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Knowledge Transfer in Partnering Projects

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Preface

The analysis of the connection between the research areas of knowledge transfer and partnering has proven to be, to some extent, a cutting-edge research within the project management field. The relevance of the topic, that has been underlined several time in the study, has inspired me during the overall research development, despite the challenges and complexity encountered.
In particular, after previous researches on partnering, with this study I had the opportunity to learn more about the topic of knowledge transfer within partnering projects. This has captured my curiosity and has motivated me during the entire research development.
During the initial phase of the research, the possibility of interviewing several experts in the field has been very inspiring because I could listen to remarkable project experiences and different ideas and opinion about the research topics. While at the beginning of the interview process I didn't feel totally confident, I definitely improved after a few interviews and I was able to obtain satisfactory results.
In general, during the development of this Master Thesis, I improved my research skills and competence. However, several difficulties were also met during these six months and, therefore, it has been necessary to involve a continuous level of commitment and perseverance.

This research has been developed within the Department of Production and Quality Engineering (IPK) and in collaboration with SINTEF, involving a nearly six-months working process. The support of qualified experts has guided me through the accomplishment of this study, offering precious advices and knowledge. In particular, this research would have not been possible without the professional and positive support of Wenche Aarseth.

Finally, a special thanks to Sigurd, who makes me happy every day.
And thanks to my family that always encourages and supports me, even from a distance.

Summary

The general purpose of this research was to investigate the perception of the link between knowledge transfer and partnering within the construction industry. From a comprehensive literature review and a set of qualitative interviews, the presence of an intricate framework emerged, which shows the presence of a strong connection between these two research areas.
Specifically, the findings revealed that the link between knowledge transfer and partnering developed in two ways, visualized as a loop. In fact, the presence of a shared collaborative culture in partnering promotes an effective knowledge transfer process in construction projects and, vice versa, an effective knowledge transfer process could set the stage for successful partnering implementation.
A preliminary literature review has been conducted on knowledge transfer and partnering, respectively, with the purpose of creating a better understanding of the research purpose and analysing how the link between these topics is considered by the authors. In particular, the theoretical framework shown that some of partnering key elements, like cooperation, open communication, and mutual trust could also enhance effective knowledge transfer in projects. In fact, according to some experts' opinions, the presence of these factors promotes the creation of a collaborative shared culture that will most likely favour the transfer of *tacit* knowledge.
Afterwards, a set of ten qualitative interviews provided a more practical insight, showing how the researchers and the project managers recognise the link between knowledge transfer and partnering. In particular, the interview-objects also revealed a need for more practical and concreate contributions both partnering and knowledge transfer. Further researches should then performed in order to exceed the current research limitations and provide an open framework for future project improvement.
Finally, it is believable that the analysis of the link between knowledge transfer and partnering could be extremely relevant in influencing the overall project success. Partnering in projects helps to overcome the complexity and the fragmentation of the construction industry, while, at the same time, an effective knowledge transfer process is a method for achieving benefits in projects. The implementation of these elements denotes the perfect system for the achievement of positive projects performances. At the end a new perspective of the link emerges; *successful* partnering in projects influences *effective* knowledge transfer.

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1. Introduction

1.1. Background and relevance of the study

The increasing complexity of the construction industry and the presence of adversarial and conflictual relationships in projects has prompted several authors to seek for new innovative approaches to project management (Ayas, 1996, Lahdenperä, 2012).
Within this context, the importance of an improved collaboration between the project participants has been underlined, thus the adoption of collaborative working methods has profoundly increased during the last years. Partnering, as a collaborative managerial approach, has become common nowadays, especially within the construction industry as an attempt of reducing conflicts between project participants and consequently achieving successful outcomes (Lahdenperä, 2012).
At the same time, in order to deal with the emergent complexity and uncertainty, other authors have claimed for the adoption of an innovative knowledge management attitude in projects. Assuming that a project is a *learning opportunity* (Björkegren, 1999), a knowledge-based project management approach could support the achievement of higher project performances (Sense, 2007, Björkegren, 1999).
According with this considerations, this study analyses the connection between partnering, as a collaborative procurement approach, and the knowledge transfer process within the construction industry. Conceptually, the effective implementation of these practices (partnering and knowledge transfer) could positively influence the project outcomes.

Partnering is defined as a managerial approach, based on strong collaboration between the project participants (Barlow and Jashapara, 1998). Within this context, the project participants, at different level, actively work together, continuously sharing expertise and knowledge. Therefore, in this scenario, it is possible that an effective knowledge transfer process (within a single project or across different projects) becomes even more important than within a traditional construction project.
For this reason, it can be practically relevant to investigate how the adoption of partnering practices in projects influences the effectiveness of knowledge transfer, and vice versa. In fact, while some of the partnering relational success factors could, to some extent, promote an effective knowledge transfer, at the same time, a knowledge-based project management could

enhance the social interactions and the collaboration between the project participants. Specifically, cooperation, open communication, and mutual trust are some of the partnering relational key factors that could enhance the effective knowledge transfer. In fact, when the project participants work together in a collaborative and open manner, an effective knowledge transfer process becomes essential.

Despite the presence of several studies concerning both the topic of partnering and knowledge transfer separately, there is a limited number of academic contributions that actually investigate the link between knowledge transfer and partnering. Considering the practical relevance of these research areas, this study represents an attempt to narrow the knowledge gap.
The presence of collaborative working relationships in projects, along with the implementation of an effective knowledge transfer process, could be the formula for the achievement of successful projects outcomes. Thus, an inducement for improving project performances could arise from a better understanding of the link between effective knowledge transfer and successful partnering.

1.2. Research questions

The aim of this thesis is to investigate the perception of the link between knowledge transfer and partnering projects, within the construction industry. First, the research will show whether a link exists, according to the interviewees' opinions and what emerges from the literature review. Afterwards, if the connection will be confirmed, the study will answer to the following research questions:

- Which partnering key elements enhance effective knowledge transfer?
- How knowledge transfer and partnering in projects influence each other's?

Partnering and knowledge transfer are both important means for the achievement of successful outcomes in projects. The knowledge-based project management approach strongly relies on the presence of social interactions and collaboration between individuals. These factors are, coincidentally, considered essential for the success of partnering projects. At the same time, the development of an effective knowledge transfer process favours the creation of trust, collaboration, and open communication, which, again, are critical success factors for partnering

projects. These considerations reveal the presence of a broad link between knowledge transfer and partnering and are assumed as starting point for the following study.

As stated, this research attempts to clarify the nature of the link between knowledge transfer and partnering projects, through a comprehensive analysis of the literature and a set of interviews. The study followed specific and systematic steps in order to obtain valuable results. First, the topics of partnering and knowledge transfer are presented, separately (chapter 2). The theoretical review constitutes an important framework for the entire analysis. Afterwards, in the chapter 5, the findings from the interviews shows how the experts (from the academic and the construction context) perceive the link between knowledge transfer and partnering in projects. Finally, the last part of the research will discuss what emerges from the interviews and the literature review, with the purpose of answering to the research questions (chapters 6 and 7).

During the initial phase, the definition of an accurate problem statement for this research involved an attentive analysis of the topic. In fact, even though the general purpose of the thesis was defined from the preliminary phases, it has been necessary to collect more information from the literature, in order to further narrow the point of view of the study. As mentioned, since there are limited contributions in the literature concerning the analysis of the link between knowledge transfer and partnering, it was quite challenging to define the relevant research questions. In addition, the complexity and contingency of the concepts (partnering and knowledge transfer) required a systematic and focused elaboration of every information from the literature, in order to fully comprehend the direction of the research. During this phase, the fact of having a previous understanding about the topic of partnering constituted an advantage. In fact, despite the initial obstacles, this study has proved to be stimulating and interesting and, after the definition of the problem statement, the research developed in a linear fashion.

2. Literature Review

The literature study analysed the topic of knowledge transfer and partnering in projects, and it constitutes the basis for a complete understanding of the findings. First, this chapter focused on knowledge transfer within the construction industry, with particular attention to the key elements; then it included an excursus on partnering in projects.

2.1. Knowledge transfer

This chapter starts presenting the vast concept of *knowledge*, and then it narrowed down to the analysis of *knowledge transfer* in projects. Effective knowledge transfer is essential for the achievement of successful outcome in projects, however different barriers can arise during this process and specific key elements should be implemented.

2.1.1 Knowledge transfer definition

As Gasik (2011) reported *"all projects have one thing in common, knowledge"* (page 23). From several years, different authors have analysed the complex and multifaceted concept of *knowledge*. While some researchers have focused on the static nature of knowledge, other studies have defined knowledge in a dynamic and human perspective. Nonaka (1994), for example, have defined knowledge as a *belief* or *commitment* of an individual, underlying the more personal and subjective nature of knowledge; similarly, Akhavan et al. (2006) have affirmed that knowledge is linked to the users' values and experiences, thus hard to define.
Within the organisational context, knowledge can be the basis for the organisations' competitive advantage (Inkpen, 1998, Chen et al., 2014) and it constitutes a significant factor in preserving organisational culture (Hajidimitriou et al., 2012). In accordance, the new edition of ISO 9001:2015 in the paragraph 7.1.6. has underlined the importance of *organizational knowledge* for the achievement of successful outcomes in the organization. Knowledge is also considered an essential asset within the construction industry, driving innovation and creating value (Zhang and He, 2015).

The distinction between tacit and explicit knowledge dates back to the research of Polanyi (1962), the first authors to introduce this classification, stating *"we know more that we can tell"*

(Koskinen et al., 2003). After that, several authors have assumed the concepts of tacit and explicit knowledge in their studies.

Tacit knowledge is defined as *"individual and unarticulated"* (Hartmann and Dorée, 2015). Because of its subjective quality, tacit knowledge involves intangible factors embedded in individuals' experiences, know-how and beliefs and it is, therefore, hard to formalize, communicate and express in words (Inkpen, 1998, Carrillo and Chinowsky, 2006, Hajidimitriou et al., 2012, Chen, 2004). According to Nonaka (1994) individuals accumulate tacit knowledge through experience and this, consequently, forms the models of behaviour, the beliefs and the perspective with which individuals analyse different situations. Besides, tacit knowledge is considered as one of the most valuable and critical resource in the organisation and sharing tacit knowledge is essential for the improvement of team collaboration and effectiveness (Zhang and He, 2015, Choy Chong, 2006). Despite its significance, the management of tacit knowledge has probably not yet been completely understood (Koskela et al., 2002, Dave and Koskela, 2009).

On the other hand, explicit knowledge is defined as systematic, codified and formal. This kind of knowledge can be easily expressed and shared through standardized procedures and formal languages, words and numbers (Hajidimitriou et al., 2012, Zhang and He, 2015). Several different system and tools has been developed for the transfer of explicit knowledge, like procedure manuals, work breakdown structure, document management systems, and organisation maps (Dave and Koskela, 2009).

Table 1. Definitions of *knowledge* from five different publications.

Nonaka (1994)	*Justified true belief* (page 15).
Zhang and He (2015)	*Knowledge is one of the essential assets in the construction industry due to its significant role in driving innovation and creating value* (page 2).
Hajidimitriou et al. (2012)	*Organisational knowledge is regarded as the basis for the firms' sustainable competitive advantage* (page 40).
Inkpen (1998)	*Knowledge is the primary organisational resource* (page 70).
Akhavan et al. (2006)	*Knowledge is linked to the capacity for action* (page 2).

Knowledge management is an essential tool for the improvement of organisational performances and the achievement of benefits, through the use of the knowledge embedded in the individuals and in the organisations (Carrillo and Chinowsky, 2006). Knowledge management is considered as a strategic method to achieve competitive advantage within the

organisation, enabling information and expertise to be transferred efficiently among people (Akhavan et al., 2006).

In detail, according to Gasik (2011) knowledge management regulates the processes of knowledge creation, acquisition, transfer, sharing and exploitation. Therefore, the scope of knowledge management is the development of methods, tools, and techniques for the management of information and knowledge within the organisations, with the purpose of achieving better results (Gasik, 2011). According to Dave and Koskela (2009), one of the organisation key issue is how to integrate the knowledge of the individuals into products, processes, or services that could benefit the organisation as whole.

Because of its contingent nature, knowledge management entails different perspectives especially when implemented in different organisational contexts. This causes, according to Gasik (2011), the need for a systematization of the concept, in order to build univocal practices. Other authors have claimed that a clear definition of knowledge management is still missing (Choy Chong, 2006) and this could lead to possible misunderstanding and confusion (Carrillo and Chinowsky, 2006). In addition, there is no formal settlement about how knowledge management is related to knowledge transfer (Dave and Koskela, 2009); while the term *knowledge management* refers, usually, to the attempt of increasing organisational performance, *knowledge transfer* is generally considered as the transmission of information between individuals (Dave and Koskela, 2009).

Knowledge transfer constitutes one of the most important process (or stage) within the larger knowledge management system, even though this aspect is often mistaken in the literature (Gasik, 2011, Hajidimitriou et al., 2012). The concept of knowledge transfer is for Gasik (2011) an act of communication between the sender and the receiver; under certain conditions, knowledge is transferred between one unit (that can be an individual, the organization or a project) to another unit (Hartmann and Dorée, 2015). According to Björkegren (1999) this point of view implies that explicit knowledge is transferred between two actors in a linear and systematic manner. However, considering the transfer of tacit knowledge, Björkegren (1999) argued that a new approach of *translation and reconstruction* (page 27) of knowledge should be adopted. In this situation, knowledge transfer becomes an interactive exchange of experiences between different entities (Hajidimitriou et al., 2012, Yuanyuan and Perez-Aleman, 2012, Argote and Ingram, 2000). Therefore, both explicit and tacit knowledge can be transferred within the organisation or among project participants. In particular, tacit knowledge can be most likely transferred through interactions between knowledge sources (Gasik, 2011)

and it could be strongly influenced by the previous experiences of the sender and receiver (Björkegren, 1999).

Table 2. Definitions of *knowledge management* from five different publications.

Webb (1998) in Carrillo and Chinowsky (2006)	*The identification, optimization, and active management of intellectual assets to create value increase productivity and gain and sustain competitive advantage* (page 2).
APQC American Productivity and Quality Centre (1996) in Dave and Koskela (2009)	*Knowledge management is equivalent to the strategies and processes for knowledge identification, documentation and influence with the aim of making companies competitive* (page 895).
Scarbrough et al. (1999) in Anumba and Pulsifer (2010)	*Any process or practice of creating, acquiring, capturing, sharing and using knowledge, wherever it resided to enhance learning and performance in organisations* (page 688).
Excalibur Technologies (1999) in Anumba and Pulsifer (2010)	*Distribution, access of human experiences and relevant information between related individuals and work groups* (page 688).
O' Leary, 2001 in Anumba and Pulsifer (2010)	*Capture, access and reuse of knowledge using information technology* (page 688).
KPMG, KM Research Report (1998) in Anumba and Pulsifer (2010)	*Systematic and organised attempt to use knowledge within an organisation to transform its ability to store and use knowledge to improve performance* (page 688).
Anumba and Pulsifer (2010)	*Systematic process of capturing, transferring, and sharing knowledge to add competitive value and to improve performance* (page 688).
Akhavan et al. (2006)	*Integrated systematic approach to identify, manage, and share all of the department's information assets* (page 2).
Akhavan et al. (2006)	*A systematic, goal oriented application of measures to steer and control the tangible and intangible knowledge assets of organisation* (page 2).
Lin and Lin (2006)	*Organisation, creation, sharing and flow of knowledge within the organisation* (page 768).
Probst, Raub & Romhard (2003) in Gasik (2011)	*Knowledge management is a process of systematically and actively identifying, activating, replicating, storing, and transferring knowledge* (page 23).

Several authors agreed that an effective knowledge transfer could contribute to improve the organisational performances (Argote and Ingram, 2000, Hajidimitriou et al., 2012). In fact, considering that knowledge constitutes the *mind* of the organisation, it is extremely important to preserve it (Choy Chong, 2006).

In particular, an effective knowledge transfer process can lead to several advantages. First, considering the organisation level, effective knowledge transfer strongly affects the success and

the competitive advantage of the organisation itself (Chen et al., 2014, Goh, 2002, Barlow and Jashapara, 1998, Inkpen, 1998, Argote and Ingram, 2000). Similarly, according to Ayas (1996), the capability of one organisation to learn from experience, can guarantee continuous improvement over time. Moreover, as Nonaka (1994) stated, the process of knowledge transfer is directly linked to better problem-solving activities in the organization.

When considering the project level, these benefits are accentuated. According to Fong (2005), the possibility of project participants to access experience and knowledge from previous projects, would indirectly improve the quality of the project. Zhang and He (2015) affirmed that effective knowledge sharing in project is essential for team-building effectiveness. However, these benefits would be achieved if the process of knowledge transfer is managed in an effective way (Anumba and Pulsifer, 2010). In fact, despite knowledge is a source of competitive advantage, first knowledge need to be captured, organized, transferred, and used properly (Beverly, 2003).

Table 3. Definitions of *knowledge transfer* from four different publications.

Easterby-Smith et al. (2008) in Hajidimitriou et al. (2012)	*Process during which one organisation learns from the experience of the other* (page 41).
Mowery et al. (1996) in Yuanyuan and Perez-Aleman (2012)	*A firm internalizes complementary knowledge from the origin company so that the expertise of the two partnering organisations converges* (page 5).
Argote and Ingram (2000)	*Process through which one unit is affected by the experience of another* (page 152).
Wong (2003) in Duan et al. (2010)	*Systematically organised information and skills are exchanged between entities* (page 357).
Duan et al. (2010)	*Knowledge is exchanged between or among individuals, teams, groups, or organisations* (page 357).

2.1.2. Knowledge transfer in projects

Traditional project management, as the process of organizing resources with the purpose of achieving specific goals, entails a shift towards more innovative approaches (Ayas, 1996).

In particular, in the construction industry (that is a project-based industry) each project is unique and several stakeholders usually collaborate at different stages of the project lifecycle (Dave and Koskela, 2009). The temporary nature of construction and heavy fragmentation increases the complexity of construction industry and, at the same time, makes this industry ideally suited to benefit from improved knowledge sharing (Anumba and Pulsifer, 2010). Therefore, in this

scenario, a new approach is required that would promote effective knowledge transfer in projects and, consequently, overcome some of the limitations of this sector (Latham, 1994).

An innovative attitude, complementary to the traditional project management approach, should consider a project as an occasion for knowledge creation and it should assume that the knowledge collected from one project can be utilized in other projects (Björkegren, 1999). In fact, as mentioned, construction projects are interim endeavours, characterized by a high degree of intensive knowledge (Anumba and Pulsifer, 2010). Two different dimension of knowledge transfer are considered: external knowledge transfer between different projects (in a portfolio logic) and internal knowledge transfer within different phases of one project.

First, the knowledge should be transferred externally, between different projects. Within the construction industry, it is easier that the knowledge from one project to another get lost or stored in minds of individuals (Cheng, 2009, Barlow and Jashapara, 1998). In fact, as soon as one project finishes, the project participants start immediately to work on the next project and, often, the lesson learned are dispersed at the completion of each projects (Cheng, 2009), and not reuse in future projects (Dave and Koskela, 2009). Different technologies are used today to share knowledge externally, but these mainly address explicit knowledge rather than tacit knowledge (Dave and Koskela, 2009).

Furthermore, because of the heavy fragmented life cycle of the construction projects, the loss of knowledge can occur also internally, within the different phases of a single project that are considered as potential opportunities to capture knowledge (Cheng, 2009, Dave and Koskela, 2009). In addition, construction projects are frequently characterised by a competitive and adversarial environment (Carrillo and Chinowsky, 2006) and within this context, the project participants may not always be willing to share knowledge (Cheng, 2009). When several individuals with diverse goals and responsibility work together for a limited period of time (Fong, 2005), the learning may not always be favoured (Cheng, 2009). In this complex situation, knowledge management (at the organisational level) can facilitate effective knowledge transfer across different stages of a construction projects (Dave and Koskela, 2009)

The following model, designed by Cheng (2009), shows how the knowledge can get lost during the project lifecycle. The loss of knowledge between different projects follows an identical trend (Cheng, 2009).

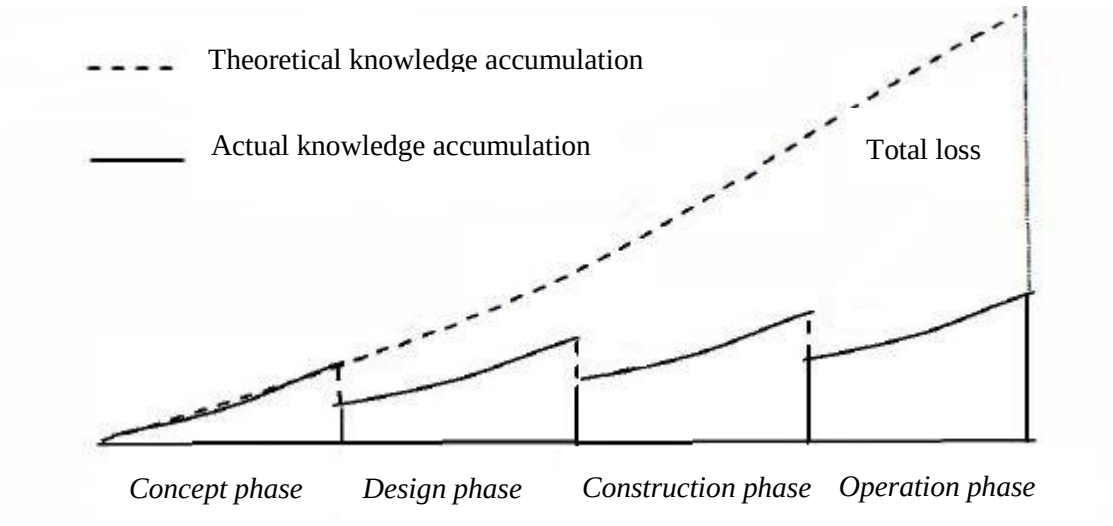

Figure 1. Knowledge accumulation and loss during the project lifecycle by Cheng (2009).

Despite the nature of the construction projects could limit the transfer of knowledge, an effective knowledge transfer represents one of the main key factors for success (Fong, 2005, Gasik, 2011, Cheng, 2009). The ability to continually sharing knowledge within a project, engaging the project participants in a process of learning, is essential (Ayas, 1996). At the same time, a lack of effective knowledge transfer in construction projects constitutes one of the main reason for project failure (Gasik, 2011).

Effective knowledge transfer in projects can bring different benefits. First, it is possible to avoid the same mistake to happen again (Fong, 2005). In fact, the sharing of information and skills, from previous projects or between the same project, could reduce time and cost of solving problems (Lin et al., 2005). In addition, an effective knowledge transfer process could help improve the quality of project, learning from the past satisfactory results (Fong, 2005). Similarly, according to Ayas (1996), achieving improvements in projects over the long-term, mainly depends from the capability of learning from experience. Likewise, Fong (2005) in his study conducted a survey in order to understand the benefits of learning from previous projects (Figure 2).

However, as Ayas (1996) affirmed: "*learning within a project does not happen naturally*" (page 131), but it is a complicated process that need to be effectively managed. Particularly, when new interactions take place during the project development of among different projects new learning barriers between team members could arise (Fong, 2005). Therefore, in order to obtain benefits, it is necessary to implement specific formal and informal tools for effective knowledge transfer in projects (Cheng, 2009). For example, Ayas (1996) affirmed that the project managers should continually try to enhance the learning capacity of the individuals involved in the

projects, while Koskinen et al. (2003) underlined the importance of interactions between project participants: knowledge (in particular tacit knowledge) is acquired and transfer when individuals can access to ideas, information, and opportunities to participate (Dave and Koskela, 2009).

Others authors, like Cheng (2009) and Barlow and Jashapara (1998), agreed that new forms of project procurement, such as partnering or public-private partnership, could introduce a more effective knowledge transfer process, and consequently, lead to successful projects outcome.

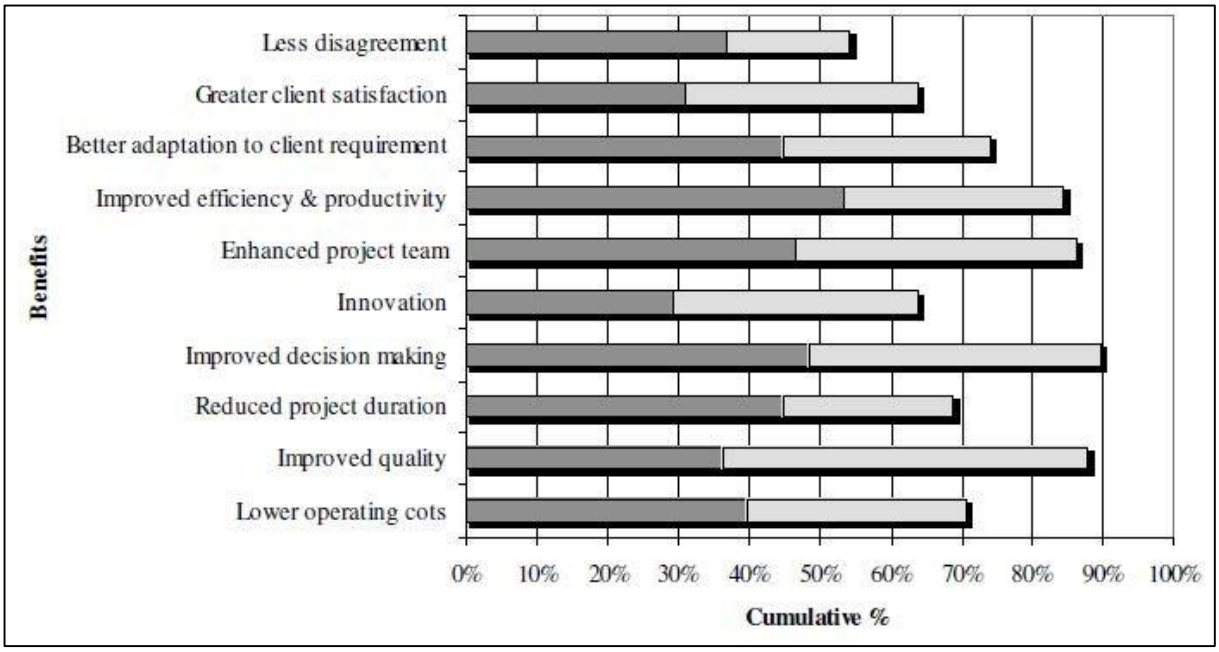

Figure 2. Benefits of learning from previous projects by Fong (2005).

2.1.3. How to transfer knowledge effectively?

Effective knowledge transfer in projects requires the use of specific procedures, structures and tools that should be tailored on the needs of each single situation (Inkpen, 1998, Ayas, 1996) and should be fully integrated within the organisation's business procedures (Hartmann and Dorée, 2015). However, the implementation of best practices for effective knowledge transfer might require several years (Choy Chong, 2006). For this reason, several authors have developed different models that can help in the implementation of effective knowledge transfer, among different projects or within a single project.

The model presented by Carrillo and Chinowsky (2006) includes different steps for the development of an effective knowledge transfer process; first, it is important to identify the

knowledge assets (within the organisation or in the project), then a strategy for effective knowledge transfer should be define and the barriers identified. Finally, the same authors underlined the importance of a system for measuring the effectiveness of the knowledge transfer process.

Chen (2004) attempted to solve the transfer of tacit knowledge, through a so-called *human resource method*. The aim of this method is to increase the motivation of the individuals towards developing, sharing, and using their knowledge to achieve organisational goals.

Similarly, Hartmann and Dorée (2015) presented two models for effective knowledge transfer: the *sender-receiver* approach and the *social learning* approach. The way of considering the social interactions between projects participants differs in these two approaches. In the *sender-receiver* approach the social interactions, like face-to-face meeting, are the transmission channels for the transfer of knowledge (Hartmann and Dorée, 2015) and the knowledge is exchanged when the sender is willing to share and the receiver possess the ability to absorb new knowledge (Hartmann and Dorée, 2015). Further, the researchers have shown that this method presents some difficulties, in fact according to Hartmann and Dorée (2015) if projects are perceived "*as sender/receiver island*s" then learning between projects could be thwarted.

The *social learning approach* considers the transfer of knowledge as an active process, occurring through interactions of individuals during everyday activities. Social interactions are, in this context, considered as learning practices, rather than a mere channel (Hartmann and Dorée, 2015).

Likewise, Sense (2007) stated that the learning in projects is contingent upon human practices and is transmitted within the social context. Therefore, social relations, dialogues, and collective actions are means for learning in projects. Sense (2007) also identifies the elements that could stimulated learning activities between project participants. For example, the nature of the relationships that exists between project participants, so-called *learning relationships*, could affect the mutual learning and sharing of knowledge (Sense, 2007). In a similar way, Nonaka (1994) referred to the *"community of interaction"*, to indicate that the knowledge transfer process is associated to the extent of social interactions between individuals.

Moreover, Beverly (2003) considered teamwork as an important tool for effective transfer between project participants. In fact, according to the author, when individuals work in teams, informal communication and cooperative culture are enhanced; these conditions foster the sharing of information and expertise.

Recently, Zhang and He (2015) affirmed that the top manager plays an important role in promoting the creation of social interactions among individuals in project, aiming to create a

no-blame atmosphere that could consequently encourage knowledge transfer. Another practical way to transfer tacit knowledge among projects could be to move the individuals that hold the expertise and know-how (Argote and Ingram, 2000, Ayas, 1996)

Despite the procedures chosen for knowledge transfer, it should be underlined that the level of transferability of the knowledge depends on the extent the knowledge itself can be codified (Barlow and Jashapara, 1998). The transfer of knowledge between individuals is easier when the knowledge is explicit and, therefore, easily codified. Contrariwise, when the knowledge is embedded in individuals' experiences and know-how, an externalization process is necessary to transform the knowledge from tacit to explicit (Inkpen, 1998). This idea originates from the most recognised and valued model of knowledge creation by Nonaka (1994). According to this model, the organisational knowledge creation involves a continuous interplay among the individuals, and continuous conversion from tacit into explicit and vice versa. between tacit and explicit knowledge. Specifically, the knowledge conversion proceeds through four different phases (Figure 3); *socialisation* (conversion of tacit to tacit), *combination* (conversion of explicit to explicit), *externalisation* (conversion of tacit to explicit), and *internalisation* (conversion of explicit to tacit).

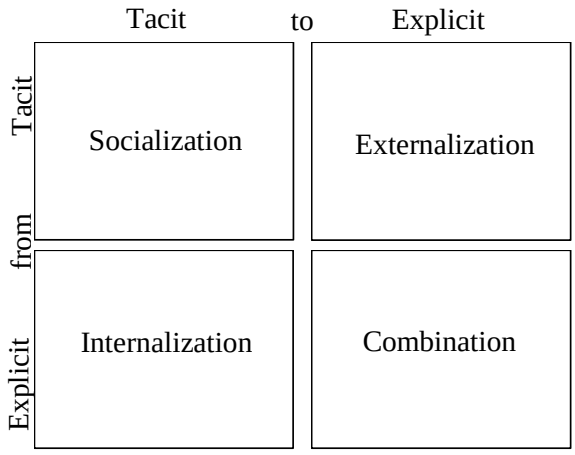

Figure 3. Knowledge creation model by Nonaka (1994).

2.1.4. The barriers to knowledge transfer

Several barriers can arise, when trying to implement an effective knowledge transfer in construction projects (Choy Chong, 2006). In particular, the transfer of knowledge from one project to another can be impeded by specific characteristics that seem intrinsic to the nature of the projects itself (Hartmann and Dorée, 2015), as explained in chapter 2.1.2 However, other barriers to effective knowledge transfer can be identified.

First, one barrier is the time constraint in projects. In fact, the employees do not often have time during and at the end of the project to adequately capture, store and transfer knowledge (Carrillo and Chinowsky, 2006, Fong, 2005, Cheng, 2009). According to Hartmann and Dorée (2015), the sender needs time to collect and store the lessons learned, as well as the receiver needs time to determine if it is beneficial to capture knowledge.

Secondly, the lack of purpose and commitment to sharing. In fact, it is sometimes difficult for the employees to understand the relevance of knowledge on the project performance, therefore the learning process is often perceived as an additional workload rather than a benefit (Hartmann and Dorée, 2015, Carrillo and Chinowsky, 2006, Beverly, 2003).

Finally, another barrier is the organisational culture. In fact, the organisation should encourage and motivate individuals in sharing knowledge during and at the completion of each project (Carrillo and Chinowsky, 2006, Cheng, 2009).

Other barriers to effective knowledge transfer can be, for example, a lack of resources (Carrillo and Chinowsky, 2006), the absence of a management support (Beverly, 2003, Carrillo and Chinowsky, 2006), the scarce development of social relationships (especially when individuals work on individual projects) (Fong, 2005), the work-place design (Fong, 2005), and, finally, a lack of standard process (Cheng, 2009).

2.1.5. The key elements for effective knowledge transfer

The following table lists the key elements for effective knowledge transfer, from a review of the articles used as references in this research.

Table 4. Key elements for effective knowledge transfer from the literature review.

Key elements	**Authors**
Trust	Nonaka (1994) Zhang and He (2015) Hajidimitriou et al. (2012) Maurer and Weber (2015) Inkpen (1996) Chen et al. (2014) Akhavan et al. (2006) Beverly (2003) Lin and Lin (2006) Yew Wong (2005) Duan et al. (2010) Chen (2004) Muthusamy and White (2005) Goh (2002) Koskinen et al. (2003)
Social Interactions / Social Network	Barlow and Jashapara (1998) Zhang and He (2015) Argote and Ingram (2000) Duan et al. (2010) Muthusamy and White (2005) Gasik (2011)
Communication / Continuous Dialogue / Openness	Nonaka (1994) Zhang and He (2015) Chen et al. (2014) Beverly (2003) Yew Wong (2005) Duan et al. (2010)
Cooperation / Collaboration	Zhang and He (2015) Hajidimitriou et al. (2012) Yuanyuan and Perez-Aleman (2012) Inkpen (1996) Beverly (2003) Yew Wong (2005) Chen (2004) Goh (2002)
Shared Experience	Nonaka (1994)
Common Language	Zhang and He (2015) Duan et al. (2010)
Proximity / Co-location	Zhang and He (2015) Ayas (1996)

	Koskinen et al. (2003)
Attitude and Culture / Motivation Commitment Willingness	Zhang and He (2015) Argote and Ingram (2000) Choy Chong (2006) Duan et al. (2010) Goh (2002) Yew Wong (2005) Beverly (2003) Choy Chong (2006) Muthusamy and White (2005) Lin and Lin (2006)
Understanding of the Benefits	Zhang and He (2015)
Participation	Zhang and He (2015)
Management Support / Business Processes Organisational Infrastructure Strategy Elimination of Organisational Constrains	Zhang and He (2015) Akhavan et al. (2006) Lin and Lin (2006) Ayas (1996) Yew Wong (2005) Choy Chong (2006) Goh (2002) Akhavan et al. (2006)
Technology Support System and IT Infrastructure	Zhang and He (2015) Akhavan et al. (2006) Yew Wong (2005) Choy Chong (2006) Duan et al. (2010) Goh (2002) Gasik (2011)
Reward System	Zhang and He (2015) Lin and Lin (2006) Ayas (1996) Yew Wong (2005) Choy Chong (2006) Goh (2002) Gasik (2011)
Accessibility to Knowledge	Inkpen (1998)
Absorptive Capacity	Inkpen (1998) Argote and Ingram (2000) Chen (2004) Muthusamy and White (2005) Goh (2002)
Clear Definition of Objectives and Rules	Inkpen (1996) Lin and Lin (2006) Yew Wong (2005)
Leadership Commitment / Top Management Support	Inkpen (1996)

	Akhavan et al. (2006) Lin and Lin (2006) Ayas (1996) Yew Wong (2005) Choy Chong (2006) Goh (2002)
Commitment of Resources	Chen et al. (2014) Yew Wong (2005)
Managerial Time	Chen et al. (2014)
Effective and Systematic Processes and Measures / Performance Measurement	Akhavan et al. (2006) Lin and Lin (2006) Yew Wong (2005) Choy Chong (2006)
Training Program	Akhavan et al. (2006) Ayas (1996) Yew Wong (2005) Choy Chong (2006) Duan et al. (2010) Goh (2002) Gasik (2011)
Organisational Culture	Akhavan et al. (2006) Yew Wong (2005) Duan et al. (2010)
Network of Experts	Akhavan et al. (2006)
Pilot Implementation / Feedback	Akhavan et al. (2006)
Teamwork	Beverly (2003) Ayas (1996) Choy Chong (2006) Goh (2002) Gasik (2011)
Innovative Culture	Lin and Lin (2006) Yew Wong (2005)
Empowerment of Individuals	Yew Wong (2005) Choy Chong (2006)
Type of Knowledge	Goh (2002)
Knowledge Exchange Arenas (knowledge cafes, discussion forum, meetings, seminars and workshops)	Gasik (2011)

The implementation of specific key elements in projects could lead to successful outcomes. On the contrary, unawareness towards these elements can hinder the achievement of expected benefits (Yew Wong, 2005).

Several authors, like Hajidimitriou et al. (2012), Akhavan et al. (2006) and Chen et al. (2014), have considered trust as an important key element for effective knowledge transfer. Mutual trust enables a proactive and open knowledge sharing environment (Yew Wong, 2005), and

represents the basis for collaboration between individuals (Chen, 2004, Muthusamy and White, 2005). Therefore, a climate of low trust will negatively influence the interactions between team members, and consequently impact the transfer of tacit knowledge in projects (Zhang and He, 2015). Likewise, when the level of trust between project participants is high, the individuals are more willing to share their knowledge (Cheng, 2009, Beverly, 2003) and understand other parties' decisions (Lin and Lin, 2006). Specifically, as Koskinen et al. (2003) stated, *"the greater the level of trust, the greater the level of accessibility and the better the opportunities for tacit knowledge to be transferred"* (page 288).

The presence of a strong cooperative and collaborative culture also constitutes an essential prerequisite for effective knowledge in projects (Goh, 2002), and it is directly affected by the level of trust (Hajidimitriou et al., 2012). Reciprocally, the degree of commitment and cooperation between project participants affects the level of trust between project participants (Beverly, 2003).

Similarly, team work is considered as a critical factor for effective knowledge transfer and it is directly related with the level of trust and collaboration (Choy Chong, 2006). Frequent and close social interactions between team members allow open communication and increase trust, while, at the same time, a trusting environment could facilitate the interactions among team members (Zhang and He, 2015). In addition, the creation of team networks ensures the access to information and to more learning opportunities (Yuanyuan and Perez-Aleman, 2012). Meetings and group discussions within the project teams could help to build a positive knowledge sharing atmosphere (Cheng, 2009).

Nonaka (1994) explained how *shared experience* could facilitate the creation of a common perspective between team members and, consequently, foster effective knowledge transfer. In fact, when mutual trust and a common perspective are built, it is easier to transfer tacit knowledge within the project (Nonaka, 1994).

Generally, effective knowledge transfer strongly depends on the willingness of the project participants to collaborate and share knowledge for achieving mutual benefits (Goh, 2002). Therefore, the establishment of a collaborative climate, will not alone lead to effective knowledge transfer (Goh, 2002) but, for example, the presence of a supportive organisational culture plays an important role (Yew Wong, 2005), especially on tacit knowledge sharing (Cheng, 2009). Some authors like Goh (2002) and Nonaka (1994), agreed that a non-hierarchical organisational structure, together with a horizontal communication flow, could further enhance effective knowledge transfer. In this context, the project-leaders should involve

the individuals in a continuous learning process, creating a culture that promote knowledge transfer (Yew Wong, 2005).

Furthermore, an open communication supports effective knowledge transfer in projects and promotes coordination between partners (Chen et al., 2014). Finally, Zhang and He (2015) and Ayas (1996) mentioned co-location as an important success factor, improving communication between project participants and, thus, knowledge transfer in projects. Similarly, Koskinen et al. (2003) affirmed that *corporeal proximity* (page 288) usually enhances the interaction between project participants and promotes knowledge sharing.

2.2. Partnering

This chapter reports a digression on partnering definition from different contributions and it provides an overview of the critical factors for successful partnering projects.

2.2.1. Partnering definition

Many researches have been conducted in the last twenty years concerning the definition of partnering and its implementation in practice, in particular with regards to the construction industry. One of the first definition of partnering has been provided by the Construction Industry Institute in 1991. Partnering is:

> "*A long-term commitment by two or more organisations for the purpose of achieving specific business objectives by maximising the effectiveness of each participant's resources. This requires changing traditional relationships to a shared culture without regard to organisation boundaries. The relationship is based upon trust, dedication to common goals, and an understanding of each other's individual expectations and values. Expected benefits include improved efficiency and cost-effectiveness, increased opportunity for innovation, and the continuous improvement of quality products and services."*
>
> (CII, 1991)

Several other authors have developed their own definition of partnering, with the purpose of settle a univocal understanding. For example, Naoum (2003) and Eriksson (2010), respectively, performed a research with the purpose of increasing the understanding about partnering . What emerged from the literature review is that there is still no univocal consensus on partnering definition (Naoum, 2003, Bygballe et al., 2010, Larson, 1995), and this also depends upon the contingency of partnering to different situations and contexts (Eriksson, 2010). Accordingly, Bygballe et al. (2010) stated that the lack of understanding about partnering concept in the construction industry could represent a challenge for effective project implementation.

In general, while some definitions of partnering are broad and generic, not giving the reader a deeper insight into the concept, other researches have exclusively focused on the analysis of the key elements of partnering. Larson (1995) considered partnering as an attempt of creating an integrated project team that shares common goals and procedures. Likewise, Naoum (2003)

believes that partnering helps to build a *framework* based on cooperation and teamwork, and, similarly Cheung et al. (2003) defined partnering as a method for establishing non-adversarial working relationships in projects. Black et al. (2000), and similarly Chan et al. (2010), stated that partnering is a process designed to encourage good working relationships between project participants at different levels, while Barlow and Jashapara (1998) referred to partnering as a variety of managerial practices for the creation of collaboration in projects. Partnering is also defined as a managerial approach used by two or more organisations to achieve specific objectives, by maximising the effectiveness of each project participant (Bennett and Jayes, 1995 in Eriksson, 2010). Furthermore, considering the factors that enhance partnering success, Larson (1995) defined partnering as a form of cooperative relationships between contractors, clients, and suppliers, based upon collaboration, trust, openness and, mutual respect.

Partnering, as a procurement method, is it not suitable for all kind of projects, but it is usually required in complex construction projects, characterized by high uncertainty (Eriksson, 2010). According to Barlow and Jashapara (1998), partnering is preferred when specific requirements may not be fulfilled using traditional project procurement methods.
Despite the difficult context, the organisations involved in partnering could perceive mutual benefits and avoid competitiveness (Barlow and Jashapara, 1998). In fact, partnering could lead to the improvement of performance in terms of cost, time, and quality and other benefits like, for example, the opportunity for innovation, sharing of risk between parties, and reduction of litigations (Cheung et al., 2003). Furthermore, partnering can increase customer satisfaction and eliminates adversarial relationships in projects (Cheung et al., 2003, Black et al., 2000, Chan et al., 2010). However, these benefits are not always easy to achieve (Beverly, 2003).

Several authors have reported the distinction between *strategic* and *project* partnering. According to Aarseth et al. (2012) and Bygballe et al. (2010) the former refers to a long-term commitment between project participants across several projects, as a means to achieve competitive advantage. Contrariwise, the latter describes the situations when partnering is adopted over the life cycle of a single project. Conclusive, in order to create a high level of cooperation in partnering and achieve benefits, Bresnen and Marshall (2000b) suggested to assume a long-term partnering perspective.

Table 5. Definition of *partnering* from eleven publications.

Barlow and Jashapara (1998)	"Partnering refers to a variety of managerial practices and organisational design that enhance and maintain collaboration" (page 88).
Black et al. (2000)	"Partnering procurement method aims to eliminate adversarial relationships between client and contractor by encouraging the parties to work together towards shared objectives and achieve a win-win outcome" (page 423).
Chan et al. (2010)	"Partnering is the simple process of establishing good working relationships between project parties" (page 524).
Cheung et al. (2003)	"(…) an important management tool to improve quality and programme, to reduce confrontations between parties, thus enabling an open and non-adversarial contracting environment" (page 333).
Eriksson (2010)	"Cooperative governance form that is based on core and optional cooperative procurement procedures to such an extent that cooperation-based coopetition is facilitated" (page 905).
Kadefors (2004)	"Partnering is based on three factors: mutual objectives, an agreed method of problem resolution, and an active search for continuous measurable improvement" (page 180)
Lahdenperä (2012)	"Collaborative building project practice" (page 58).
Larson (1995)	"(…) method of transforming contractual relationships into a cohesive, project team with a single set of goals and established procedures for resolving disputes in a timely and effective manner" (page 30).
Larson (1997)	"Formal management intervention designed to overcome the tendency to manage project in adversarial fashion" (page 188).
Naoum (2003)	"Partnering (…) provides a framework for the establishment of mutual objectives among the building team" (page 71).
Ng et al. (2002)	"(…) criteria include commitment, equity, trust, preparation, mutual goals/objectives, partnering tools and procedures, inclusion of appropriate parties, continuous join evaluation, and timely responsiveness". (page 438)

2.2.2. The key elements for successful partnering

As projects has become more complex and uncertain (Azari et al., 2014) the adoption of collaborative forms of project delivery, like partnering, has increased (Lahdenperä, 2012), especially because the possibility of achieving successful projects outcome. For this reasons, several researchers attempted to define the key factors that could facilitate partnering implementation in projects (Eriksson, 2010).

Table 6. Key elements for successful partnering from the literature review.

Key elements	**Authors**
Trust (mutual trust)	Eriksson (2010) Aarseth et al. (2012) Lahdenperä (2012) Bygballe et al. (2010) Naoum (2003) Bresnen and Marshall (2000a) Kadefors (2004) Suprapto et al. (2015) Bayliss et al. (2004) Cheung et al. (2003) Larson (1995) Ng et al. (2002) Mollaoglu et al. (2015) Black et al. (2000) Wood and Ellis (2005)
Collaboration and cooperation (cooperative culture – collaborative tools – cooperative attitude)	Eriksson (2010) Aarseth et al. (2012) Lahdenperä (2012) Naoum (2003) Bresnen and Marshall (2000a) Suprapto et al. (2015) Cheung et al. (2003) Larson (1995) Mollaoglu et al. (2015) Black et al. (2000) Wood and Ellis (2005) Bayliss et al. (2004)
Conflicts resolution mechanism (guidelines for resolving disputes)	Eriksson (2010) Aarseth et al. (2012) Lahdenperä (2012) Bresnen and Marshall (2000b) Naoum (2003) Kadefors (2004) Bayliss et al. (2004) Larson (1995) Mollaoglu et al. (2015)

	Crowley and Karim (1995)
Early involvement of suppliers (optional early involvement of contractors)	Eriksson (2010) Lahdenperä (2012) Mollaoglu et al. (2015)
Value based procurement - Bid evaluation based on soft parameters	Eriksson (2010)
Incentives (compensation)	Eriksson (2010) Naoum (2003)¨ Bresnen and Marshall (2000a) Kadefors (2004) Bayliss et al. (2004) Bayliss et al. (2004) Mollaoglu et al. (2015) Anvuur and Kumaraswamy (2007)
Common goals (mutual- beneficial goals – shared objectives – joint objectives)	Eriksson (2010) Aarseth et al. (2012) Lahdenperä (2012) Naoum (2003) Kadefors (2004) Suprapto et al. (2015) Larson (1995) Ng et al. (2002) Mollaoglu et al. (2015) Black et al. (2000)
Win-win situation (outcome – approach)	Aarseth et al. (2012) Lahdenperä (2012) Black et al. (2000)
Risk – sharing (joint risk management)	Eriksson (2010) Aarseth et al. (2012) Lahdenperä (2012) Larson (1995) Mollaoglu et al. (2015)
Commitment and attitude of project participants (mutual commitment)	Lahdenperä (2012) Bresnen and Marshall (2000a) Suprapto et al. (2015) Bayliss et al. (2004) Cheung et al. (2003) Ng et al. (2002)

	Mollaoglu et al. (2015)
Collaborative contractual clauses (framework agreement – partnering charter)	Eriksson (2010) Lahdenperä (2012) Bresnen and Marshall (2000b) Bygballe et al. (2010) Naoum (2003) Bayliss et al. (2004) Cheung et al. (2003) Larson (1995) Mollaoglu et al. (2015) Anvuur and Kumaraswamy (2007)
Open and effective communication (openness) – informal communication – open sharing of information	Lahdenperä (2012) Kadefors (2004) Suprapto et al. (2015) Bayliss et al. (2004) Cheung et al. (2003) Larson (1995) Ng et al. (2002) Mollaoglu et al. (2015) Black et al. (2000) Gemuenden and Lechler (1997) Wood and Ellis (2005) Crowley and Karim (1995)
Joint decision-making	Lahdenperä (2012) Anvuur and Kumaraswamy (2007)
Open book economy	Eriksson (2010) Lahdenperä (2012)
ICT (IT tools)	Eriksson (2010) Lahdenperä (2012) Bresnen and Marshall (2000b) Mollaoglu et al. (2015)
Team building activities (teamwork) – trainings – project team	Eriksson (2010) Lahdenperä (2012)

	Bresnen and Marshall (2000b) Kadefors (2004) Suprapto et al. (2015) Cheung et al. (2003) Larson (1995) Mollaoglu et al. (2015) Gemuenden and Lechler (1997)
Facilitator (team building)	Eriksson (2010) Lahdenperä (2012)
External facilitator (workshops)	Bayliss et al. (2004) Mollaoglu et al. (2015)
Workshops (continuous workshops – initial workshops – follow up workshops – monthly review meetings – joint workshop – meetings – start up workshops)	Eriksson (2010) Lahdenperä (2012) Bresnen and Marshall (2000b) Bygballe et al. (2010) Kadefors (2004) Bayliss et al. (2004) Cheung et al. (2003) Mollaoglu et al. (2015) Black et al. (2000) Anvuur and Kumaraswamy (2007)
Total quality management	Bresnen and Marshall (2000b) Bygballe et al. (2010) Black et al. (2000)
Continuous improvement process (continuous feedback)	Bresnen and Marshall (2000b) Naoum (2003) Kadefors (2004) Larson (1995) Mollaoglu et al. (2015) Black et al. (2000)
Gain-pain share	Bresnen and Marshall (2000a) Kadefors (2004) Suprapto et al. (2015)
Target cost	Suprapto et al. (2015)
Social functions (informal gathering)	Bayliss et al. (2004)

	Cheung et al. (2003)
Top management commitment to partnering spirit (leadership) – participative leadership	Bayliss et al. (2004) Ng et al. (2002) Gemuenden and Lechler (1997)
Measurement (key performance indicators and reports) – periodic assessment – joint evaluation – evaluation methodology – partnership monitoring – periodic performance evaluation	Cheung et al. (2003) Larson (1995) Ng et al. (2002) Mollaoglu et al. (2015) Anvuur and Kumaraswamy (2007)
Joint problem solving	Cheung et al. (2003)
Empowerment of stakeholders.	Ng et al. (2002)
Willingness to accept mistakes	Ng et al. (2002)
Joint subcontractors selection	Eriksson (2010) Mollaoglu et al. (2015)
Joint project office	Eriksson (2010) Mollaoglu et al. (2015)

The success of partnering strongly depends on the creation of a shared collaborative culture, characterized by stable and healthy relationships between project participants (Bayliss et al., 2004). Likewise, according to Eriksson (2010), Black et al. (2000), and Lahdenperä (2012), collaboration is one of the most important key factor for partnering projects. In order to build collaborative working relationships between different project level, Bresnen and Marshall (2000a) asserted that a change of the individuals' attitude could be necessary. Specifically, non-adversarial working relationships should be established among the project participants through mutual commitment, trust, respect, and open communication (Cheung et al., 2003, Chan et al., 2010).

Among the factors that makes partnering successful, communication has also a strong impact (Yeung et al., 2007). Indeed, enhancing open communication in partnering could facilitate the creation of a collaborative attitude among project participants at different levels (Chan et al., 2010).

Trust is one of the most important success factor in partnering (Eriksson, 2010, Bygballe et al., 2010). In fact, the development of collaborative long-term relationships in partnering strongly depends on the presence of mutual trust between the parties (Naoum, 2003). Reciprocally, an environment characterized by mutual trust can facilitate the interactions among team members,

promote team development and enhance knowledge sharing (Zhang and He, 2015). In accordance, Barlow and Jashapara (1998) agreed that partnering may promote learning in projects, favouring the creation of a *learning culture* (page 87). In fact, partnering provides favourable conditions for the development of new skills and the implementation of open communication between project participants (Barlow and Jashapara, 1998).

In general, the partnering success factors can be mostly defined as behavioural and attitudinal (Cheung et al., 2003), despite the use of partnering contractual elements could further contribute to achieve a high level of collaboration in projects (Eriksson, 2010) and generate a trustful environment (Lahdenperä, 2012). For example, the early involvement of contractors could help to introduce collaboration throughout all the project life cycle (Eriksson, 2010). Similarly, the joint sub-contractors' selection could facilitate the development of cooperative relationships between project participants (Eriksson, 2010). Finally, a shared risk and reward approach, a value based procurement, and the use of an open book economy could increase the commitment of project participants towards the project (Lahdenperä, 2012).

2.3. Summary of the theory

Knowledge transfer is defined as the exchange of experiences among the individuals, internally and externally to a single project, (Argote and Ingram, 2000, Hajidimitriou et al., 2012) and it has assumed a significant role in facing the increasing complexity and fragmentation of the construction industry (Latham, 1994, Dave and Koskela, 2009). In fact, effective knowledge transfer has become essential nowadays for the achievement of successful projects outcome (Ayas, 1996, Gasik, 2011). In order to obtain benefits, specific key elements for effective knowledge transfer should be adopted in projects (Table 4). On the other hand, new forms of project procurement, such as partnering, could contribute to the achievement of more effective knowledge transfer process in construction projects (Barlow and Jashapara, 1998).

Partnering refers to a variety of managerial practices with the purpose of creating collaboration and non-adversarial relationships between project participants at different levels (Barlow and Jashapara, 1998, Black et al., 2000). Despite a univocal definition of partnering is still missing (Eriksson, 2010), the majority of the authors agreed that, within a complex and uncertain context, like the construction industry, partnering could be beneficial to achieve higher project performances (Cheung et al., 2003). However, the success of partnering is dependent upon the creation of a collaborative culture (Bayliss et al., 2004), and on the presence of specific key factors (Table 6), like mutual commitment, trust, and open communication (Cheung et al., 2003, Chan et al., 2010).

In particular, trust a key element that strongly influences the success of partnering (Eriksson, 2010, Bygballe et al., 2010) and at the same time enhances knowledge transfer in projects (Hajidimitriou et al., 2012, Akhavan et al., 2006, Chen et al., 2014). Mutual trust is the basis for the creation of collaboration between individuals (Chen, 2004, Muthusamy and White, 2005) and, at the same time, it enables a proactive knowledge sharing process (Yew Wong, 2005). In fact, an environment characterized by mutual trust can facilitate the interactions between project participants and favour the development of a learning culture (Barlow and Jashapara, 1998, Zhang and He, 2015).

3. Literature gap

The literature review (chapter 2) showed that several contributions exist about the topics of knowledge transfer and partnering, separately. However, it emerged that there is a gap in the literature to what it concerns the link between knowledge transfer and partnering in projects; only one of the analysed articles similarly addressed this issue.

Some of the articles in the references were selected because they provided a more general framework about the concept of knowledge transfer and partnering, as reported in table 7. Other articles, like for example the contributions by Fong (2005) and Cheng (2009), addressed the issue of knowledge and learning in construction projects, while authors, like Zhang and He (2015) and Koskinen et al. (2003), have analysed, more specifically, how the interactions between project participants could affect the knowledge transfer process. However, the researches that focuses on learning in project are still not so numerous (Sense, 2007).

Several other authors, like Hajidimitriou et al. (2012), Inkpen (1998), Muthusamy and White (2005), have analysed how inter-organisational alliances (or international joint venture) between two or more firms, within the manufacturing industry context, could influence knowledge transfer. What emerged is that an increasing number of manufacturing companies are adopting strategic alliances in order to access to a wider network of knowledge and expertise and, possibly, achieve competitive advantage.

Among all, the article by Barlow and Jashapara (1998) was particularly relevant for this research because if one of the few contributions that directly analysed the topic of knowledge transfer in partnering projects. Specifically, the authors underlined the increasing awareness towards the role of partnering in promoting learning within the individual, team, and organisational level. Through a case study, Barlow and Jashapara (1998) demonstrated that the effectiveness of the knowledge transfer process is positively correlated to the level of cooperation within partnering firms.

Concluding, this research has utilized a large sample of articles that aided to create a general awareness towards the topics of partnering and knowledge transfer and, at the same time, were useful for a clear understanding and interpretation of the findings.

Table 7. Classification of the references by main topic.

	Partnering	KT	KM	KT in projects	KT in alliances	KM in projects	Partnering and KT
Aarseth et al. (2012)	X						
Akhavan et al. (2006)			X				
Anumba and Pulsifer (2010)						X	
Anvuur and Kumaraswamy (2007)	X						
Argote and Ingram (2000)		X					
Ayas (1996)				X			
Barlow and Jashapara (1998)							X
Bayliss et al. (2004)	X						
Beverly (2003)					X		
Björkegren (1999)				X			
Black et al. (2000)	X						
Bresnen and Marshall (2000a)	X						
Bresnen and Marshall (2000b)	X						
Bygballe et al. (2010)	X						
Carrillo and Chinowsky (2006)						X	
Chan et al. (2010)	X						
Chen et al. (2014)		X					
Chen (2004)		X					
Cheng (2009)				X			
Cheung et al. (2003)	X						
Choy Chong (2006)			X				
Crowley and Karim (1995)	X						
Dave and Koskela (2009)				X		X	
Duan et al. (2010)		X					
Eriksson (2010)	X						
Fong (2005)				X			

Gasik (2011)			X				
Goh (2002)		X					
Hajidimitriou et al. (2012)					X		
Hartmann and Dorée (2015)		X					
Inkpen (1996)					X		
Inkpen (1998)					X		
Kadefors (2004)	X						
Koskinen et al. (2003)				X			
Lahdenperä (2012)	X						
Larson (1995)	X						
Larson (1997)	X						
Lin and Lin (2006)						X	
Lin et al. (2005)						X	
Maurer and Weber (2015)					X		
Mollaoglu et al. (2015)	X						
Mowery et al. (1996)					X		
Muthusamy and White (2005)					X		
Naoum (2003)	X						
Ng et al. (2002)	X						
Sense (2007)				X			
Suprapto et al. (2015)	X						
Wood and Ellis (2005)	X						
Yeung et al. (2007)	X						
Yew Wong (2005)			X				
Yuanyuan and Perez-Aleman (2012)					X		
Zhang and He (2015)				X			
	21	**6**	**4**	**6**	**8**	**4**	**1**

4. Research method

The findings of this research are based on a literature review and a set of interviews.
First, the literature review was necessary to build a general framework about the topics of the research: knowledge transfer and partnering. Moving from a general to a specific point of view (as represented in Figure 4), the theoretical framework (chapter 2) considered the general aspects of knowledge transfer and partnering respectively, and then it narrowed on the link between knowledge transfer and partnering, investigating if the authors of the articles perceived this connection.
The interviews structure followed the same "funnel" model (Appendix I). The interviewees first were asked about partnering and knowledge transfer in general (definition and critical success factors), then they expressed their opinions and perceptions about the link between knowledge transfer and partnering. However, in chapter 5, the most important findings of the research are presented as first.

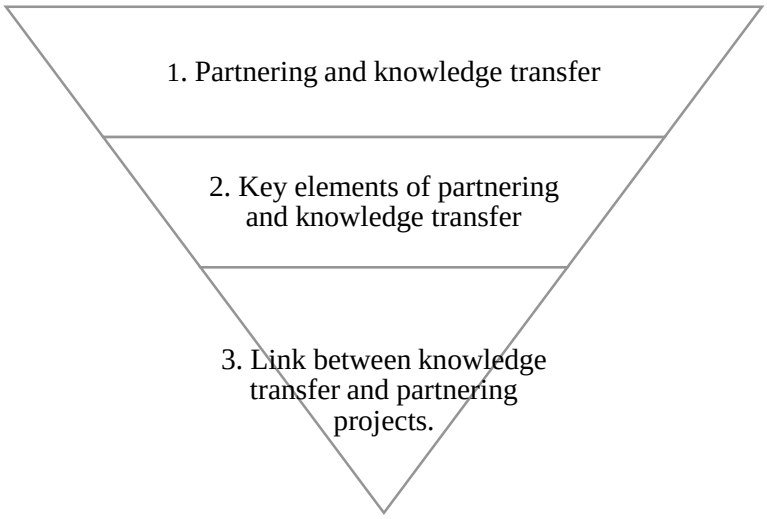

Figure 4. Development of the research process; from a general to a specific point of view.

This research assumed two different theoretical perspectives: partnering and knowledge transfer. As illustrated in figure 5, the research first analysed the topics separately, shaping the overall context for the research. Then, considering the specific purpose of the study, the theoretical perspectives are conceptually merged and the analysis focused on the intersection between the concepts.

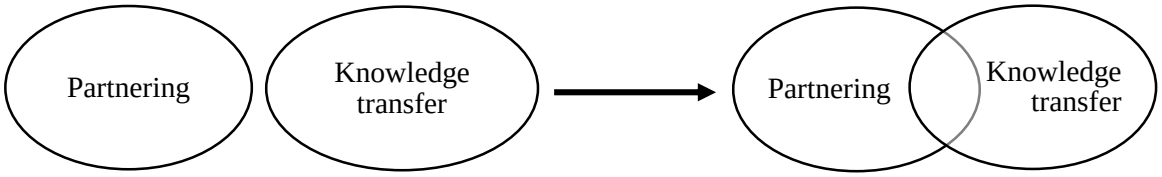

Figure 5. Theoretical perspectives of the research.

The *broadest research question* of the study (Creswell, 2013) was *"*does a link exists between knowledge transfer and partnering?*"*. Because of the complexity of the topics, it has been necessary to specify two additional sub-questions, which are essential to narrow the focus of the research (Creswell, 2013). The sub-questions of this research were:

- which partnering key elements enhance effective knowledge transfer?
- how knowledge transfer and partnering in projects influence each other's?

During the initial phase of the research, a previous knowledge about the topic of partnering constituted an advantage for the definition of the problem statements. It was well-known that, despite many researches on partnering were developed in the last ten years, there is still a strong need for improving the understanding of this concept. In addition, the notable relevance of these topics within the construction sector contributed in increasing the researcher's commitment towards this research.

Furthermore, a clear definition of the research questions at the beginning of the process facilitated the development of the entire research, even though the research questions have evolved and changed during the whole initial phases of the study, concurrently with the increasing of information.

According to Bryman and Bell (2015), the research strategy is the broad orientation of the study, which usually refers to a *quantitative* or a *qualitative* approach. In this study, since the findings of the research are mainly based upon personal interpretation and experiences, it has been natural to choose a qualitative research strategy. In fact, a qualitative approach is adopted in situations where is important to understand *social* problems, through an interpretation of data (Creswell, 2013).

Moreover, the research method usually refers to the mode of collection, analysis, and interpretation of data (Creswell, 2013). In this study, the qualitative data were collected from a sample of ten interviews to experts, working within the academic and the industry contexts.

Table 8. Classification of the research method based on Bryman and Bell (2015).

Research Strategy	Qualitative
Research Method	Literature Review - Interviews

4.1. Literature review

There are many reasons why it can be relevant to conduct a literature review. First, when starting a scientific research, it is important to identify what is already known in connection with the research area (Bryman and Bell, 2015). In addition, performing a literature review can provide diverse observations and findings that can enrich the overall research.
Specifically, a literature review constituted the basis for this research. The review focused first on the concepts of partnering and knowledge transfer, from a general to a more detailed point of view. In particular, from different authors' contributions it was possible to deduce how knowledge transfer and partnering influence each other's.

4.1.1. Selection of the articles

The first step in the literature review was the selection of relevant articles and publications.
The majority of articles were selected from scientific databases, like Scopus, Emerald, and Wiley Online Library, using and combining specific key-words, like *partnering*, *knowledge*, *knowledge transfer*, *collaboration*, *construction projects*. From the first phase of the research 75 articles were chosen from the databases. Through a screening of the selected articles it was possible to define which contributions were actually significant for the purpose of the research. The articles that were not considered relevant for the research have been discarded. At the end of the screening-phase, the reference list contained 21 articles about partnering and 31 articles about knowledge transfer (52 articles in total).
Specific criteria have been used to define which articles were relevant for the research. The academic importance was assessed first, considering, for example, how many times the article has been cited in other contributions. Afterwards, during the screening phase, the selection was based mainly on the contents of the article, reading the abstract and the introduction. The articles were selected if they were clear, coherent and consistent with the content of the research.
The presence of a literature gap appeared clear from the beginning of this phase (chapter 3). It was then not possible to select only the articles concerning the link between knowledge transfer

and partnering and, for this reason, different cognitive areas have been taken into account. Several of the articles, included in the references, provided a general insight on the aspects of partnering and knowledge transfer (or eventually knowledge management). These articles served to build the theoretical basis for the research. More specifically, other selected articles considered knowledge transfer in projects, despite few contributions actually addressed this topic clearly (Ayas, 1996). Finally, only one articles addressed the issue of the link between knowledge transfer and partnering.

The selected articles have been mainly published in international referred journals (Table 9). Furthermore, in order to have a consistent idea about the development of the topic over time, the selected articles covered a period of publication of twenty years, between the 1994 and 2015.

Table 9. Main international refereed journals and number of references.

Journal of Knowledge Management	4
Journal of Management in Engineering	5
Journal of Business Research	1
Journal of Construction Engineering and Management	3
International Journal of Project Organisation and Management	2
Organisational Behaviour and Human Decision Process	1
Management Science	1
International Journal of Project Management	18
The Learning Organisation	2
Project Management Journal	2
Strategic Management Journal	1
International Journal of Managing Projects in Business	1
Construction Management and Economics	8
Journal of Purchasing and Supply Management	1

4.1.2. Analysis of the theory

The articles included in the references list were analysed in an attentive and critical way. In particular, the main concepts were extrapolated and elaborated in accordance with the research questions and the structure of the study. Since the purpose of the research were already roughly decided at the beginning of this process, the analysis of the contributions from the literature proceeded efficiently. At the end of this analytical phase, all the theory required for building the theoretical framework were collected.

Following these systematic steps permitted to maintain a continuous control over the information and build a clear framework of the theory. The literature review constituted also the basis for the preparation of the interview guideline.

4.2. Interviews

The main purpose of the interviews was to understand how academic and practitioners perceive the link between partnering and knowledge transfer. Specifically, addressing the interviews towards different targets (professors at NTNU and experienced project managers) permitted to attain different point of view and approach towards the topic.

An important step in the research process was the selection of the sample of interview-objects. Within the university context, the interviewees were chosen based on their previous experiences as researchers with partnering (or other collaborative procurement method eventually) and their capability to contribute to the research with valuable data. Specifically, the interviews involved two PhD candidate at NTNU Norwegian University of Science and Technology, two professors within the Department of Quality and Production Engineering at the same university, one assistant professor at Tampere University of Technology, and two researchers working at SINTEF (the largest independent research organisation in Scandinavia). The same criterion was used to select the interview-objects from the industry, in fact all the participants work in the field of project management and have experience working in partnering projects. Specifically, two interviewees are currently working as project managers in a large Norwegian construction company, while the third interview-object is a project manager consultant in an international engineering company, with office in Trondheim.
The diversity in the sample of interview-objects could, on one side, enhance the value of the research but, on the other side , it could increase the complexity of the overall research process. In this situation, it is especially important to consider the diverse nature of each interview-objects during the interviews and the analysis of the findings, in order to obtain the best results from each answer. The points of view in this research were mainly two: the perspective of professors and the opinion of practitioners.

Table 10. Sample of interview-objects.

	Role / work position	Experience with partnering	Experience with knowledge transfer
1	PhD candidate	10 years	Not major research area
2	PhD candidate	1 year - More experience with contracts	Not major research area
3	Senior Scientist	1 year	Long previous experience
4	Professor	15 years	Some experience and researches
5	Senior Researcher	Experience with contracts in construction projects	Not major research area
6	Professor	20 years	15 years
7	Assistant Professor	12 years	Not major research area
8	Project Management Consultant	10 years	Not major work area
9	Project Manager	14 years	Not major work area
10	Project Leader	12 years	Not major work area

The interviews were conducted by a single interviewer using a *semi-structured* approach. According to Bryman and Bell (2015), in a semi-structured interview the interviewer prepares a general guideline but the sequence of the questions can vary during the interview, adjusting the process based on the interviewees' replies and flux of thoughts. This requires high flexibility and preparation from the interviewer in order to have a clear and objective understanding about what the interview-objects consider as important and, consequently, obtain valuable findings.

In this research, the interview guideline included seven *open-ended* questions (Appendix I). The use of open-ended questions was necessary in order to collect meaningful answers from the experts. In fact, an open-ended question does not suggest any possible answers, and the interviewee can express his/her opinion freely. This type of questions is also ideal for qualitative research but, sometimes, it could be time consuming and the responses could be difficult to code and interpret. Specifically, some general open-ended questions like "how do you define partnering projects?" or "how do you define effective knowledge transfer?" were asked at the beginning of each interview. This serves to build a common basis for the comparison of the results. Other questions like "can you list the key elements of partnering?" opens to a wider range of possible answers, therefore it was extremely important that the experts had a deep understanding regarding the topic of the research.

In particular, it should be underlined that short time was given to the interview-objects to list the critical success factors for partnering and knowledge transfer. The intention behind this choice was to have direct and unbiased answers and test the familiarity of the interview-objects

with the topics. Despite this expedient could have influenced the answers of the interviewees, the responses are considered extremely valuable because everyone had several year of experiences within the academic context or working as project manager.
The last questions presented a high degree of openness, like "how knowledge transfer process influences the success of partnering projects?". These type of questions was particularly significant for the purpose of the research.
All the interview-objects agreed to record the interviews. This represented a great advantage for the research. The records of the interviews helped to not lose any part of the conversations and to examine the answers in a more objective and attentive way. In particular, the analysis of the records and codification of the data started after the completion of the first interview, meaning that, during the analysis process, the collection and the coding of the data proceeded in parallel. In this way the process was continuously improved and shaped according to the necessity of the research. Finally, when all the data were available, the findings were elaborated and merged with the theoretical framework, taking into account the main research questions of the study.

The use of specific expedients during the interviews process has guaranteed unbiased results. First, (1) a single interviewer carried out all the interviews and coded the findings. In fact, using different strategies when addressing the interview-objects' answers or assessing the findings with different methods could strongly influence the results of the research. Second, (2) the interviewees did not have access to the interview guideline in advance. The interview-objects answers to the questions in an instinctive and open way, providing their opinion and point of view freely. Finally, (3) the coding process were initiated in parallel with the interview process. This helped to optimise the interview guideline during time and, consequently, obtain meaningful results.

In total, this study involved ten different interview-objects with different backgrounds, years of experiences, and mind-sets. Although the sample of interviewees could not be representative of all the experts in the field, it is valuable and instrumental for this research. In particular, the fact that all the interviewees are experts in the field of partnering and project management ensured positive results, that could represent the basis for future studies.

4.3. Reflections on the interviews

The interview process, that lasted more or less two months, extended from a preliminary phase until the final phase and elaboration of data. During the preliminary phase, the interview-objects were contacted and the interviews were scheduled. In this phase, the interview guideline was prepared based on the results from the literature review. The guideline was then tested during the first semi-structured interview. Eventually, some changes were made in the guideline in order to obtain more valuable results from the interviews. In general, during these phases, a continuing interaction between the theoretical framework and the data collected was necessary to not lose the track of the research.

Although it might seem relatively easy to perform semi-structured interviews towards experts, this process can sometimes be complex and time-consuming, especially if the interviewer does not have previous experience with scientific researches. For this reason, it was important to be focused and prepared for each interview.

Several obstacles could arise during an interview. For example, according to Bryman and Bell (2015), there could be misunderstandings about the questions, the interview-objects may not have good memory about the topic, and/or the information might be recorded in a wrong way. These problems were generally recognized during this research. In particular, during an interview, one expert misinterpreted the question, while, in another case, no answer was given to a question. More often, it happened that the interviewees digressed on the answer, providing non-relevant information, especially because the questions were open-ended. In all of these situations, the interviewer had to be able to deal with the unexpected and control the discussion, keeping the track of the answers.

According to Schön (1983), it is exactly in these situations of uncertainty and instability that the *reflection-in-action* principle comes into play. When to cope with unexpected situations, the practitioners (in this case the interviewer) often reveal a capacity for reflection on their intuitive knowing during the action itself, "*think about what they are doing, while doing it"* (page 275) (Schön, 1983). Reflection-in-action is central to handle divergent situations of practices (Schön, 1983), but this must not discourage the interviewer to reflect upon the interview also after its completion.

Being aware of this principle was important for the improvement of the interview process. In conclusion, the whole interview process can be defined as a learning practice. The improvement of the interviewer's approach over time has been notable and this has permitted to obtain considerable results for this research. In addition, despite the challenges encountered in this

process, the opportunity of interviewing experts in the field have been both motivating and interesting.

4.4. Limitations of the research

Developing a scientific research could be a complex and, sometime, intricate process. Many variables need to be taken into account and it is important to approach the research with a clear and systematic method. In particular, the researcher needs to understand the strengths of the analysis and, at the same time, the limitations (or weaknesses) of the study, in order to enable for future improvements.

The general context of this study is the construction industry, a project-based environment characterised by a high level of fragmentation and contingency. Within this context, partnering and knowledge transfer assume strong relevance, as attempts to improve the project performances.

Specifically, this research focused on the broad and complex topics of partnering and knowledge transfer. An attentive and methodical approach was therefore necessary, because these issues could be interpreted and analysed under several different perspectives. This represented one of the main weaknesses of the research. However, it was decided not to limit the research on specific aspects of knowledge transfer and partnering, rather consider the general picture in order to give an idea of how the link can generate and influence the overall project success in a more conceptual way. Being aware that different assumptions can influence the research results, it was important to keep an unbiased and objective point of view during the overall analysis.

The literature review (chapter 2) underlined that partnering does not involve standard implementation practices, because these differ for each specific project. This aspect could be considered as a weakness and it, generally, influences all the researches on this topic. Similarly, partnering, as a collaborative procurement method, can be adopted for a long-term period (strategic partnering) or exclusively within one project (project partnering). Although this distinction could, to some extent, influence the way partnering is implemented in projects, this research does not assume one specific perspective. In fact, the purpose of this study goes further the mere analysis of partnering, looking at the conceptual link between partnering and knowledge transfer. It is believable that the classification between strategic and project

partnering would not particularly influence the results of this research, even though the different perspective will be discussed in chapter 6.

Furthermore, this research considered knowledge transfer within partnering projects. In this context, knowledge transfer could occur within one single partnering project (internally) or between different partnering projects (externally), if a strategic partnering is implemented. Once again, it was important to be aware that this distinction could, to some extent, influence the development of an effective knowledge transfer (chapter 6). However, for the purpose of the research, the general picture is considered.

Conceptually, investigating the link between knowledge transfer and partnering could seem quite contradictory or inconsistent. In fact, while partnering refers to a project procurement method, that, if adopted, could improve the quality of the project, knowledge transfer is a process that should be adopted within each project in order to achieve successful outcomes. However, in a practical way, other variables are involved and, consequently, this link would not appear so simple.

This analysis assumed relevance because, although this link could seem quite obvious, there are not contributions that actually clarify this relationship. While some articles have addressed the topic of knowledge transfer in projects, the significance of this research depends on the fact that it considers the connection between knowledge transfer and partnering. In fact, as reported in the chapter 2.1.2, the specific characteristics of the project-based context could to extent thwart the development of effective knowledge transfer. Contrariwise, partnering attempts to solve the competitiveness and fragmentation typical of traditional projects, providing a solid ground for the establishment of collaboration between the project participants. Hypothetically, within this context, knowledge transfer should be fostered. For this reason, if this research would have considered knowledge transfer in traditional projects, then the findings would have been quite different.

Since the complexity and vagueness of these aspects, it has been essential to adopt a clear and systematic method of analysis. Besides, strong focus and concentration have helped to not lose the track of the study and to not stop believing in the relevance of this, somehow intangible, research.

This study featured also practical limitations. The research has been developed during a period of six months and has the clear purpose to understand how the link between knowledge transfer and partnering is perceived. The theoretical framework (chapter 2), that mainly served as basis for understanding the research, contains a comprehensive presentation of both topics. However,

it is believable that the literature review could be even enlarged and that a deeper investigation of the theory could be done considering the publications is a larger time spam.
The second parts of the research entailed the development of ten interviews. Specific limitations are evident in this part of the study. In particular, the interviews were conducted towards two different targets: professors within the academic context and project managers within the construction industry. A diversified sample of interviews could enhance the value of the results, but at the same it could increase the complexity of the analysis. It is, therefore, important to take into account the different nature of the interview-objects during the analysis of the results. In addition, (1) the number of interview-objects per target groups is diverse. This could, partially, influence the results of the research, especially when the total amount of interview-objects is relatively small. This limitation was caused mainly by a time constraints and logistic problems during the research development; however, this problem could be easily optimised in further researches. Similarly, (2) the interview-objects work within the Norwegian construction industry. This limitation could be solved enlarging the sample of interview-objects in other countries. Considering other contexts in the analysis will introduce new interesting points of view and, hopefully, improve the final findings. Furthermore, (3) the majority of the experts do not consider knowledge transfer as their major research or working area, even though all of them had some experiences with this topic during their careers.
As mentioned before, partnering is a complex concept, that still presents a lack of a univocal definition. (4) Therefore, if the interview-objects have different understanding about partnering practices, then this could lead to different points of view about the link between knowledge transfer and partnering. In order to limit this problem, it was important, at the beginning of the interviews, to assess each experts' perception and understanding of partnering. In this way a right interpretation of the findings was possible.

The study combines two research areas that are well established and that are significant for the construction industry. In addition, in order to overcome the contingency and complexity of the topics, specific expedients have guaranteed unbiased results (chapter 4.2). Moreover, in spite of the limitations and weaknesses of this research, the reliability of the analysis is ensured by the presence of several strengths.
The reliability of this thesis depended upon different factors. First, (1) the literature review was based on well-recognized articles that are published within international referred journals (table 9). At the same time, (2) the interviews were conducted towards a panel of experts in the field. This aspect increases the reliability of the findings and it represents an important strength for

the entire research. Finally, (3) the general reliability of the findings has been verified comparing the results with the theoretical framework. In table 11, the strengths and weaknesses (or limitations) of the study are represented in a systematic way.

Table 11. Strengths and weaknesses of the study.

	Method	**Findings**	**Overall analysis**
Strengths	- Literature review as basis of the research. - Experts panel. - Two targets of interview-objects. - Specific expedients for unbiased results.	- Relevance for construction project success. - No previous academic contributions.	- Researcher commitment and interest. - Clear definition of the research questions. - Attentive and systematic analysis.
Weaknesses	- Limited sample of interview-objects. - Limited time. - Different ratio in the target groups. - Focus on Norwegian context. - Knowledge transfer not major area	- Contingency of the topics. - Different practical perspectives.	- Contingency of the topics. - Different points of view. - Lack of partnering definition.

5. Findings

The purpose of this thesis was to understand whether a link exists between knowledge transfer and partnering, and, furthermore, how the experts perceive this link. In particular, the findings answered to the following research questions:

- Does a link exist between knowledge transfer and partnering in projects? (RQ1)
- Which partnering key elements enhance effective knowledge transfer? (RQ2)
- How knowledge transfer and partnering in projects influence each other's? (RQ3)

The findings from ten interviews are summarized in the table 12. The main findings (from finding 1 to finding 5) answered to the research questions above, while the minor findings (finding 6 and 7) revealed how the interview-objects consider the concepts of partnering and knowledge transfer.

Table 12. Findings from the interviews.

	Findings	**Number of interviewees**	**Research questions**
Finding 1.	a link exists between knowledge transfer and partnering projects	9/10	RQ1
Finding 2.	cooperation, open communication, trust, and co-location are some of the partnering key elements that can influence knowledge transfer	8/10	RQ2
Finding 3.	the link is a loop	4/10	RQ3
Finding 4.	the collaborative environment of partnering positively influences the development of knowledge transfer	9/10	RQ3
Finding 5.	knowledge transfer is essential for successful partnering	4/10	RQ3
Finding 6.	a precise definition of partnering is still missing	10/10	-
Finding 7.	definition and context of knowledge transfer	general	-

5.1. Does a link exist between knowledge transfer and partnering in projects? (RQ1)

5.1.1. Finding 1. A link exists between knowledge transfer and partnering projects.

Nine out of ten interview-objects perceived that a link exists between partnering and knowledge transfer in projects. One expert has questioned this statement, arguing that, considering the competitive environment in which most of the projects develop, it is often not possible to share information or create collaborative working relationships.

The nine interview-objects, who believe in the presence of a connection between knowledge transfer and partnering, noticed that some of the key elements are common for both partnering and knowledge transfer process. In their opinion, this aspect could be the evidence of the link. The common success factors for partnering and knowledge transfer, defined by the interview-objects, are listed in table 13.

"The critical factors of knowledge transfer are quite similar to the critical factors for partnering. The fact that there are common factors in partnering and knowledge transfer means something."

(Interview-object)

Table 13. Common success factors in partnering and knowledge transfer.

01. trust
02. communication
03. cooperation
04. incentives – rewards system
05. commitment / willingness to share
06. leadership support
07. team building activities
08. workshops and meetings
09. co-location
10. common understanding
11. involvement of project owner
12. common goals
13. learning from mistakes (lesson learned)

5.2. Which partnering key elements enhance knowledge transfer? (RQ2)

5.2.1. Findings 2. Cooperation, open communication, trust, and co-location are some of the partnering key elements that can influence knowledge transfer

Eight out of ten interview-objects agreed that several partnering key elements, like cooperation, open communication, workshops, common goals, trust, and co-location, could affect the knowledge transfer process within the project.

"Partnering is one approach that present a good knowledge transfer, because there are many elements in partnering approach which help you to have a good knowledge transfer."

(Interview-object)

"I believe that some partnering elements are directly connected to knowledge transfer. Communication, start-up and following workshops, informal communication and informal meetings help to have a better knowledge transfer.

(Interview-object)

An open communication between the individuals in partnering could lead to an improved knowledge transfer process, while the co-location of project participants could shorten the communication-line, leading to easier transfer of knowledge. Workshops, seminars, and meeting (both formal and informal) could facilitate the sharing of information and discussion between the project participants and this indirectly lead to more effective project practices. Moreover, the interview-objects agreed that the creation of an open culture could increase the willingness of sharing information and improve knowledge transfer in partnering. As last, one of the interview-objects underlined the importance of the early involvement of the project participants for the control of costs and changes.

All the interview-objects believe that the element of trust is fundamental in the definition of the link between effective knowledge transfer and successful partnering projects. Trust is an important success factors for partnering in projects and, coincidentally, building trust between the project participants is essential for the improvement of the knowledge transfer. Specifically, when the level of trust between the project participants is high, it could be easier to share

knowledge and learn from mistakes. In accordance with these assumptions, an interview-object stated that trust could also be considered as a prerequisite for effective knowledge transfer. Contrariwise, one expert has argued that the link between trust and knowledge transfer is not linear; while trust could bring effective knowledge transfer in project, not necessarily effective knowledge transfer leads to the creation of trust between the project participants.

"*Trust is crucial. If you work with companies you do not trust, then you will not share information, especially mistakes and problems. However, it is important to share mistakes because you can learn from it and make people not doing the same error again."*

(Interview-object)

More in general, several other factors could negatively influence the link between knowledge transfer and partnering. For example, (1) the external regulation and the form of contract could influence the way partnering is implemented and, consequently, the connection with knowledge transfer. Moreover, (2) situations in which two organisations have collaborated during previous endeavours or if they expected to work together in the future could impact the way these organisations share information. Similarly, (3) when significant problems arise during the project development, the willingness of cooperation could dramatically decrease. In addition, the (4) organisational culture and the (5) internal procedures for knowledge management could negatively affect the success of partnering in projects.

Other external factors can influence the development of partnering and knowledge transfer in projects. For example, the (6) market condition and the (7) economic situation. A non-favourable economic situation could drastically limit the willingness of sharing knowledge and cooperate. However, as one of the interview-object stated, the intrinsic partnering characteristics and the link with effective knowledge transfer could create the ideal conditions to face with economic issues during the project development.

"The economic situation has driven us into a tougher situation, characterised by high competition. Before, there was a lot of work and this was a good situation for openness and collaboration. Now, also the Norwegian economy took a downtrend because of the international financial crisis. (…) Norwegian companies risk to be outside the market, and in this situation openness and sharing information are out of the question. (…) Trust has reduced a lot during the last couple of years."

(Interview-object)

"When the time are good and there are a lot of money around, then it is more fruitful to be engaged in collaboration. But when the projects are few and the money are scarce, then companies tent to go back to their traditional way and mode of operation."

(Interview-object)

"While at the beginning everything was great, after a while the companies (involved in partnering) *started to lose money. However, because we had partnering in project, people managed to collaborate during all the project life cycle. I think that, if it was not like this, the companies would have lost more money."*

(Interview-object)

5.3. How knowledge transfer and partnering influence each other's? (RQ3)

5.3.1. Finding 3. The link is a loop

Considering both dimensions of the link between partnering and knowledge transfer, four out of ten interview-objects described the link between partnering and knowledge transfer as a loop; as one experts stated "*the link between knowledge transfer and partnering develops in a double way"*. The presence of a loop means that while effective knowledge transfer enhances partnering practices, at the same time, the partnering collaborative culture and the soft elements facilitate the development of effective knowledge transfer and learning in projects.
In a logical way, the interview-objects that have considered the link as a loop, consequently, supported also the findings 4 and 5. Therefore, five out of ten interview-objects claimed that the link is valid only in one way; partnering promotes effective knowledge transfer (finding 4).

"The link between partnering and knowledge transfer can be considered as a loop, it can be both ways. (…) Partnering facilitates in different ways knowledge transfer, knowledge sharing and learning. But I guess, somehow, it also fits the other way around; because when you start sharing experiences and discussing about what could have been done better, then partnering experience is lifted as well."

(Interview-object)

"I think that if there are two or more organisations who have effective knowledge transfer practices, then it will be probably more likely that they will be engaged in partnering projects. But it might work in the other way around; that a partnering project might support the development of knowledge transfer. These two concepts strengthen and reinforce each other's, as your left hand and right hand. You need both, and they work together. But I am not sure which one comes first."

(Interview-object)

"The link goes both ways, because creating good communication in partnering, you also create the situation or culture where you have the opportunity to exchange knowledge and experience. And this happens automatically."

(Interview-object)

5.3.2. Finding 4. The collaborative environment of partnering positively influences the development of knowledge transfer

Among all the interview-objects, nine out of ten assumed that partnering in projects positively supports effective knowledge transfer (first side of the link). These experts agreed that, given a successful collaborative partnering environment, this could facilitate the development of effective communication and enhance the sharing of knowledge between the project participants. Therefore, the essence of the link resided in the specific nature of the partnering projects, that provides the perfect conditions to exchange knowledge and expertise. As one interview-object explained this happens automatically within the partnering context: "*a partnering project has many characteristics that make it more suitable for open knowledge transfer"* (interview-object). According to another expert, the reasons why knowledge transfer could be more effective in partnering projects, than in traditional procurement projects, is because the easier access to the know-how, the higher commitment to the project, and the common goals among project participants. In addition, while in a traditional project the participants, usually, leave the project after their tasks are finished, in partnering the individuals could be involved in the same collaborative and continuative process for long time (strategic partnering).

"If you create a pro-active collaborative environment with partnering, then you can effectively share knowledge. Therefore, the link between partnering and knowledge transfer depends from this environment."

(Interview-object)

"It is partnering that bring effective knowledge transfer. In partnering, knowledge transfer is influenced because you easily can access to all the know-how and you have defined common goals. You do not do this in a traditional project, because you don't think that collaborating is useful."

(Interview-object)

Moreover, an interview-object argued that, sometimes, partnering can be adopted with the purpose of improving knowledge transfer in project. In fact, as the expert explained, partnering can strategically provide access to a broader spectrum of knowledge, from designers, suppliers, constructors and so on, and the project participants work together and share experiences.

"Knowledge transfer it is the reason why you want partnering, because you want the knowledge of designers, suppliers, constructors, and so on."

(Interview-object)

5.3.3. Finding 5. Knowledge transfer is essential for successful partnering

The results from the interviews showed that there is another way to consider the link between knowledge transfer and partnering (second side of the link). Four out of ten interviews-objects explained that if two or more organisations developed effective knowledge transfer practices then it would be more likely for them to be engaged in an effective partnering collaboration. Therefore, in order to have successful partnering, effective knowledge transfer is essential. Knowledge transfer can also be considered an element of partnering. However, while one interview-object believes that partnering projects are not successful if effective knowledge transfer is missing, another expert disagreed with this statement.

"Knowledge transfer can influence partnering in two ways, creating general collaboration ability and providing technological knowledge to the project."

(Interview-object)

"Knowledge transfer is an element of partnering. I think that a partnering project is not really a partnering project, if it does not involve knowledge transfer to a significant extent."

(Interview-object)

The interview- objects asserted that there are two separate dimensions of knowledge transfer in partnering projects. First, knowledge transfer within a partnering project involves client, suppliers, consultants and eventually other project participants at different level. The vertical arrow in figure 6 represents the transfer of knowledge within each project. If we assume the presence of long-term (or strategic) partnering, then the knowledge transfer process occurs between different (future or parallel) projects. From one project to another, the knowledge is transferred within the client level, supplier level and so on. The horizontal arrow in the figure 6 symbolises this process. In particular, the presence of horizontal long-term relationships among different projects might change the way the project participants work together, communicate and share knowledge.

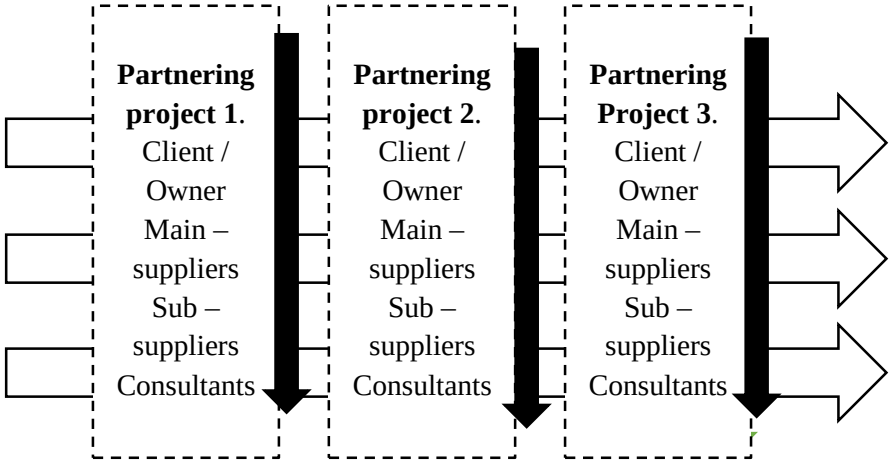

Figure 6. Knowledge transfer in partnering projects (from an interview-object).

5.4. Other findings

5.4.1. Finding 6. A precise definition of partnering is still missing

All the interview-objects agreed that a univocal definition of partnering is still missing. In particular, the researchers and professors provided their own definitions of partnering based on their previous experiences or studies (Table 14), however one interviewee from the industry were not able to provide a specific definition of partnering.

As one interview-object affirmed, the uncertainty about partnering definition among the professionals might lead to the creation of more than on understanding and, consequently, to an increasing complexity during the implementation of the projects. Likewise, according to a project manager from the industry, partnering could be entitled in different ways depending how the project participants establish the collaboration. Moreover, the last interview-object underlined that the presence of long-term relationships between project participants could influence the collaboration and the knowledge sharing.

Table 14. Some definitions of partnering from the interview-objects.

"Partnering is a means to help project managers to improve collaboration between parties."
"Partnering is a model of sharing and developing project ideas together."
"Partnering is when the actors work for the best of the project."
"Partnering means working together and learn from experience."

Moreover, nine out of ten interview-objects confirmed that partnering could bring benefits to the project and could contribute to the achievement of a successful outcome. However, only one researcher was sceptical about the effect of partnering in projects and about the possibility of increasing the value of the project through collaboration.

To what it concerns the partnering contracts, two interview-objects explained that within the Norwegian construction industry, where the majority of these interviews took place, partnering contracts are usually standard construction contracts (legal side) with the inclusion of partnering elements (non-legal side). According to the experts, different companies usually design targeted partnering arrangements, since standard procedures are still missing.

"I do not have a definition for partnering. There are different ways to make the project participants (contractors, engineers, architects) collaborating in a good way. For example, in

one project we had a system of collaboration at site. Different factors together can decrease or increase the effectiveness of the project."

(Interview-object)

"*Some people defined partnering as an attitude, but it is not clear what does it mean to change attitude or behaviour. The concept of attitude is not easy to define, as well as partnering. Of course, partnering is a positive value and it seems to be a nice thing to do."*

(Interview-object)

"Partnering is mainly a model. It is about sharing and developing projects ideas together from the beginning, by having a long-term relationship. However, there are a number of reasons why partnering does not always work. I consider partnering as a fairy tale."

(Interview-object)

Twenty-five different key elements have been identified as the most important for achieving successful outcome in partnering projects (Table 15).
All the interview-objects defined trust as one of the most critical key element for the partnering success. Following, collaboration and open communication in project are considered essential for successful projects outcomes by eight out of ten interview-objects. In particular, as three experts stated, it is important that the project participants are willing to communicate also about financial issues, adopting an open book economy.

"It is almost impossible to have collaboration if you do not trust the other people in the project. If you spend sometimes at the beginning of the project to establish common goals for the project participants, you will more easily get trust into the team. Trust it is not a problem when people are motivated and committed."

(Interview-object)

"The communication is very important for the success of a project. In partnering there is higher demand for open communication, than in traditional projects."

(Interview-object)

Furthermore, five out of ten interview-objects affirmed that the co-location of the parties during the project is critical for the achievement of higher performances. In fact, if project participants work at the project-site, it is easier to gather, discuss, and solve problems in a more effective

way. Likewise, an expert argued that working on the project-site, rather than in the office, can also increase employees' motivation, passion, and commitment to the project.

More than half of the interview-objects (six out of ten) considered workshops, seminars and meetings important elements for the implementation of successful partnering. As the experts explained, the workshops are usually hold at the beginning of the project, during the implementation phase, and at the final stage. The purpose of these meetings is to implement effective partnering practices, spreading the collaborative attitude among the project participants. In addition, during these workshops, rules and responsibilities of each project participant are usually defined and the social interactions are fostered. According to one interview-object, informal social gatherings are also important to improve collaboration and communication between members and to help the creation of an open culture in partnering.

One interview-object underlined the relevance of using integrated computer system in partnering projects (for example BIM Building Information Management or VDC Virtual Design and Construction). As the expert explained, considering partnering as a process, these elements could be needful to set up meetings and workshops, distribute responsibilities and control performances.

A collaborative project method, such as partnering, involves tailored forms of contractual agreement between the project participants. The interview-objects affirmed that different contractual elements can, to some extent, regulate partnering projects. For example, an interviewee underlined the importance of creating a core group, that includes owner, financial parts, project managers, contractors, and so on. The individuals that are part of this group will most likely be more involved and committed towards the project. Moreover, the early involvement of the suppliers (five out of ten interview-objects), a value-based procurement (one interview-object), and a target-cost (two out of ten interview-objects) are other contractual elements that can indirectly increase the motivation of the project participants and constitute a stable basis for collaboration.

A project manager from the industry explained that a value-based procurement has often been adopted in large partnering projects within the Norwegian construction industry. With a value-based procurement, the project owner during the tender does not consider only the criteria "price" in the selection of suppliers. Rather, more attention will be given, for example, to the ability of suppliers to create collaborative relationships. According to the same interview-object, it is also possible to adopt a value-based procurement if the suppliers are involved in the early phase of the project and participate actively during the tender. In this situation, the

suppliers can provide detailed specification for the project in advance and collaborate with the owner in building the total price of the project. Consequently, the final design will be created based on the suppliers' capability and with the common intention to optimise the total cost of the project. This approach could increase the overall motivation of the project participants and, at the same time, improve the collaboration between them. Another project manager from a Norwegian construction company has described this situation from the contractor's perspective. According to his experience, a value-base procurement could be very demanding for the contractor's part and it represents a challenging situation that forces the contractor to allocate more resources and best people on that specific project. However, on the other hand, in this situation the commitment and motivation of the contractor's part could also be enhanced.

Table 15. Main partnering key elements from the interviews.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	
01. trust	X	X	X	X	X	X	X	X	X	X	10/10
02. common goals	X		X	X	X			X	X	X	7/10
03. cooperation collaboration	X		X	X	X		X	X	X	X	8/10
04. incentives	X			X		X					3/10
05. dispute resolution	X				X		X	X			4/10
06. risk sharing	X				X						2/10
07. involvement of project owner	X		X			X			X		4/10
08. win-win situation	X										1/10
09. common project governance	X		X		X			X			4/10
10. open book economy		X					X	X			3/10
11. workshops and seminars		X	X	X		X	X			X	6/10
12. communication and openness	X	X	X	X	X		X	X		X	8/10
13. gain-pain sharing			X	X	X						3/10
14. early involvement of suppliers			X		X	X	X		X		5/10
15. co-location			X			X	X		X	X	5/10
16. common understanding					X		X	X			3/10
17. involvement of sub-suppliers					X	X			X		3/10
18. target cost						X			X		2/10
19. joint decision making						X	X			X	3/10
20. commitment	X									X	2/10
21. leadership support	X										1/10
22. team building activities	X										1/10
23. creation of a core group									X		1/10
24. value based procurement									X		1/10
25. integrated computer system									X		1/10

5.4.2. Finding 7. Definition and context of knowledge transfer

The interview-objects reported a general lack of standard knowledge transfer practices in projects and provided a more practical insight into the concept. According to one project manager, knowledge transfer in project is not always an easy process, especially within the construction industry. In fact, when several people are involved in different stages of a project the information are usually transferred internally via documents or reports (explicit knowledge) but the transfer of tacit knowledge is often overlooked.

Among the researchers and professors, four interview-objects defined knowledge transfer as the process of sharing ideas, concepts, and experiences between the project participants. Specifically, one expert underlined that knowledge transfer refers to the transfer of information about the status and the problems of the projects (explicit knowledge) but it should also involve the transfer of best-practices, know-how and expertise (tacit knowledge). When tacit knowledge is transferred then knowledge transfer assumes a long-term value.

The knowledge can be transferred at the individual, group, or organisational level. Considering each project as a single organisation, the knowledge transfer happens between individuals working in the same project. Therefore, as of the interview-object stated, the individuals hold a significant role in implementing effective knowledge transfer within the project. Similarly, according to another interviewee, if people have previously worked together or know each other's, then the process of knowledge transfer could be facilitated. In general, the interview-objects underscored that a positive social setting is necessary for effective knowledge transfer. The social context and the culture in which knowledge transfer occurs can strongly influence its effectiveness.

Moreover, the interview-objects have listed the key factors that can intensify the creation of an open and social context and, consequently, facilitate effective knowledge transfer (tacit and explicit knowledge). As one expert stated, it is necessary to find a *mechanism* that can facilitate effective knowledge transfer through the use of relational key elements. Knowledge transfer is strongly related to the context and the culture of the project: *"you learn more when you are in the right context"* (one interview-object). Therefore, the key elements for effective knowledge transfer should contribute to the development of the *right* context. Some of the key elements underlined by the interview-objects are reported in table 16.

"The concept of knowledge transfer is related to people and it implies an intellectual perspective. Moreover, knowledge transfer process is strongly related to the context in which happens."

(Interview-object)

"Knowledge transfer is especially necessary in construction projects, because of the high fragmentation. Several specialized companies work together, and everyone has a little piece of knowledge. Therefore, high coordination is needed. Transfer the knowledge from one project to another is also another challenge. Today, the only good answer to this problem is to bring people over, because the knowledge remains with the people, in their mind. We are not very good in connecting experiences from project to project. This is even more challenging with the construction industry, because we have the tendency to finish one project and run to the other without recording any experience. Then, we make the same mistakes, over and over again."

(Interview-object)

Table 16. Main knowledge transfer key elements from the interviews.

01. trust
02. open communication
03. team building activities
04. training
05. seminars and workshops
06. co-location
07. common problem solving
08. cooperation and collaboration
09. willingness to sharing
10. IT systems
11. learning environment / culture

6. Discussion

6.1. Does a link exist between knowledge transfer and partnering in projects? (RQ1)

Interestingly, the interviews confirmed what was deducted from the analysis of the theoretical framework; a link exists between knowledge transfer and partnering. While the great majority of the interview-objects (nine out of ten interviewees) agreed that a connection exists, it was more difficult to reveal this finding from the literature. Implicitly, some assertions in the theory have shown that knowledge transfer and partnering are exceptionally related.

First, in order to deal with the increasing complexity of the construction industry (Azari et al., 2014) some authors, like Lahdenperä (2012), encouraged the adoption of collaborative forms of project delivery, such as partnering. Contrariwise, other authors argued that the adoption of a knowledge-based approach in project management is the formula for achieving success projects outcome (Björkegren, 1999). Therefore, it seems that partnering and knowledge transfer represent the solution to the same issue: dealing with the increasing complexity in construction industry.

Moreover, the link between knowledge transfer and partnering is confirmed by the presence of several common success factors. The success factors of partnering and knowledge transfer were detected from the different articles (Table 4 and Table 6). After, the interview-objects have defined the key factors that they considered to be relevant for the success of partnering and for effective knowledge transfer in projects (Table 13). From a comparison between the results from the literature review and from the interviews, it emerged that the factors identified by the interview-objects and from the literature were quite similar (Table 17). This similarity validated the presence of a link between knowledge transfer and partnering. Curiously, from the analysis of the results it is possible to notice that the responses from the professors and researchers within the academic context (seven out of ten interview-objects) were similar to the literature; on the other hand, the answers from the project managers (three out of ten interview-objects) were more practical and concrete.

Finally, the presence of a link between knowledge transfer and partnering has been confirmed through a comparison between the results from the interviews and the literature review.

Table 17. Common key elements in partnering and knowledge transfer; comparison of the findings from the literature review and from the interviews.

LITERATURE REVIEW		**INTERVIEWS**
Knowledge transfer	**Partnering**	**Common elements**
Trust	Trust (mutual trust)	Trust
Cooperation Collaboration	Collaboration and cooperation (cooperative culture – collaborative tools – cooperative attitude)	Cooperation
Reward System	Incentives (compensation)	Incentives - rewards system
Clear Definition of Objectives and Rules	Common goals (mutual- beneficial goals – shared objectives – joint objectives)	Common goals
Attitude Motivation Commitment	Commitment and attitude of project participants (mutual commitment)	Commitment / willingness to share
Communication / Continuous Dialogue / Openness	Open and effective communication (openness) – informal communication – open sharing of information	Communication
Technology Support System and IT Infrastructure	ICT (IT tools)	
Teamwork	Team building activities (teamwork) – trainings – project team	Team building activities
	Workshops (continuous workshops – initial workshops – follow up workshops – monthly review meetings – joint workshop – meetings – start up workshops)	Workshops and meetings
Pilot Implementation / Feedback	Continuous improvement process (continuous feedback)	
Social Interactions / Social Network	Social functions (informal gathering)	
Leadership Commitment / Top Management Support	Top management commitment to partnering spirit (leadership) – participative leadership	Leadership support
Effective and Systematic Processes and Measures / Performance Measurement	Measurement (key performance indicators and reports) – periodic assessment – joint evaluation – evaluation methodology – partnership monitoring – periodic performance evaluation	
	Willingness to accept mistakes	Learning from mistakes (lesson learned)
Proximity / Co-location		Co-location
Common Language / Understanding of the benefits		Common understanding
Training program		Training

Once the existence of the link between knowledge transfer and partnering was confirmed, it was possible to proceed in the study, analysing more in depth the nature of the connection.
In particular, partnering is defined as a managerial approach based upon strong cooperation between project participants (Barlow and Jashapara, 1998). Within this collaborative context, an effective knowledge transfer process seems to be necessary in order to achieve the expected benefits. This aspect has prompted to focus on the link between partnering and knowledge transfer specifically, instead of limiting the analysis to the more general topic of knowledge transfer in projects. In fact, as emerged from the literature, the specific characteristics of the construction projects can limit the creation of an effective knowledge transfer (chapter 2.1.2).
Contrariwise, partnering is implemented to overcome the complexities typical of adversarial projects, offering a wider access to expertise and know-how. This context offers the perfect conditions for knowledge transfer enhancement. Therefore, if the research would have focus on knowledge transfer within the traditional project context, probably the findings of the research would have been relatively different.

6.2. Which partnering key elements enhance knowledge transfer? (RQ2)

The expression "critical success factors" refers to those key elements absolutely necessary in order to reach a goal (Anvuur and Kumaraswamy, 2007). In particular, these factors could have a strong impact on the success of knowledge transfer and partnering. Therefore, it was significant to analyse which specific partnering critical success factors could also influence the knowledge transfer process. Figure 7 explains this point in a representative way: considering a list of partnering critical elements (that were found through the literature review), there are some factors that could simultaneously affect the effectiveness of knowledge transfer.

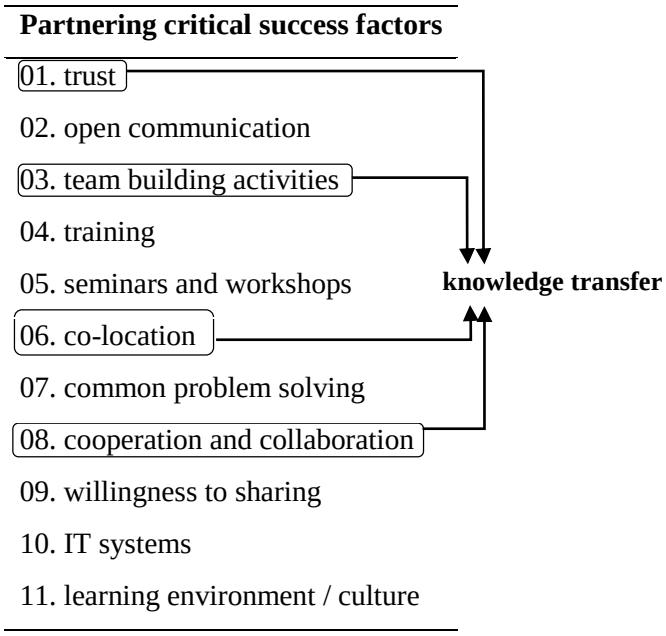

Figure 7. Representation: some partnering success factors also enhance knowledge transfer.

A collaborative environment, an open communication between project participants, and mutual trust are some of the partnering key elements that imply effective knowledge transfer in projects.

From the literature review it emerged that several authors considered collaboration as one of the most important key factor for partnering success (Eriksson, 2010, Lahdenperä, 2012, Black et al., 2000). Similarly, several interview-objects affirmed that collaboration represents one of pillars for partnering success. In particular, while the establishment of a shared cooperative and collaborative culture contributes to the achievement of partnering success (Bayliss et al., 2004); at the same time, collaboration helps with the creation of a positive and open context, which,

consequently, could favour the development of effective knowledge transfer (Inkpen, 1996). As Dave and Koskela (2009) affirmed *"social interaction/collaboration between workers is one of the most appropriate ways to capture tacit knowledge"* (page 901).

To some extent, the development of the other critical success factors depends to and impacts the level of collaboration within the partnering context. For example, an open communication could facilitate the creation of a collaborative attitude between the project participants (Chan et al., 2010) and, consequently, improve the effectiveness of the knowledge transfer process (interview-object). Likewise, open communication is defined by Nonaka (1994) as a process of sharing tacit knowledge between individuals.

Some interview-objects considered the co-location of project participants as a fundamental element for strengthen the communication and collaboration between the project participants. However, the literature does not include co-location in the list of partnering critical success factors. Moreover, according to Bresnen and Marshall (2000a), a change of the individuals' attitude could be necessary in order to build healthy collaborative working relationships in projects. The interview-objects agreed that an open culture is essential for the achievement of effective knowledge transfer in partnering.

From the literature, trust proved to be one of the most important key element for successful partnering, and interestingly for effective knowledge transfer as well (Eriksson, 2010, Bygballe et al., 2010, Koskinen et al., 2003). As Dave and Koskela (2009) stated *"knowledge sharing happens more efficiently if there is a level of trust existing between employees"* (page 901). Similarly, all the interview-objects pointed out the importance of trust; building trust between individuals is essential for partnering success and, at the same time, it enhance knowledge transfer.

Despite its strong relevance in projects, trust can be difficult to define and manage because its abstract and indefinite nature; as Koskinen et al. (2003) affirmed, trust in project depends upon the sincerity and the expectations of one individual towards the other. In addition, trust affects and is affected by several other variables and elements. An environment characterised by openness and mutual trust, like partnering, usually favours the creation of collaborative relations and fosters the interactions between individuals (Naoum, 2003, Zhang and He, 2015). On the other side, a high level of collaboration and open communication, that are prerequisites for successful partnering, helps in building trust. Finally, a high level of mutual trust between the project participants is likely to improve knowledge transfer; as Hajidimitriou et al. (2012) stated *"trust lies at the heart of tacit knowledge exchange"* (page 45).

This intricate network of relationships and dependency between trust and other attitudinal aspects in projects is clearly not easy to represent in a systematic way but it is better depicted as a series of gears, that fit together, continuously moving (Figure 8). The model also shows that the relational partnering key factors are strongly connected one to each other's; for example, open communication affects the collaboration between project participants, leading to an improved knowledge transfer, and so on. Within this relational and dependent context, the implementation of successful partnering practices could become conceptually complicated.
Finally, because of its strong influence on both partnering and knowledge transfer, the element of trust could be considered the *key* element in the link between effective knowledge transfer and successful partnering. But, once again, because of the personal and subjective nature, trust could be extremely difficult to define, measure, and implement in practices.

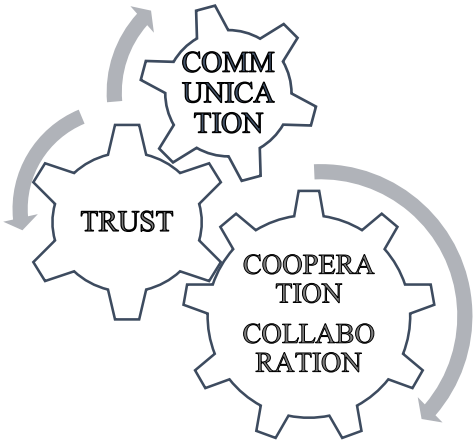

Figure 8. The relational factors interact and simultaneously affect each other's in projects.

The critical success factors of partnering are mostly defined as behavioural and attitudinal (Cheung et al., 2003). Other partnering contractual factors could contribute in the creation of collaboration and trust in projects, in a more practical way (Eriksson, 2010). Therefore, the connection between knowledge transfer and partnering in projects depends on the presence of both relational and contractual elements.

Finally, considering the link between knowledge transfer and partnering, if these critical success factors are implemented in partnering projects, then, hypothetically, an effective knowledge transfer process is also implied. In this situations, most likely, the project performances will be enhanced.

6.3. How knowledge transfer and partnering influence each other's? (RQ3)

The main purpose of this research was to examine the nature of the link between knowledge transfer and partnering within the context of the construction industry.
From the interviews it emerged that partnering and knowledge transfer influence each other's. Specifically, partnering provides a collaborative and open working context, which favours the development of effective knowledge transfer; at the same time, effective knowledge transfer in projects, could lead to successful project partnering. This connection could, to certain extent, be defined as a loop (Figure 9).

The literature review does not completely and clearly address this issue, indeed there are limited contributions about the link between knowledge transfer and partnering. In general, the more relevant contribution is from Barlow and Jashapara (1998). In their research, the authors reported that there is a growing awareness about the role that partnering can play in promoting learning in projects. In particular, partnering offers the conditions for the development of cooperation and communication and, as a result, stimulates knowledge transfer between project participants (Barlow and Jashapara, 1998). However, the great majority of the authors does not consider the connection between knowledge transfer and partnering, rather they analysed each topic separately and under different points of view. For example, Cheng (2009) mentioned that new forms of project procurement could lead to the development of a more effective knowledge transfer process. Considering the context of the production industry, several authors, like Beverly (2003), affirmed that alliances between different organisations constitutes a unique learning opportunity. These different statements from the literature should be adapted to the context of the construction projects, in order to gain validity for this thesis.

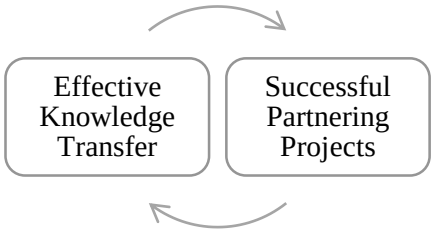

Figure 9. Loop between effective knowledge transfer and successful partnering projects.

According to the interview-objects, the link between effective knowledge transfer and partnering could be more articulated than it actually seems.

As reported in chapter 6.2, specific partnering success factors could indirectly enhance knowledge transfer, in particular with regard to tacit knowledge (one side of the link). In fact, the partnering culture promotes sharing and transfer of knowledge, expertise, and know-how and this happens, especially, when the project participants are willing to commit themselves and promote a collaborative attitude (Bresnen and Marshall, 2000a).
At the same time, as some interview-objects underlined, the presence of a successful knowledge transfer in project, could facilitate the development of partnering, as a collaborative procurement method (second side of the link). Specifically, when two or more organisations have developed optimal practices for the transfer of knowledge, it would be more likely for them to be engaged in a successful collaboration. When this happens, then the key elements for effective knowledge transfer assume high relevance for the development of partnering.

In this context, according to one interview-object, it is also possible to consider knowledge transfer as a critical success factor for partnering. However, since effective knowledge transfer is desirable within every construction projects, this opinion is difficult to discuss. In fact, as Gasik (2011) have stated, considering the general context of project management, the lack of project knowledge transfer is one of the main reasons for projects failure.
On the other hand, according to Barlow and Jashapara (1998), under specific circumstances, partnering can be adopted with the explicit purpose of improving the knowledge transfer process. In fact, as stated before, partnering presupposed the necessary conditions that could ensure an effective knowledge transfer process; within partnering, it is possible to access to a broader spectrum of knowledge (from designers, suppliers, constructors, and so on). According to Lahdenperä (2012), this is particularly true within the complex and fragmented construction industry where, usually, several individuals are involved in the same projects, bringing different knowledge, skills and competences. Cooperation and collaboration become essential for these types of projects and it supports the idea that the implementation of partnering in construction project could be extremely beneficial.
While the temporary and interdisciplinary nature of a construction project calls for improved learning and knowledge sharing, the discontinuities and fragmentation of the projects could limit the assimilation of knowledge (Hartmann and Dorée, 2015). For this reason, this study aimed to increase the awareness towards the link between effective knowledge transfer and partnering within the construction industry because the adoption of partnering in a construction project is a way of overcoming the limitations of traditional projects, introducing collaborative

relationships between project participants (Bayliss et al., 2004, Black et al., 2000, Chan et al., 2010, Cheung et al., 2003).

In summary, despite the limited contributions in the literature, the results from the interviews supported the point of view of Barlow and Jashapara (1998): partnering plays a significant role in promoting learning in projects, offering the condition for the development of a cooperative culture.

A slight difference emerged from the interviewees' opinions. In fact, the point of view of professors and researchers (seven out of ten interview-objects), about the topics of partnering and knowledge transfer, resembled what expressed in the theory, while the responses from the project managers (three out of ten interview-objects) are more practical and based on direct experiences. Therefore, despite several studies have been conducted on partnering and knowledge transfer, there is still a gap between the theory and the working practices and a clear need of a more practical understanding of these practices.

7. General discussion

The traditional view on project management generally focus on individual projects, which are usually treated as separate entities (Björkegren, 1999). Nowadays, because of the increasing complexity and challenges within the project context, this traditional view has been questioned by several authors.

According to the knowledge-based perspective of project management, a project within the construction industry should be considered as an occasion for learning (internal knowledge transfer), while at the same time, previous project experiences should be exploited and utilised in future endeavours (external knowledge transfer) (Björkegren, 1999). In fact, the success of any projects (or organisations) depends on how effectively they manage the knowledge presents internally and externally (Dave and Koskela, 2009). The innovative project procurement method of partnering, has been considered by some authors as a means for introducing effective knowledge transfer in construction projects (Lahdenperä, 2012). However, the complex and contingent nature of both partnering and knowledge transfer have thwarted the development of these practices and limited the researches within this field (Gasik, 2011).

The previous researches on partnering and knowledge transfer, that are included as references in this study, presented different points of view about the topics of knowledge transfer and partnering. As first, knowledge transfer commonly refers to the exchange of information and expertise between sender and receiver (Gasik, 2011, Hartmann and Dorée, 2015) within the same project and/or among different projects (*lesson learned*). However, other studies have considered knowledge transfer under different perspectives, giving more importance to the social aspects and the interactions between project participants (Sense, 2007, Hartmann and Dorée, 2015). Similarly, partnering is generally considered as a project procurement method based on collaborative working relationships, trust, and open communication between project participants at different levels. However, partnering does not rely on a univocal set of procedures and practices, but it is contingent to different situations and contexts.

In general, according to the theory, an effective knowledge transfer process should be implemented among each organisations and within each project. Specifically, in partnering projects the participants need to work closer and collaborate actively, continuously sharing expertise and know-how. In this interactive context, an effective knowledge transfer process is

essential; in fact, partnering is not just an agreement between the parties but is *"an attitude that implies cooperation"* (interview-object). Therefore, the relevance of this research relies in having analysed the specific relation between knowledge transfer and partnering projects.
As stated before, if the research would have taken into account the traditional project context, then the final results would have been different. In fact, the high level of collaboration between the individuals in partnering positively influences the knowledge transfer process. Specifically, while explicit knowledge can be easily transferred within any context through the use of specific tools and procedures, the transfer of tacit knowledge is enhanced in a collaborative and open climate. At the same time, when partnering is strategic (long-term implementation), the knowledge transfer process will be extended among parallel and/or subsequent projects. In this situation, the external transfer of knowledge is enhanced by the project participants from different organisation collaborating closely over a long period of time, project after project. Therefore, as represented in table 18, knowledge transfer in partnering can vary according to the situations and the time-spam.

Table 18. Knowledge transfer in partnering projects.

	Knowledge transfer within a project (internal)	**Knowledge transfer among different projects**
Project partnering	- Collaboration - (Trust)	- Learning from experiences (lesson learned)
Strategic partnering	- Trust	- Trust - Same individuals in different projects

In the first situation, partnering is assumed in the short-term period, over the duration of a single project and knowledge transferred among each individual within this single project (internal). Potentially, through the implementation of partnering key elements it is possible to establish a high level of collaboration between the project participants and, consequently, enable effective transfer and sharing of knowledge. The level of trust, in this scenario, could be either low or high, depending if project participants know each other's from before.
Even though project partnering exclusively refers to a single project development, knowledge can be collected from previous projects experiences (also not partnering projects). In this situation, knowledge transfer is considered as *lessons learned*; each project participant, involved in the project, brings his personal skills and competences and strives for the project

success. Sharing knowledge and expertise is extremely valuable and it could increase the competitive edge of the projects, leading to a successful outcome.

In the second situation, when strategic partnering is adopted, the knowledge transfer process within a single project can be facilitated by the presence of a higher level of trust between the project participants. In fact, it assumed that the level of mutual trust between the individuals increases project after project, when the same project participants work together in the long period. Similarly, knowledge transfer among different projects (external) is also enhanced by the fact that the project participants share a high level of mutual trust and cooperation. However, the transfer knowledge in the long period and among different partnering projects can be complicated. The literature does not clearly address this issue, but some interview-objects have claimed that one possible solution could be to move individuals from one project to another. In this way, the knowledge and expertise of each project participants will be transferred among different projects. This solution is yet temporary and strongly depends on the willingness of each project participant to share knowledge. Therefore, more practical and solid procedures should be implemented in order to ensure a long-term effective knowledge transfer in partnering projects.

The classification proposed above represents a simplification of the complex process of knowledge transfer within partnering projects, therefore, it is important to be aware that different procedures and situations could occur in practice.

The knowledge transfer process is strongly influenced by the culture of the context in which is embedded (Hartmann and Dorée, 2015), and this, consequently, could affect the link between knowledge transfer and partnering.

The traditional *sender/receiver* perspective of knowledge transfer (chapter 2.1.3) assumes that knowledge, as an objective entity (explicit knowledge), can be easily transferred between individuals (Hartmann and Dorée, 2015). Similarly, in some cases, learning within a project is mostly accepted as a random and opportunistic actions based on the experiences of the project participants (Sense, 2007). These perspectives are recognized by the several authors; however, these approaches do not take into account the tacit dimension of knowledge, which is extremely valuable for the project success. Therefore, within the project-based context, the traditional perspectives of knowledge transfer has quite some limitations and call for alternatives (Hartmann and Dorée, 2015).

Innovative learning approaches in projects, supported for example by Hartmann and Dorée (2015) and Sense (2007), assume the context and the individuals as an integral part of learning

and, therefore, consider the social interactions no longer as a mere channel for effective knowledge transfer, rather as one of the most appropriate way to capture tacit knowledge (Dave and Koskela, 2009). The so-called *social learning* approach assumes that learning occurs because of the social relationships that are embedded in the collaborative project environment (Hartmann and Dorée, 2015). Similarly, according to Sense (2007) learning in project is strongly linked to people and their actions. Knowledge is, therefore, transferred inside the social context. Consequently, the learning process can be different in each context and situation, because is influenced by the experiences and interactions of the project participants. Moreover, learning takes place when project participants participate and interact actively (Sense, 2007) and, in this context, dialogues, conversations, and sharing of experiences are considered as key mechanism to enhance the transfer of tacit knowledge.

To some extent, this social learning context, that is described by Sense (2007) and Hartmann and Dorée (2015), recalls to the partnering collaborative context. In fact, in partnering the interactions and the social relationships between project participants are, usually, enhanced. According to the theoretical point of view, these elements foster learning in projects (tacit knowledge). From this logical perspective, it is possible to understand that a strong connection exists between knowledge transfer and partnering.

Finally, it is arguable that learning occurs within any setting and socio-cultural conditions. However, citing Hartmann and Dorée (2015), if projects continue to be perceived *"as sender/receiver islands, then lesson learned remain "message in bottles (…) arriving at new shores by chance"* (page 350). Therefore, while explicit knowledge is easily transfer within any situations and context, a collaborative-social setting can enhance the transfer of tacit knowledge. It is, then, important to design an appropriate cultural environment for the development of effective knowledge transfer.

As stated previously, partnering might represent the perfect collaborative-social context for the development of effective knowledge transfer. However, partnering is also highly contingent to the specific situations in which is implemented and, at the same time, partnering practices might be different for each project, making difficult to define a general partnering-model. Similarly, diverse partnering conditions lead to different social-interaction levels between project participants, and, based on what discussed previously, this could mutually influence the effectiveness of the knowledge transfer process. Assuming that knowledge transfer in projects follows a social learning approach, (Hartmann and Dorée, 2015, Sense, 2007), in order to enhance knowledge transfer, the partnering relationships should be based on a high degree of

mutual collaboration between the project participants at different levels, and being grounded on a considerable presence of social-relational factors, such as trust, open communication, and collaboration (chapter 6.2).
In this research, the literature review has underlined the existence of this relational-based approach. Contrariwise, the interview-objects, the project managers in particular (three out of ten interviewees), have assumed a more contractual point of view about partnering. In general, the relational-based approach and the formal-contractual approach should coexist in projects and "support" each other's, with the final purpose of increasing project performances.

Furthermore, one last aspect should be considered to complete this discussion about the link between knowledge transfer and partnering; this aspect is the tacit knowledge.
As explained in chapter 2.1.1, tacit knowledge is characterised by a subjective and intangible nature and it is embedded in individuals' know-how and expertise. According to the literature, tacit knowledge it is usually hard to formalize and transfer between project participants (Carrillo and Chinowsky, 2006, Chen, 2004), despite it constitutes one of the most valuable resource for the achievement of competitive project performances (Zhang and He, 2015).
The innovative collaborative-social perspectives of learning in projects, probably, enhances the transfer of tacit knowledge, promoting the presence of strong social interactions between the project participants. The relationships between the individuals involved in the project, the level of mutual trust, and the co-location of the project participants could influence the way knowledge is transferred (Koskinen et al., 2003). When project participants share tacit knowledge, the creation of a mutual understanding and a common perspective about the project is facilitated (Nonaka, 1994).
The relational-based approach, which is typical of partnering projects, supports this *learning mechanism*, ensuring the presence of attitudinal elements, such as collaboration, trust, and open communication. To conclude, the link between knowledge transfer and partnering assumes a new dimension; the partnering collaborative context introduces relational elements, like trust and collaboration, that indirectly foster the transfer of tacit knowledge (chapter 6.2) but is should be accompanied by a knowledge-based project management, which assumes the social interactions in projects as extremely essential for the transfer of tacit knowledge transfer.
However, there is a peculiarity in partnering projects that should be considered: the individuals involved in partnering projects, especially within the context of strategic partnering, often present different background and competences. This could, to some extent, create interaction problems and, according to the previous assertions, consequently influence the whole project

performance (Koskinen et al., 2003). In particular, the transfer of tacit knowledge can be hinder by the presence of divergent view and perspectives between the project participants.

Finally, the transfer of tacit knowledge is fragile and easily affected by each individuals' willingness to positively contribute to the learning in projects. From the analysis of the link between partnering and knowledge transfer, it emerged that there could be significant opportunities of creating a stable and lasting learning environment in projects, within which tacit knowledge can be transferred effectively. Therefore, it is necessary to be aware that an understanding of the link between knowledge transfer a partnering could help in achieving successful project performances, especially when tacit knowledge is effectively shared within a single project (internally) or among different projects (externally).

8. Conclusions

From this research, the following conclusions can be determined:

- The interview-objects perceived that a connection exists between knowledge transfer and partnering (RQ1).
- A comprehensive framework has shown the partnering key elements that are directly related to effective knowledge transfer. These are, for example, cooperation, open communication and mutual trust. The importance of these factors has been underlined in the theoretical contributions and also in the interviews. These factors confirmed that a strong relationship between partnering and knowledge transfer exists (RQ2).
- The link between knowledge transfer and partnering developed in two ways, formed as a loop. However, because of the intrinsic and contingent nature of the concepts (partnering and knowledge transfer) it can be quite complicated to define the link in a static way (RQ3).

According to what have been discussed in the previous chapters, the link between knowledge transfer and partnering can be described in a general way. While the presence of a shared collaborative project culture promotes partnering success, at the same time, collaboration, open communication, and mutual trust are some of the partnering success factors that also imply effective knowledge transfer in projects (RQ2). Linearly, the link between knowledge transfer and partnering within the construction industry can, therefore, be defined as a loop (RQ3). In one way, the partnering collaborative context promotes the sharing of knowledge between project participants, offering a wider access to expertise and know-how. On the other way, an effective knowledge transfer process, within a construction project, could contribute to the implementation of a successful partnering. Interestingly, these findings are consistent with the contribution of Barlow and Jashapara (1998), one of the few researches in the literature that have focused on the analysis of link between partnering and knowledge transfer. However, from the interviews, it also emerged a need for more practical contributions about partnering and knowledge transfer, and further studies should analyse more thoroughly the link between these research areas (chapter 9).

Different aspects determine the relevance of the research. First, it was extremely important to emphasize the link between knowledge transfer and partnering in projects. In fact, even though

knowledge transfer should always occur within each construction project, the high level of fragmentation of this context can hinder the effectiveness of the knowledge transfer process. According to what emerged in this study, the implementation of partnering and its critical success factors can help to overcome the limitations of traditional projects context (chapter 2.1.2) and, thus, *ensure* the implementation of an effective knowledge transfer. Therefore, the results of this research are valid only for the specific context of partnering projects, while if the analysis have focused on knowledge transfer in traditional construction projects, then the findings would have most likely been quite different.

Moreover, this research presented a possible solution to deal with the increasing complexity and uncertainty of the construction industry. The adoption of collaborative working relationships in projects, along with the implementation of an effective knowledge transfer process, have been suggested as a method for achieving higher benefits in projects. More specifically, a new project management approach that promotes knowledge transfer in project (Björkegren, 1999) and the use of a collaborative procurement method, as Lahdenperä (2012) have claimed, denotes a perfect system for the achievement of successful projects outcome.

Therefore, it is possible to state that the link between knowledge transfer and partnering is not only evident in a conceptual and theoretical way (for example analysing the elements of partnering and knowledge transfer), but it can be clearly noticed also from the analysis of the outcomes. In fact, since both partnering and knowledge transfer could bring benefits in projects, a combination of these approach could, hypothetically, represent the winning strategy for projects success.

Concluding, the link between knowledge transfer and partnering should be read in a new perspective that is the connection between *effective* knowledge transfer and *successful* partnering projects.

9. Further Researches

From the analysis it emerged that, despite several studies have been conducted on partnering and knowledge transfer, still there is a gap between the theoretical framework and the working-practices. This shows a need of increasing the practical understanding of partnering and knowledge transfer between the professionals.

This research represents a first step towards a complete understanding of the link between knowledge transfer and partnering projects and it opens to new possible researches development. In fact, further studies are expected to develop this research area and clarify how the connection between knowledge transfer and partnering could contribute to the improvement of the project performances. For example, further research should analyse, in an empirical way, how the adoption of partnering can specifically influence the knowledge transfer within a single project (internal) or among different projects (external). In addition, it could be valuable to verify, through interviews or case studies, the impact of partnering practices on the transfer of *tacit* knowledge, precisely.

The interviews were conducted on ten interview-objects. In total, seven researchers and three practitioners have participated to the interviews. Profound reflections concerning the method of the study, have revealed a series of weaknesses and limitations (chapter 4.4), that could be definitely avoided in the next researches. A larger sample of interview-objects should be involved in the interview-process, and, specifically, it is recommended to increase the number of the interview-objects from the industry (in this research three practitioners have been interviewed). When the sample of interview-objects will be larger, than it is important to have the same number of interviewees ratio from the two different target-groups (academic and industrial context). Finally, the interviews should be also conducted outside the Norwegian context. The presence of these limitations in the research method was mainly caused by time constraints during the development of this study. Therefore, it is believable that these problems could be easily optimised.

Another valuable suggestion for further research is to involve the analysis of specific case studies (supported by qualitative interviews). Perhaps, a sample of partnering construction projects should be selected and examined, with a specific focus on the knowledge transfer process. Through a case studies analysis, it might be possible to understand how knowledge transfer develops in partnering projects and if this collaborative environment positively influences the knowledge transfer process.

Moreover, future researches should study more in depth the second side of the link between knowledge transfer and partnering, substantiating the finding in chapter 5.3.3: *knowledge transfer is essential for successful partnering*. In fact, while the great majority of the interview-objects (nine out of ten) have considered true the statement that *the collaborative environment of partnering positively influences the development of knowledge transfer* (first side of the link), only four out of ten interviews believe that effective knowledge transfer could promote the development of a successful partnering (second side of the link).

Finally, other limitations, as described in chapter 4.4, might be more difficult to overcome. For example, the contingent and intrinsic nature of the topics (partnering and knowledge transfer) represents one of the main constraints while developing researches on this area and it cannot be avoided. However, the complexity of the analysis confers practical significance to the overall research purpose and, considering the academic relevance of these topics, further researches would contribute to narrow the literature gap even further.

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Appendix I. Interview Guideline.

The purpose of the interviews is to understand how experts, from the academic and industrial context, perceive the link between knowledge transfer and partnering projects. The context of the research is the construction industry. The findings of the research will assist practitioners in promoting effective knowledge transfer in partnering projects, increasing the awareness of these practices, toward successful outcome.

The semi-structured interviews are based on seven questions and will last about one hour.

Introduction / personal questions:

- Name.
- Current work position (role).
- Years of experience in project management in general.
- How long have you been working with partnering topic/projects?
- How long have you been working with knowledge transfer topic/projects?

Questions:

1. How do you define partnering in projects?
2. Can you list the key elements / success factors of partnering? (Which are the most relevant elements that can influence the success of partnering?)
3. How do you define knowledge transfer? (in construction projects)
4. Can you list the key elements / success factors of knowledge transfer? (Which are the most relevant elements that can influence the success of knowledge transfer?)
5. How to you describe the link between partnering and knowledge transfer?
6. Which partnering critical factors enhance effective knowledge transfer?
7. How knowledge transfer process influences the success of partnering projects?

Appendix II. Conference paper.

Effective knowledge transfer in successful partnering projects

First Author[a], Second Author[b], Third Author[a,b,]1

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Abstract

The purpose of this study is to determine whether there is a connection between partnering and effective knowledge transfer. Analysing the factors that enable partnering, there are reasons to believe that partnering may help to promote effective knowledge transfer in projects. Collaboration, open communication, and trust are partnering elements that imply effective knowledge transfer and coincidentally lead to successful outcome. The findings will drive practitioners to a greater awareness of partnering practices and assist them in promoting effective knowledge transfer in partnering projects. In order to exceed research limitations, further study could be performed on a larger sample of interviewees.

Keywords: Partnering; knowledge transfer; relational; benefits realization; collaboration

1. Introduction

Partnering is a potential tool for enhancing the efficiency of the construction industry, introducing collaboration and, consequently, tangible benefits in projects [17]. At the same time, effective knowledge transfer could lead to competitive advantage in projects [14]. Naturally, the awareness towards these topics has become increasingly important, especially within the construction industry, characterized by adversarial relationships and conflicting goals between the project participants [25]. The adoption of collaborative relationships along with the implementation of an effective knowledge transfer process could be the formula for the achievement of successful projects outcome. In addition to this, an inducement for improvement could emerge when the link between effective knowledge transfer and successful partnering projects is understood.

While there are many references in the literature to partnering and knowledge transfer separately, it seems that the importance of the link has often been overlooked. This research offers a contribution to this knowledge gap, analysing how effective knowledge transfer and partnering influence each other's. This may support the development of more effective practices in construction projects and lead the practitioners towards a higher awareness.

In order to answer to the main research question, "what is the link between knowledge transfer and project partnering", a systematic literature review will provide a brief insight into the topics, highlighting the critical success factors respectively of partnering and knowledge transfer. The similarity of the key elements demonstrates that a link exists. Because of this, it is worth to analyses more in depth the nature of the connection between knowledge transfer and partnering through a set of qualitative interviews towards academics and practitioners. Finally, the findings from the interviews will be compared with the results from the literature review, in order to clarify the relationship between effective knowledge transfer and success in partnering projects.

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2. Theory

Knowledge is considered as one of the core elements for organizations' competitive advantage [23,24]. Different experts, like Carrillo and Chinowsky [12], attempted to define the concept of knowledge, starting from the distinction between tacit and explicit knowledge. Tacit knowledge is defined as intangible and it is embedded in individuals' experiences and know-how [12,15,23,24]. Contrariwise, explicit knowledge is systematic and formal and it can be transferred through standardized procedures [23,32].

As knowledge constitutes the "mind" of the organization [18], effective knowledge transfer is essential for the creation of successful outcome in projects. Specifically, knowledge can be transferred among individuals, teams, or organization [19,22] and is defined as the process during which one organizations learn from the experience of the other [3,23]. According to Ayas [4], the capability of learning from experience, can guarantee continuous improvement over time, and leads to the creation of business benefits [12].

The unique and temporary nature of projects often makes effective knowledge transfer challenging [6,12,16]. Therefore, it is important that the organizations and individuals involved in the project engages in a constant process of learning [4]. In addition, a greater awareness towards the key success factors could help in achieving effective knowledge transfer in projects [31].

As projects becomes more complex and uncertain [5], the adoption of collaborative forms of project delivery, like partnering, increases, particularly in the construction industry [25]. Consequently, several studies have been conducted concerning the definition of partnering and its implementation in practice. Despite this, there is still no univocal consensus on partnering definition [9,11,20,26,28]. For example, partnering is defined by Black et al. [8] as a procurement method that aims to eliminate adversarial relationships, encouraging the project participants to share common objectives. Similarly, Chan et al. [13] considered partnering as a process of establishing good working relationships. Moreover, Barlow and Jashapara [6] referred to partnering as a variety of managerial practices for the creation of collaboration in projects. According to Bygballe et al. [11], the lack of understanding about partnering concept in the construction industry represents a challenge for the effective project implementation. However, the majority of the authors have recognized that partnering provides different advantages in projects, including improvement of performance in terms of cost, time, and quality [7,8,13,17].

Recently, several authors, like Eriksson [20] and Yeung et al. [30] investigated the relevant key elements for partnering. The success of partnering projects strongly depends on the creation of a shared collaborative culture [7]. In fact, as opposed to traditional procurement methods, partnering assumes a relational focus and encourages collaborative behaviours [1]. Specifically, the performance of the partnering projects depends upon the endurance of the relationships between the participants [7]. For this reasons, it is believable that a change of attitude is necessary in order to build healthy collaborative working relationships in projects [9]. Within partnering culture, based upon trust, cooperation, and common objectives [9], the goal is to establish non-adversarial working relationships, through mutual commitment and open communication [17]. Furthermore, other key elements, like value based procurement, early involvement of contractors, and joint selection of subcontractors may foster the involvement of the various actors into the partnering process [20,25]. A solid network between the participants, characterized by strong non-adversarial relationships between suppliers, architects, and consultants, reinforces the learning in projects, that is the key for added value [11].

Limited contributions from the literature considered the link between effective knowledge transfer and success project partnering. Mowery et al. [27] and Inkpen [24] analysed how "alliances" between manufacturing firms can enhance effective knowledge transfer, while other authors, like Fong [21] and Cheng [16] focused on the knowledge transfer process in construction projects. Moreover, the research

of Barlow and Jashapara [6] analysed the factors that influence knowledge transfer between construction firms, considering the UK context.

3. Research Method

This research is based on findings from a theoretical review and a set of qualitative interviews. First, the literature provided a general framework about the concepts of knowledge transfer and partnering, respectively. Then, in order to completely answer to the research question, the interviews provided a more in depth insight about the relationship between these topics. The methodology used in this research followed the recommendation by Bryman and Bell [10].

Firstly, the research strategy was selected considering the nature of the topic. Since the purpose of the research depended on experts' contributions, a qualitative research strategy was chosen.

The literature review started with the selection of the relevant contributions. Specifically, the majority of articles were searched on scientific databases, like Scopus, Emerald, and Wiley Online Library, using specific key words, for example partnering, knowledge, knowledge transfer, collaboration. At the end of the selection and the screening phase, 32 articles were accepted, from internationally refereed journals (table 1). Afterwards, the main contents from the articles were analysed and coded, according to the purpose of the research. The results from the literature review constituted the basis for the formulation of the interviews.

Table 1. Main international journals.

International Journals	**N. of Articles**
International Journal of Managing Projects in Business	1
Journal of Construction Engineering and Management	1
The learning organization	2
Construction Management and Economics	6
International Journal of Project Management	7
Journal of Management in Engineering	3
Project Management Journal	1
Strategic Management Journal	1

The main purpose of the interviews was to understand how academic and practitioners perceive the link between partnering and knowledge transfer. Specifically, addressing the interviews towards different targets (researchers and professors from the academic context and practitioners from the industry) it is valuable in order to attain two different points of view to the topic, but, at the same time, it could be more complex and time-consuming.

An important step was the selection of the sample of interviewees. Within the academic context, the interview-objects were chosen based on their previous experience as researchers with partnering or collaborative procurement methods and their ability to contribute to the research with valuable and relevant data. The first round of interviews involved two PhD candidate at xxx university, two professors at the same university, one assistant professor at xxx university, and two researchers working at xxx (the largest independent research organization in Scandinavia). All the experts work in the field of project management, and, particularly, two of them have one year of experience with partnering, while the others have worked in this field for more than ten years. The same criterion was used to select the interview-objects from the industry. Three experts project managers, respectively from an international engineering company and a large Norwegian construction company were chosen based on their long term experiences with partnering contract.

Table 2. Sample of interview-objects.

	Role/work position	Experience with partnering	Experience with knowledge transfer
1	PhD candidate	10 years	Not major research area
2	PhD candidate	1 year (more experience with contracts)	Not major research area
3	Senior Scientist	1 year	Long previous experience
4	Professor	15 years	Some researches in the area
5	Senior Researcher	Experience with contracts in construction projects	Not major research area
6	Professor	20 years	15 years
7	Assistant Professor	12 years	Not major research area
8	Project Management Consultant	10 years	Not major work area
9	Project Manager	14 years	Not major work area
10	Project Leader	12 years	Not major work area

The interviews were conducted by a single interviewer using a semi-structured approach [10]. The interview guideline included seven open-ended questions [10]; general open-ended questions, like "how do you define partnering/knowledge transfer?" were asked at the beginning of each interview, in order to create a common basis for the comparison of findings. The last questions, for example, "how knowledge transfer process influences the success of partnering project?", presented a higher degree of openness, thus the interview-objects could freely express their own opinion.

The use of specific expedients has guaranteed unbiased results. First, (1) one interviewer carried out the interviews and coded the findings. Using a different strategy when addressing the interview-objects' answers or assessing the findings using a different method could strongly influence the results of the research. Second, (2) the interviewees did not have access to the interview guideline in advance. Therefore, the interview-objects could not prepare the answers, but better provide their own unbiased opinions to the questions. Finally, (3) the coding process were done in parallel with the interview process. This helped to optimize the interview guideline and obtain meaningful results. Afterwards, when all the data were available, it was important to interpret the findings, always taking into account the main research question.

This research presented some practical limitations, that could to some extent influence the results. As mentioned, the research mostly took place within the Norwegian academic and industrial context. In particular, the interviews involved only three representatives from the construction companies, while seven interview-objects were professors and researchers. Lastly, only one interviewee has direct experience with knowledge transfer, although all the experts have collaborated in researches or discussions about the topic.

4. Findings

The purpose of this thesis was to understand whether a link exists between knowledge transfer and partnering, and, furthermore, how the experts perceive this link. In particular, the findings answered to the following research sub-questions: does a link exist between knowledge transfer and partnering in projects? (RQ1), which partnering key elements enhance effective knowledge transfer? (RQ2), and how knowledge transfer and partnering in projects influence each other's? (RQ3). The findings from the interviews are summarized in the table 3.

Table 3. Findings from the interview.

	Findings	**Interview-objects**	
Finding 1.	a link exists between knowledge transfer and partnering projects	9/10	RQ1
Finding 2.	cooperation, open communication, trust, and co-location are only some of the partnering key elements that can influence knowledge transfer	8/10	RQ2
Finding 3.	the link is a loop	4/10	RQ3
Finding 4.	partnering collaborative environment influences positively the development of knowledge transfer	9/10	RQ3
Finding 5.	knowledge transfer is essential for successful partnering	4/10	RQ3
Finding 6.	a precise definition of partnering is still missing	10/10	-

As response to the first research question, nine out of ten interview-objects perceived that a link exists between effective knowledge transfer and successful partnering projects.

Moreover, as a result, eight out of ten interview-objects agreed that several partnering elements, like cooperation, open communication, workshops, common goals, trust, and co-location, could affect the knowledge transfer process within a project.

Regarding the nature of the connection, only four of the interview-objects presumed the link between partnering and knowledge transfer as a loop. Specifically, nine out of ten experts agreed that is the collaborative partnering environment that enhances effective knowledge transfer. According to them, the partnering spirit (based on openness, trust, and cooperation) provides the perfect conditions for the exchange of knowledge and expertise between the project participants. Similarly, high commitment, common-goals, early involvement of project participants, and, in particular the co-location, are other key elements that, according to the interview-objects, could increase effective knowledge transfer in partnering.

On the other side, four out of ten experts stated that effective knowledge transfer strongly influences the achievement of success in partnering projects. In particular, one of the researcher have considered knowledge transfer as a key element of partnering itself, affirming that partnering is not complete if it does not involve effective knowledge transfer in a certain level; while another interview-object affirmed that, in specific cases, knowledge transfer represents the purpose of adopting partnering as project procurement method.

According to the experts, an open communication between the project participants in partnering could lead to an improved knowledge transfer process. Moreover, five out of seven interview-objects explained that the co-location of project participants shortens the communication-line, leading to easier transfer of knowledge. Thus, six interviews-objects considered workshops, seminars, and meeting (both formal and informal) as a way to allow project participants to share information, discuss, and improve project practices. Continuing, the interviewees agreed that an open culture and willingness to share information is also essential for effective knowledge transfer in partnering.

In particular, trust is considered by all the interview-objects as essential for the definition of the link between effective knowledge transfer and partnering. In fact, trust is defined as a critical success factor for partnering in projects, and, at the same time, trustful relationships between project participants could strongly improve the knowledge transfer process.

Finally, the interview-objects agreed that a univocal definition of partnering is still missing. In particular, while a practitioner from the construction industry stated that it could be challenging to define partnering, another project manager was not able to provide a specific definition of partnering. Likewise, the last interviewee underlined that the presence of more than one definition of partnering could lead to

more than one understanding, and, therefore, increase the complexity in implementing partnering in practice. Despite the lack of a common definition, the interviewees agreed that partnering could bring benefits to the project. However, one expert was even sceptical about the use of partnering and the possibility of increasing the value of the project through collaboration.

5. Discussion

The main purpose of this research was to examine the nature of the link between effective knowledge transfer and successful partnering projects in the construction industry. In particular, the research aims to increase the awareness toward these topics, since their significant influence on the project success. In effect, adopting partnering in construction projects is a way of introducing collaborative relationships and, consequently, tangible benefits [7,8,13,17]. Similarly, knowledge transfer is essential for the creation of successful outcome in project [4]

The expression "critical success factors" refers to those key elements absolutely necessary in order to reach a goal [2]. Therefore, considering their great impact on partnering and knowledge transfer, the focus on these factors seemed significant [7]. From both the literature review and the interviews, a similarity emerged between the critical success factors that are designed for the success of partnering and knowledge transfer. A collaborative environment, open communication, and trust are identified as some partnering elements that imply effective knowledge transfer in projects and coincidentally lead to successful outcome. This showed that a link could exist. More specifically, the common elements identified from the literature review are to some extent similar to the elements recognized by the interviewees, although the experts from the industry gave more attention to the contractual elements. Collaboration, trust, and open communication are some of the common relational elements in effective knowledge transfer and partnering, whilst contractual elements are, for example, the early involvement of the suppliers, a value-based procurement, and target cost. This distinction depends from the point of view of the interview-objects towards partnering practices. For example, partnering could be seen more as a process, with the contractual part simply a feature of the relationships between project participants [6]. Conversely, it is possible to assume that the contractual agreements could influence the collaborative relationships in partnering [29]. However, in general, the connection between effective knowledge transfer and success in partnering can be affected from both soft and hard elements.

More in depth, the focus shifted towards the analysis of the link between effective knowledge transfer and partnering. In particular, as mentioned in the previous chapter, the literature review presented few articles concerning the main purpose of the research. While there are many contributions that focus on the alliances between manufacturing firms [24,27], it is more difficult to find information regarding the link between effective knowledge transfer and partnering. In their research, Barlow and Jashapara [6] reported that there is a growing awareness about the role that partnering can play in promoting learning, within the individual, team, and organizational level. Moreover, Chen et al. [14] asserted that the knowledge transfer mechanism is positively correlated to the cooperation level between partnering firms.

From the interviews, different opinions emerged about the link between effective knowledge transfer and successful partnering projects. Firstly, the experts believe that specific partnering elements enhance effective knowledge transfer, in particular with regard to tacit knowledge. Specifically, factors like co-location or open communication allow people to work closely, establishing collaborative relationships, trust, and effective team working. Thus, partnering culture promotes sharing and transfer of knowledge. However, the project participants must be willing to commit themselves in changing attitude [9]. Within this environment, it is believable that the parties will also be willing to implement an effective knowledge transfer process. On the other side, the interview-objects stated that effective knowledge

transfer in project favours the development of successful partnering. When two or more organizations develop optimal practices for the transfer of knowledge, it would be more likely for them to be engaged in a successful collaboration. Concerning this, the success key factors for knowledge transfer will assume high relevance in the development of partnering.

Similarly, another point of view is to consider knowledge transfer as a critical success factor for partnering projects. However, as one of the interviewees stated, this is difficult to affirm, since effective knowledge transfer is required within every projects. Furthermore, in accordance to Barlow and Jashapara [6], partnering can be adopted with the purpose of improving the knowledge transfer process. In fact, since partnering practices provide access to a broader spectrum of knowledge (from designers, suppliers, constructors, and so on), the knowledge transfer can be improved providing mutual benefits to the involved organization.

6. Conclusion

This research intended to clarify the nature of the relationship between effective knowledge transfer and successful partnering projects in the context of the construction industry. What emerged, from the literature review and the set of interviews, is that a strong link exists, and, more specifically, that this could, to some extent, be defined as a loop.

The key success factors, like trust, collaboration, open communication, and co-location, are crucial for the creation of partnering culture. Within this context, the knowledge transfer process is, according to the experts, enhanced. At the same time, the presence of effective knowledge transfer could constitute the basis for the implementation of a successful partnering project.

In brief, according to the experts, knowledge transfer and partnering mutually influence each other's. While effective knowledge transfer enhances partnering performances, at the same time the partnering collaborative culture facilitates in different ways the effective sharing of experiences and knowledge and creates a learning culture [6]. In fact, it is not possible to exclude effective knowledge transfer from successful partnering projects.

The relevance of partnering practices and knowledge transfer process in promoting project success is often underlined in this research. It is probable that, showing the strong connection between effective knowledge transfer and success in partnering, will serve as inducement for the practitioners to improve these practices and, possibly, achieve successful outcome in projects.

Finally, in order to exceed the research's limitation, further studies on this topic should include a larger sample of interviewees. For example, a greater number of experts from the construction industry should be involved and the analysis should be expanded outside the Norwegian context.

6. References

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