progress takes place is probably influenced by the *perceived knowledge distance*. Liyanage and Barnhard (2003) describe knowledge distance as a measure of the ease of transition from one knowledge system to another, especially when these knowledge bases contain technological knowledge. Presumably, the knowledge distance determines the degree of knowledge adaptation. Based on the background and motivations of studies mentioned above, this study posits the following proposition:

Proposition: The *perceived* knowledge distance between the university (“sender”) and *targeted* company (“receiver”) by the university determines the degree of presumptive adaptation of the knowledge to be transferred.

Valuable knowledge from a respectable source

The second main aspect of the dissemination capacity definition is value. The value of the source and the value of the message have a huge influence on knowledge transfer. Source credibility refers to the extent to which a recipient perceives a source to be trustworthy and reputable (Joshi et al., 2007). When a source is perceived as credible, the recipients are more open and receptive to the message. When the source unit is not perceived as reliable, trustworthy or knowledgeable, initiating a transfer from that source will be more difficult and its advice and example are likely to be challenged and resisted (Szulanski, 1996).

Proposition: The research reputation of the university (group) and its track record in valorisation determines its credibility as a source of valuable knowledge.

Network and inter-organizational dynamics

Parent, Roy and St-Jacques (2007) add a network aspect in the dissemination capacity definition: to diffuse knowledge through a social and/or technological network. Reagans and McEvily (2003) explored how different features of informal networks affect knowledge transfer. Easterby-Smith et al. (2008) describe the inter-organizational dynamics, such as power relations, trust and risk, structures and mechanisms, and social ties. Social cohesion refers to the extent to which a relationship is surrounded by strong third-party connections. Reagans and McEvily (2003) found support for this effect: social cohesion is positively associated with ease of knowledge transfer. This effect is primarily caused by the willingness of individuals to devote time and effort to assisting others. Especially for sources, this can be very costly. The source's willingness to transfer

knowledge despite these costs represents cooperative behaviour, and cooperation is more likely when strong third-party ties surround a relationship. A knowledge source may be reluctant to share knowledge for fear of losing ownership, a position of privilege or superiority (Szulanski, 2009). Szulanski also refers to the recipient's lack of motivation. Lack of motivation may result in “foot dragging, passivity, feigned acceptance, hidden sabotage, or outright rejection in the implementation and use of new knowledge” (Szulanski, 2009:31). Reagans & McEvily (2003) found support for another network feature: network range will be positively associated with the ease of knowledge transfer. Network range refers to the prevalence of ties that cross institutional, organizational or social boundaries. People who are connected to multiple bodies of knowledge are exposed to more worldviews, they are more likely to recognize the need for discussion, and to communicate in a language that a contact can understand. So, people with networks characterized by range should find it easier to transfer knowledge because the behaviours that ease knowledge transfer are part of their everyday network activity (Reagans & McEvily, 2003). Based on the background and motivations of studies mentioned above, this study posit the following proposition:

Proposition: Social cohesion and network range of the university (“sender”) and *targeted* company (“receiver”) determines whether knowledge will be transferred and is moderated by (social) tie-strengths.

Conclusions and further research

The capacity of organizations, in particular universities, to disseminate knowledge to “third” parties is a neglected domain of study in knowledge and technology transfer. Only recently this capacity receives more attention. After its introduction in the mid-90s most studies regarding this capacity have been theoretical and only a few have addressed the topic from an empirical point of view. In this study four propositions are formulated, based on a definition derived from the existing studies on the topic. These propositions should become the starting point for empirical research in the future.

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