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An empirical research within Basque stakeholders in innovation to build a comprehensive knowledge transfer model

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ABSTRACT The paper focuses on knowledge transfer, as a key subject of the field of knowledge management, and as the concept which also encompasses the topic of technology transfer. Knowledge transfer is widely concerning private and public entities, including academia, for its relationship with the creation of economic wealth, not only thanks to the leveraging of science outcomes but also, through harnessing non scientific knowledge assets. In consequence, knowledge transfer is strongly connected to innovation processes and, thus, with competitiveness of entities. The research aims to go through this issue, in order to depict a technology transfer model composed by business elements which could be easily understood and applied to a company. For this purpose we built a first theoretical model drawing upon the analysis, breaking down and framing of 17 knowledge transfer models of generic nature. Afterwards, we perform a fieldwork based on qualitative interviews with 9 institutions located in the Basque Country and stakeholders in innovation, for which knowledge is a strategic asset to develop innovations and to achieve competitiveness, with the aim of extracting the major elements moderating technology transfer impact. This empirical research lets us design a representative model for an efficient transfer of knowledge which highlights the most critical factors to take into account to succeed in innovation and competitiveness. We conclude that a knowledge-intensive company could improve its competitiveness by means of customizing and manipulating the determinants of impact of the transfer of knowledge. As contribution, the research provides a deeper understanding of the complex phenomenon of knowledge transfer and a useful model to support the conduction of the processes related to technology transfer, as well as management guidelines to rule an innovative company.

Keywords: Technology transfer, knowledge management, innovation management, knowledge transfer impact, knowledge intensive firm, innovative company

Introduction

Knowledge transfer (KT) issue, encompassing technology transfer (TT), is a field of increasing interest (Graham, 2008). It raises deep and passionate debates among researchers and experts, and it is a critical subject of state agendas of most developed countries, as the Organisation for Economic Co-operation and Development (OECD) recurrently states. Scientific, technical and political literature points at KT as a key factor of economic and social development. It also refers to KT as a critical issue to improve the competitiveness of organizations, because they can collect, process, and exploit, internal and external knowledge, to turn it into competences and into added value. We find evidence about the influence of KT to achieve successful innovations (Spencer, 2003), and the consequent relationship with better business results (Dyer and Nobeoka, 2000). Sustainability and competitiveness are, therefore, a clear and close derivative of KT practices. This relationship is even more remarkable within those entities whose growth and evolution is closely linked to knowledge as the principal resource, such as: high technology manufacturing sectors and knowledge intensive services-based companies. Thus, thanks to the successful impact of a mere KT event, an organization belonging to a sector of medium-high or high technological intensity, may attain a certain improvement of its performance. But a higher steady performance may also be reached when the organization underpins knowledge as the strategic resource (Hoopes and Postrel, 1999).

On the other hand, epistemologically speaking, KT is a hugely complex phenomenon (Bozeman, 2000), of multifactorial nature (Kumar and Ganesh, 2009), whose global understanding requires an analysis under multiple streams of research (Graham, 2008). Stock of science lays extensive literature which approaches the issue from the perspective of the following theories: economics and management sciences related to the knowledge society and innovation systems; theories of business organization linked to the management of resources and projects, and organizational learning; and theories of human and social sciences associated to communication and social systems. Each approach encourages the researches to go through the fundamentals of the phenomenon, drawing upon diverse methods and techniques, and enriching the investigation process due to an eclectic analysis, which allows to describe in detail KT variables and determinants which moderate the impact and the results (Zuo *et al.*, 2013; Ding *et al.*, 2013). Likewise, a great diverse casuistry of KT operations is displayed in its state-of-the-art: intra- and inter-organizational environment, domestic and international scope, vertical or horizontal flows of knowledge, between and among individuals or units.... All these research contexts, also supply a body of critical success factors, complementing the eclectic approach with a holistic tackling.

Likewise, while all stakeholders recognize knowledge as a critical resource, mainly when sourced from scientific origin, for the success of organizations, and macroeconomic impact for society is proved, there is no consensus in addressing solutions to mitigate and redirect those causative roots for not obtaining balance between business performance and budget effort allocated. Thus, KT impact is a critical asset for each participant organization, resulting in a successful innovation, better performance and,

consequent competitiveness, which can be achieved by means of smart management of the set of its influential factors (Comstock *et al.*, 1999). As a result, supporting onto a guide of patterns or handling a map of key factors for an optimal management and administration of the global KT being performed inside an organization, could be a valuable instrument for an organization to enable competitively reach and exceed goals and business targets, and to strengthen the corporative processes. This research focuses on this aim: to identify and formulate an optimal model for KT, drawing upon the review and collection of mainstream theories studying the phenomenon, and covering major KT contexts of celebration. The model should show, in a specific and detailed way, the set of empirically recognized and pragmatic guidelines, whose adoption and smart management, leads to a remarkable competitive improvement of the organization.

Methodology, Methods and Techniques

We propose a scientific research project composed by two phases: 1) a theoretical review process by means of literature search and document processing, 2) and subsequent empirical research based on qualitative interviews with KT stakeholders.

In the first stage we conduct a study of the major KT models stocked in the literature, formulated from a strictly theoretical approach. We consider all the diverse dimensions featuring KT phenomenon, through identifying each one individually, and integrating the whole, to obtain a first holistic, comprehensive and theoretical body of the facets that influence the output of the KT. The aim of this phase is to design a business model whose content is highly accurate and representative of this socioeconomic fact, by using a suitable abstraction scale in order to remain represented all types of KT events.

As a first step, we search across scientific literature in order to collect taxonomies, morphologies and KT models designed as a result of an overall theoretical analysis, and supported on diverse scientific approaches addressing the phenomenon. We remove from the research, hence, theoretical and empirical works executed to deal with bounded sectors, subsectors, or other delimited contexts, since they all confine research findings to restricted environments. We follow the set of recommendations stated by Graham, (2008), so as to locate scientific journals that include KT field among the editorial objectives and thematic priorities. The review and analysis of scientific articles, using the technique of content analysis (Silverman, 2000), allow us to structure the research, draw conclusions, and establish a conceptual basis for developing the model.

As a second step, we wish to transform retrieved data and information into a theoretical and conceptual model, elaborated thanks to an eclectic and holistic approach, and encompassing a global scope. We base the data mining and information processing upon SLIP technique ("Sort" + "Label" + "Integrate" + "Prioritize") (Maeda, 2006), whose aim is to summarize large corpus of data and to enable the conversion of the material into structured information and knowledge. The technique is suitable, in particular, for ad-hoc processing, and consists of four chained tasks: sorting the information (S), labelling the classification (L), integrating data sets (I), and prioritizing the most important groups for the purpose of research (P).

In the second stage, once conceptual model is set, we proceed with the assessment activity. Evaluation is carried out after the selection of a group of institutions closely linked to diverse and multiple KT events, who contrast the accuracy and validity of the model thanks to the contribution about the matching extent of their practical view and the real phenomenon. Therefore, the objective is to test, validate and fit empirically the model. Given the complex characteristics of the conceptual model elaborated, and the objectives of the work, qualitative research interview (Flick, 2014) is considered as the most appropriate technique for the work.

We lead a field study to record observations to confirm or refute the theory developed in the first stage of the investigation. Research is conducted in a qualitative way, based on survey design techniques, interview execution guidelines, and handling unstructured materials, in order to obtain narrative registers about the analyzed phenomenon. We run the interviews in a face-to-face way, due to the possibilities that this media presents (Novick, 2008), and we conduct its progress aided by a semi-structured survey guide (DiCicco-Bloom and Crabtree, 2006), in the self environment where KT events happen intensively. The tactic for our research tactic leaves us to study KT phenomenon by contrast between variables we have obtained from the theoretical research, and the behavioural characteristics in the real context (Patton, 2005). The results of the qualitative research are descriptions of observed situations and manifestations described by the protagonists. Thereby, methodology is designed following guidelines and procedures suggested by King (1994), based on the following methods, techniques and materials.

We choose interviewees according to methodological guidelines stated by DiCicco-Bloom and Crabtree (2006), in order to get a homogeneous sample of individuals, and exhibited by Etzkowitz and Leydesdorff (2000) to ensure that full spectrum of the topic is covered from the diverse approaches and a heterogeneous vision is achieved. Thus, the panel of respondents exhibits all the economic and business environments affected: science and technology system, public policies system, and business system; so that the list of interviewees incorporates representatives from universities, research and technology centers, government and public institutions, and clusters of knowledge-intensive and high-tech sectors. We select 9 institutions, stakeholders in innovation, with strong empirical and practical KT background, and deeply immersed in an intense KT atmosphere: 3 high-tech clusters, 2 higher education organizations, 2 technology corporations, and 2 public institutions in charge of fostering innovation.

As a result of this, we proceed with an exercise to contrast and to check the model by means of a qualitative research interview. This technique poses limitations due to subjective judgments of both, the researcher, and the people interviewed (Roulston, 2013). The subjectivity exists because of biased responses of the interviewers (Kvale, 1992), and also, for the difficulty of interpretation and appraisal of the responses by the author (Dixon-Woods *et al.*, 2004). In order to minimize and, even completely remove, the limitations, we carefully design the study (Kvale, 1992). We interview of the participants following a structured and strict script, without flexibility in the wording or order of questions, but allowing open-ended responses. Thanks to this technique we reduce bias when several interviewers are involved (Sewell, 2008). Likewise, we used a framework model when collecting and analyzing data to eliminate bias

(Rajendran, 2001). Finally, the final results obtained from the aggregation of all the interviews, or different sources of data of the research, let us reduce even more the limitations, obtaining at the end a very close pattern of the real socio-economic fact, since the validation was conducted in the form of cross reference among the different sources of data (Rajendran, 2001).

Results

After completing literature review and filtering criteria, we gather theoretical taxonomies that represent KT, composed by main groups of determinants of impact:

- Tiemessen *et al.*, (1997), suggest four types: structure, conditions, processes, and outcomes.
- Cook, (1999), proposes three kinds: cultural, structural, and factors based on skills and resources.
- Argote and Ingram, (2000), advance three categories: actors, relationship between actors, and body of knowledge.
- Bozeman, (2000), raises five sorts: sender actor, recipient actor, subject of knowledge, means and mechanisms, and context of demand.
- Goh, (2002), states five kinds: transmitter actor, receiver actor, relationship between actors, structures and support systems, body of knowledge, and strategic mechanisms.
- Albino *et al.*, (2004), suggest three types: cognitive systems of actors, encoding process and interpretation, and knowledge object transferred.
- Becker and Nudsen, (2006), declare six categories: context of the dyad of actors protagonist, dyad characteristics, characteristics of each actor, organizational characteristics, object of knowledge, and transfer mechanisms.
- Minvaeba, (2007), proposes six sorts: object of knowledge, issuer actor, receiving actor, relationship between actors, individual characteristics and context.
- Parent *et al.*, (2007), present four groups: generative capacity, disseminative capability, absorptive capacity, and adaptive - reactive capacity.
- Easterby-Smith *et al.*, (2008), suggest four types: transmitter, receiver, knowledge, and inter-organizational dynamics.
- Perona *et al.*, (2009), expose four categories: object of knowledge, transmitter actor, receiver actor, and context of relationship between sender and receiver actors.
- Kumar and Ganesh, (2009), state eight kinds: scope of the study, object of knowledge, agents involved, process mechanisms, contextual factors, geography, and business context.
- Ward *et al.*, (2009), present five stages: problem communication and identification, selection and development of knowledge or research project, analysis of context, transfer activities, and utilization of knowledge or research results.
- Wahab *et al.*, (2009), propose five classes: object of knowledge, receiver actor, supplier actor, actor relationship characteristics and extent of transfer.

- Eckl, (2012), suggests three composed categories: knowledge generation—creator of knowledge— knowledge object; dissemination of knowledge—disseminator of knowledge—transfer media; and absorption of knowledge - knowledge taker - absorption capacity.
- Zuo *et al.*, (2013), expose three types: process mechanisms, governance mechanisms, and media mechanisms of media
- Salem and Deif (2014) advance six sets: transferred technology, internal aspects of the receiver actor, external context, relations among involved actors and other actors, resources, and external factors

We follow SLIP technique to process these categories of factors in order to arrange the information (Maeda, 2006). Thus, we get a set of nine dimensions liable to affect KT results. This array of factors, whose characterization has some extent of influence in KT celebration, consequently, impact in the final outcomes of KT obtained:

- Attributes of the sender actor involved in KT, or generator and transmitter of knowledge, who bear particular features as an individual or as a collective.
- Attributes of the receiver actor involved in KT, or recipient and user of knowledge, who carry concrete characteristics as an individual or as a collective.
- Attributes of the relationship between actors, or characteristics of the interactions of all sorts that actors play during a KT phenomenon.
- Attributes of the object of knowledge, or the characteristics embedded in a portion of knowledge that is subject of a KT process.
- Organizational and structural attributes of the actors, since actors perform KT events conditioned by the features of its structure and its organization.
- Strategic framework for KT operation and strategic transfer mechanisms, since KT is encased within a frame and it is conducted, handled and steered through a bundle of mechanisms.
- Media mechanisms, whereas KT is operated, supported and implemented by means of certain ways and structures.
- Support and operating mechanisms, since KT events progress thanks to the assistance and guide provided by processes, instruments and tools.
- Attributes of external environment, or outer characteristics of the strategic framework for KT celebration.
- And last, impact is the ending dimension describing KT phenomenon, since each KT event leads to a series of results and consequences called impact.

	ATTRIBUTES OF THE SENDER	ATTRIBUTES OF THE RECEIVER	ATTRIBUTES OF THE RELATIONSHIP AND THE INTERACTION BETWEEN ACTORS	ORGANIZATIONAL AND STRUCTURAL ATTRIBUTES	SUPPORT AND OPERATING MECHANISMS	STRATEGIC FRAMEWORK AND STRATEGIC MECHANISMS	ATTRIBUTES OF THE OBJECT OF KNOWLEDGE	MEDIA MECHANISMS AND TRANSFER STRUCTURES	ATTRIBUTES OF THE EXTERNAL CONTEXT	IMPACT
Tiemessen *et al.* (1997)					Characteristics of the processes			Structure and conditions for the transfer		IMPACT
Cook (1999)	Skills and resources of the players			Cultural and structural characteristics of the actors						
Argote e Ingram (2000)	Characteristics of the players		Characteristics of the relationship sender-receiver				Characteristics of the object of knowledge			
Bozeman (2000)	Characteristics of the sender	Characteristics of the receiver					Characteristics of the object of knowledge	Transfer media	Demand context	
Goh (2002)	Characteristics of the sender	Characteristics of the receiver	Characteristics of the relationship sender-receiver		Systems to support transfer	Strategic mechanisms to transfer	Characteristics of the body of knowledge	Transfer structures		
Albino *et al.* (2004)				Cognitive systems of the actors	Characteristics of the codification and interpretation processes		Characteristics of the knowledge transferred			
Becker y Nudsen (2006)	Characteristics of the sender	Characteristics of the receiver	Characteristics of the interaction of the dyad	Organizational characteristics of the actors			Characteristics of the object of knowledge	Transfer media characteristics	Dyad context for the transfer	
Minvaeba (2007)	Individual characteristics of the sender	Individual characteristics of the receiver	Characteristics of the relationship sender-receiver				Characteristics of the body of knowledge		Context characteristics	
Parent *et al.* (2007)				Generative, disseminative, absorptive and adaptive - reactive capacity						

Easterby-Smith *et al.* (2008)	Characteristics of the sender	Characteristics of the receiver	Inter organisational dynamic				Characteristics of the body of knowledge			IMPACT(
Perona *et al.* (2009)	Characteristics of the sender	Characteristics of the receiver	Characteristics of the relationship context sender-receiver				Characteristics of the object of knowledge			
Kumar y Ganesh (2009)	Characteristics of the players				Characteristics of the knowledge flows	Transfer scope and business context	Characteristics of the object of knowledge	Transfer media characteristics	Contextual factors and geographical characteristics	
Ward *et al.* (2009)			Context analysis		Processes of: problem communication and identification, knowledge selection and development, transfer				Context analysis	
Wahab *et al.* (2009)	Characteristics of the sender	Characteristics of the receiver	Characteristics of the relationship sender-receiver				Characteristics of the body of knowledge			
Eckl (2012)	Characteristics of the generator and disseminator	Characteristics of the receipt		Absorptive capacity	Processes of knowledge creation, diffusion and absorption		Characteristics of the object of knowledge	Transfer media characteristics		
Zuo *et al.* (2013)					Transfer process mechanisms	Transfer governance mechanisms		Transfer media mechanisms		
Salem y Deif (2014)		Characteristics of the receipt	Characteristics of the relationship sender-receiver		Resources for transfer		Characteristics of the knowledge transferred		External context and factors characteristics	

Table 1: Taxonomies of determining factors of KT

<table>
<tr><td rowspan="5">Dimensions of KT taxonomy for KT characterization</td><td rowspan="4">Attributes of the object of knowledge</td><td>Attributes of the sender actor</td><td>Media mechanisms and transfer structures</td><td rowspan="4">Attributes of external context</td></tr>
<tr><td>Attributes of the receiver actor</td><td>Strategic mechanisms</td></tr>
<tr><td>Organisational and structural attributes</td><td rowspan="2">Support and operating mechanisms</td></tr>
<tr><td>Attributes of the relationship and interactions between actors</td></tr>
<tr><td colspan="4">KT Impact</td></tr>
<tr><td rowspan="3">Dimensions of factors taxonomy for empirical research</td><td colspan="4">KT Impact</td></tr>
<tr><td>Characteristics of the object of knowledge</td><td>Characteristics of the actors</td><td>Internal mechanisms</td><td>Characteristics of the external context</td></tr>
<tr><td></td><td>Characteristics of the relationship between actors</td><td></td><td></td></tr>
</table>

Table 2: Dimensions of KT phenomenon and taxonomy of dimensions of factors affecting KT results for empirical research

As a result of this, we obtain a homogenized taxonomy of dimensions of determinants affecting KT performance, regardless of the industry in which phenomenon happens, and whose formulation is characterized by a theoretical nature. The taxonomy showed let us to define a new taxonomy composed by a set of management factors that will power qualitative research. This action is executed with the aim of complementing the model with the empirical keys that moderate KT impact. The new taxonomy is developed starting from the initial theoretical taxonomy and the major descriptors of KT. An additional split is required regarding the set of determinants describing the actors and the relationship and interaction between them because of the critical importance of differentiate both types.

Literature reviewing is completed and theoretical formulation is accomplished, thus, we proceed with the empirical research. For this purpose, a scheduled set of interviews is planned with organisations and institutions enduring intense and systematic KT phenomena. The aim of the labour is to verify empirically the accuracy of the taxonomy designed, to ensure the right statement of the dimensions of determinants, and to get a contribution in the manner of the identification of the details of the main keys that enable KT implementation success and value creation in the firms. Table number 3 shows the results obtained after summarizing, processing and transcription of raw information sourced from the interviews. These tabulated results are allocated as KT synthesized patterns to the previously established dimensions.

	Dimensions of determining factors of KT				
	Characteristics of the knowledge	**Characteristics of the actors**	**Characteristics of the relationship**	**Attributes of the external context**	**Internal mechanisms**
1	Very specialized scientific knowledge.	Human capital talent Management. Knowledge embodied in people. Culture of transfer.			Orientation to commercial exploitation of scientific knowledge. Management of intellectual and industrial property. Intense corporative R&D activities. KT integrated into innovation system.
2	Compendium of: scientific-technological knowledge and socioeconomic factors.	Characteristics of sender and receiver organizations.	Approach of shared and open innovation, and co-creation.	Characteristics of KT ecosystem	KT as a particular business strategy tool. Addressing R&D to supply value for the market. Knowledge management. Cooperative and collaborative approach.
3		Transfer culture	Relationships between scientific agents and business corporations. Relationship based on bidirectional interactions science-industry.		TC as a tool to improve company competitiveness. Structuring KT. Addressing R&D results to be converted into economic and market goods. Cooperative approach based on business needs or market opportunities. Collaborative networks with science-industry settings. Management of intellectual and industrial property.
4	Tangibilizing the knowledge	Culture of transfer. Human resources motivation. Leadership and business acumen of the manager. Size of the organization.	Understanding between actors involved in KT.	Support from public programmes from Governmental Institutions. Funding system for KT. Ecosystem of KIBS for fostering and enhancing KT. Encounters to stimulate KT.	Strategic commitment of the company. Corporative strategy to develop products and services. Structuring and systematization of KT activities. Involvement of people through incentive mechanisms. Consistency between business model of the company and market opportunities. Mechanisms of effective cooperation between actors. Knowledge management in the organization. Management of intellectual and industrial property.
5		Business acumen to leverage results of own and external scientific research.	Understanding and liaison between business needs and science production.	Harmonic ecosystem of types of knowledge. Interfacing structures to enable knowledge flows and generating innovation. Balanced system of science, industry and interface entities Public instruments to support KT. Science results available for the industry.	Knowledge management strategy. Commitment to R&D and innovation. Ability to operate knowledge-based businesses. Systematization of management of KT and intellectual and industrial property management. Incorporating scientists into companies. Business strategy embracing research results.
6		Habits of incorporating scientist in the company. Culture of transfer. Capacity of the company to absorb scientific knowledge.	Aligning academic research and industry needs. Mutual knowledge between firms and research groups.	Competitiveness and structuring of the public science system. Professionalization of KT support entities. Dissemination of the capabilities of the science system.	Strategy of knowledge development addressed to specific business needs. Mobility of researchers and scientist from research environments to firms. Management of intellectual and industrial property. Meetings science-industry to enable dynamic relations.

7	Highly specialized knowledge	Company commitment with KT and required facilities. Disposition to innovations and collaboration.	Partnership between organizations with long-term collaboration and bidirectional KT. Joint ventured relationships. Industrial culture of common understanding.	Involvement of Public Institutions.	Cooperation based on large networks of multi-profile actors. Open innovation strategy and outsourcing partnerships. Long-term contributions highly structured and systematized. Inter industrial KT. Working groups associated with knowledge value chain. Management of intellectual property.
8		Size of the company. Former successful experiences of KT. Actors with structured and organized R&D&i. Culture and strategic commitment to innovation.	Physical proximity and fluid interactions. Trust and confidence between actors.		Cooperation between scientific and technological actors of different expertises. Long-term cooperation based on partnership approach. Common strategic planning of R&D, innovation and business affairs. Performing excellent and highly specialized R&D results. R&D strategy aligned with market and business needs.
9	Structured knowledge for transferring	Attitude of individuals. Motivation and commitment to transfer. Culture of transfer. Hierarchical characterization of the organization. Organizational addressing to cooperate.		Context of socio-economic value pertaining KT, innovation and R&D	Alignment of R&D and business operations between science and industry. Incentive mechanisms to encourage attitude. Technology resources to structure and tangibilize knowledge. Appropriate collaborative models for KT. Mechanisms of management models for KT and innovation. Methods of measuring impact and extent of success of KT.

Table 3: Qualitative research results of empirical determining factors for successful KT

As a result of the research process we obtain an array of core data which permit to build a list of set of factors considered as empirical determinants of the KT impact. The data are classified and categorized according to each dimension of the taxonomy for empirical research. The empirical contribution, once merged and integrated in the theoretical taxonomy, conceives a theoretical-empirical model of guidelines to enable and enhance optimal KT events for institutions which deal with knowledge assets as strategic resources. This scheme is the final goal that the research aimed to procure, and it could be graphically exhibited as a KT representative model (figure 2). Furthermore, the model is escorted by the evidence found about a close relationship between KT, innovation, business performance, and competitiveness (Hoopes and Postrel, 1999; Dyer and Nobeoka, 2000; Argote and Ingram, 2000; Spencer, 2003; Dyer and Hatch, 2006; Easterby-Smith *et al.*, 2008; Bosch-Sijtsema and Postma, 2009; Ding *et al.*, 2013). Therefore, this depiction may become a useful and practical instrument for corporative business management

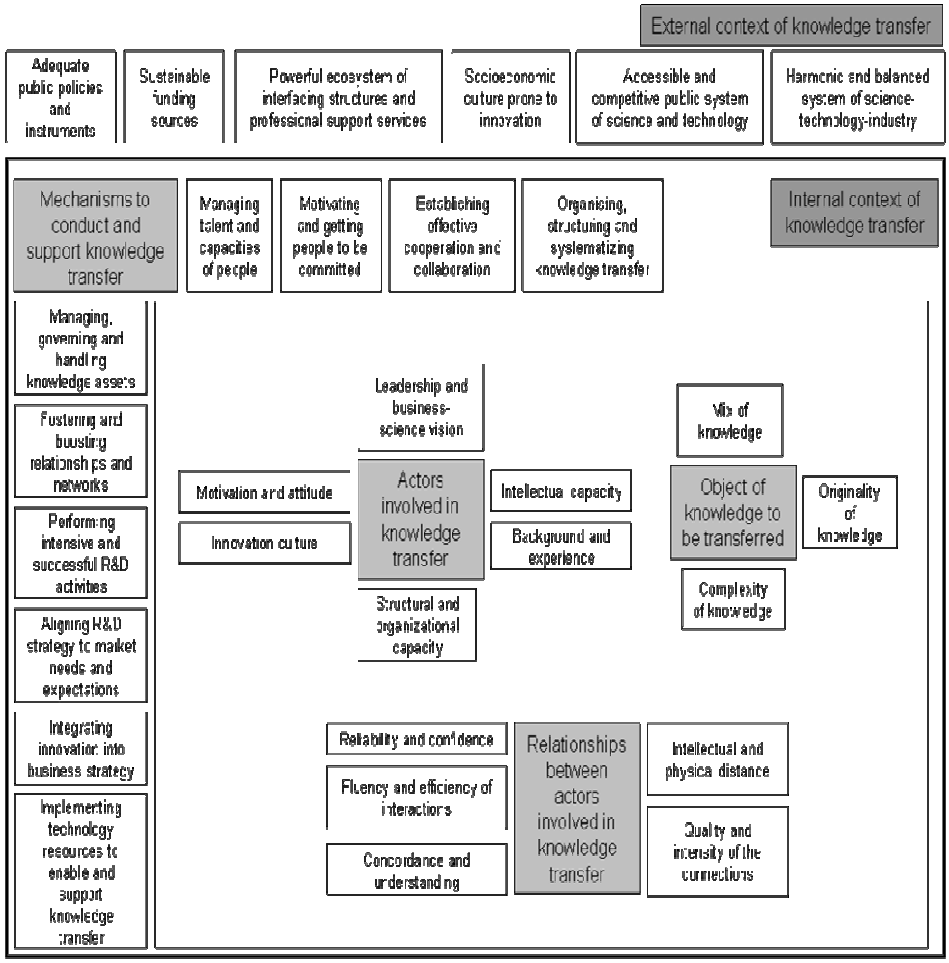

Figure 1: Knowledge Transfer Model

Discussion

The main aim of the research is to depict an extensive model for optimal KT, but we also wish to find preliminary evidences of a direct relationship between a global and continuous phenomenon of KT inside an organization, and its extent of competitiveness. The model could also become a management guide which might enable the stakeholders to improve the comprehension of the keys for KT optimization. As a main conclusion of the research, we found an empirical proof of that linkage, and furthermore, we have depicted a model of KT based on dimensions of impact determinants and enriched with the key factors to attain success.

We have also developed a KT taxonomy resulted from the analysis and processing of an exclusive set of models theoretically elaborated, in order to obtain a conceptual idealization of KT phenomenon, but much richer in terms of number and type of dimensions of determinants represented. In fact, we have improved the granularity and details of the representation, in contrast with existing models (Goh, 2002; Becker and Nudsen, 2006; Kumar and Ganesh, 2009; Eckl, 2012). We have provided a triple approach to get these results: a) process management (Ward *et al.*, 2009); b) mechanisms to conduct and support KT events (Zuo *et al.*, 2013); and c) social systems involved (Parent *et al.*, 2007).

On the one hand, the qualitative research confirms that the empirical factors, responsible of leading to an optimal KT within knowledge intensive organizations, can be assigned to the dimensions of the designed taxonomy. The results of the interviews, without exception, and without removing the effective role of any of them, perfectly fit in the theoretical model. Thus, following implications are stated:

- The taxonomy properly reflects the socio-economic real fact, showing that KT events, inside this type of organizations, are characterized by the groups of factors revealed in the first stage of this investigation.
- Every dimension has prominence and decisive influence on the KT results; and the extent of this impact is dependent on each specific case study of KT performed.
- There is a short list of factors which are mostly mentioned by respondents as the keys for an efficient KT in a general framework of KT: facing an event from all points of view; managing the complexity and the mix of the internal and external knowledge; an active and systematic interaction between participants; and a prolific collection of internal mechanisms to conduct the phenomenon.

On the other hand, a whole qualitative analysis of the results of the interviews, in contrast to the theoretical framework where KT is defined as a complex phenomenon characterized by diverse architectures of flows of knowledge (Argote and Ingram, 2000; Schulz, 2001; Becker and Nudsen, 2006; Van Wijk *et al.*, 2008; Kumar and Ganesh, 2009), let us announce the following implications:

- There is no difference among the key factors discovered for each particular case of KT: intra-organizational and inter-organizational (Van Wijk *et al.*, 2008); vertical and horizontal (Schulz, 2001); domestic and international (Van Wijk *et*

al., 2008); or between persons or organizational units (Argote and Ingram, 2000; Schulz, 2001). This finding shows, thereby, that KT is displayed as a global phenomenon whose keys of efficiency are absolute. Furthermore, KT should be preferably analyzed from an eclectic point of view to get in richer conclusions for an overall organizational level (Easterby-Smith *et al.*, 2008).

- The complexity of knowledge (Szulanski, 1996) is an intrinsic factor for this sort of organizations, rooted in the culture of these firms, and considered as an compendium of addition of scientific, technological, social, cultural and economic aspects (Roux *et al.*, 2006; Paulin and Suneson, 2012). Thereby, it must be smartly managed to become a useful asset for organizational learning and skills development (Schulz, 2001).
- The diverse roles played by the actors during a KT event: generators, senders, intermediaries, receivers, or consumers of the object of knowledge, are usually diluted and merged, thus, showing the existence of multi-role actors. In particular, it is claimed the need to operate two-way knowledge flows between organizations or individuals senders and receivers, highlighting the dual role of the leading actors in the phenomenon (Gibson and Slimor, 1991; Graham, 2008)
- The mechanisms of cooperation implemented are essential tools in order to attain effective KT, particularly when they are designed and operated: thanks to a strategic approach of strong partnership (Kotable *et al.*, 2003), to lay down long-term relationships and interactions between actors (Simonin, 1999; Tsai, 2002), and founded on the criteria of strengthening mutual understanding and trust (Levin and Cross, 2004; Bosch-Sijtsema and Postma, 2010)
- The mechanisms for KT management and strategic planning are strongly influential in the success of the phenomenon, and, singularly: knowledge management tools and intellectual and industrial property procedures (Fang *et al.*, 2013; Ding *et al.*, 2013); and an effective implementation of a comprehensive and aligned corporate strategy for research and for business development (Comstock *et al.*, 1999; Anokhin *et al.*, 2011)
- The cultural element featured by the protagonists of KT, specially pertaining to the focusing, sensitivity, and actual commitment to innovation and transfer practices, might be the most influential determinant throughout the qualitative empirical analysis, as conclusions already divulged (Baghat *et al.*, 2002; Al-Gharibeh, 2011). This finding evidence that a mere design and implementation of processes, systems, tools, and instruments to enhance KT does not ensure effectiveness of the impact of KT if it is not complemented with practices addressed to people in a psychological, social, and cultural way (Wan *et al.*, 2010; Zuo *et al.*, 2013).

Finally, qualitative research has also allowed us to extract significant conclusions from the empirical actualities, to be taken into consideration for future researches:

- The research confirms that there is evidence about preliminary relationship between an optimal KT and a better performance of a firm. This finding is confirmed in the work by all respondents, because they acknowledge that a properly KT carried into effect, and in spite of the business results achieved, has direct

impact throughout the company in terms of: motivation and involvement of individuals, partnerships with other institutions, developing new capacities, accumulating experience, etc… However, this finding is still weak as to conclude that there is a direct and proportional relationship between a global and continuous phenomenon of KT inside an organization and its extent of competitiveness, because: a) the research did not show a clear scenario of the consequences of the aggregation of knowledge transfer operations in a given organisation; and b) there is still a missing link between the diverse impact attained after the transfer of knowledge and the extent of competitiveness gained thanks to that.

- We found empirical proof that, currently, there is no systematic and generalized structuring ok KT activities, and there is not even a culture of innovation widespread and accepted to impulse it decisively; although some particular industries, e.g. high-technology, are more sensitive and present a more advanced status than other industries.
- We notice there is lack of evidences about KT phenomenon from a comprehensive approach and a holistic perspective, and from the point of view of the potential of this practice to improve business performance. The major approach of this phenomenon is confined to analyze and explain: the relations between scientists or technology units with companies, the management of intellectual and industrial property, and to deliver training activities.
- We conclude about the critical and practical challenges of making available a guide-model that will enable organizations to adopt concrete measures and to optimize global events of KT actions. The keys to understanding, application and handling the model are mainly focused in its pragmatism, conceptual simplicity, practical aim, procedural details, and diverse ways of adoption. The value added provided by the model, once implemented and operational, is forecasted to be concentred on: motivating people, structuring and systematization KT as a key practice for business management, increasing the sensitivity of the organization with scientific activities and knowledge management, optimizing internal and external processes around the collaboration and cooperation, and achieving better business results.

Implications and Research Limitations

A wide set of stakeholders could be benefited by this research. Companies and research institutions should tackle the management and governance of KT operations with interest and motivation, since it is a highly critical business practice linked to the competitiveness and improves of innovation. The policy makers should design and implement public policies according to the conclusions of the research, in order to ensure coverage of the key factors to better leverage the financial resources dedicated on public funding of innovation activities (R&D funding programmes, start-up creation, cluster and network boosting initiatives…). Public and private agencies supporting innovation should take into account these guidelines when defining strategies and partnerships with companies. Private companies supplying knowledge-intensive business services should develop new consulting products and professional services in order to ensure the evolu-

tion of the innovation road-map of their clients thanks to the advisory about the determining factors explained in the model. Finally, the scientific ecosystem and Academia may advance in the study of the extent of influence of each business factor, and conduct empirical studies of statistical nature to validate the model.

There is a limitation in this research regarding the performance of the qualitative research study. Although the subjectivity of the interviews and interpretation of information has been severely reduced thanks to a careful design of the interview, data collection and data analysis processes, the final set of determining factors depicted in the model could suffer a slight variability depending on the scope of institutions, profile of interviewers and the interview script followed.

Conclusions

In summary, the findings of the research are:

- The impact of KT phenomenon is conditioned by several dimensions of factors: characteristics of the actors and of the relationship between them, characteristics of the object of knowledge, internal mechanisms to conduct KT events, and characteristics of the external context.
- We found empirical evidence about the relationship between KT and business performance for those organizations where knowledge serves as a strategic resource.
- We discovered the key elements liable to turn KT activities into a strategic tool to improve competitiveness. The major determinants are: cultural factor, effective collaboration between agents, designing and implementation of appropriate mechanisms, and smart handling of the flow of knowledge
- It is feasible to develop a road map to permit the improvement of the firm competitiveness by means of the management of the key concepts. These guidelines suggest how to steer and govern the whole KT inside a given organization which is characterized by processing large and varied knowledge assets as strategic resource.
- We revealed evidence and direct connection between positive results of intense KT of a firm and its extent of competitiveness as consequence of the theoretic-empirical model for KT formulated. Its level of abstraction permits the representation of the full spectrum of the phenomenon and lets us display the main empirical keys for its optimization. However, further research is needed to bring into light the real connection between sustained KT processes and the grade of competitiveness of a company.

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