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Abstract

Purpose: The paper aims at identifying knowledge sharing barriers and enablers in an interorganizational setting at different levels of units. For this purpose, the interorganizational setting of Peshawar Bus Rapid Transit project in Pakistan is examined.

Design/methodology/approach: This study adopts an exploratory single case study approach. The empirical data comprises semi-structured interviews and archival documents. Thematic analysis is used for analyzing the data.

Findings: The findings identify distinct knowledge sharing barriers and enablers at different level of units (individual, team, organizational and interorganizational). Based on the findings, an integrative framework of knowledge sharing barriers, enablers, and levels of units is proposed. Furthermore, the findings provide guidance to managers as they show how different knowledge sharing barriers and enablers are important at different levels of units.

Originality: This study novelty lies in determining separate sets of knowledge sharing barriers and enablers at different level of units in an interorganizational project. This study contributes to the literature on knowledge sharing by studying an interorganizational project.

Keywords: Knowledge sharing, Knowledge sharing barriers, Knowledge sharing enablers, Levels of units, Interorganizational project.

Introduction

Knowledge is a complex, cross-functional and multifaceted concept with multilayered meanings (Nonaka, 1994; Alavi and Leidner, 2001). It is made up of experiences, information, values, and systematic attitudes that provide a proper framework for the evaluation of information and experience (Xue, 2017), which can be used in making decisions and forming actions (Chang and Lin, 2015). Knowledge is often classified into tacit and explicit knowledge (Nonaka and Takeuchi, 1995; Shujahat *et al*., 2017). Tacit knowledge is known as soft, sticky and experience-based knowledge which is undocumented and difficult to express (Nonaka, 1994) such as an individual experience, skills, insights, etc. of the project (Iftikhar and Ahola, 2020). In contrast, explicit knowledge is known as hard knowledge and can be documented (Nonaka and Von Krogh, 2009) such as design, drawings, reports, etc. of the project (Iftikhar and Ahola, 2020). Moreover, knowledge management is required to ensure the right flow of knowledge to the right person at the right time and in the right place (Shujahat *et al*., 2017). Knowledge management is an organizational discipline that aims to acquire, share, store, use and discard knowledge that is recognized as being important in generating value for organizations (Easterby-Smith *et al*., 2008). The management and processing of organizational knowledge is increasingly being viewed as critical to organizational success. Although most knowledge management processes are effective (Inkpen and Dinur, 1998), academic attention is particularly given to knowledge management processes which aim to improve organizational performance (Shujahat *et al*., 2017).

Researchers have investigated knowledge management factors such as enablers, processes, and performance (Szulanski, 1996). Prior research has mainly been concerned with storing, sharing, and creating knowledge (Argote *et al*., 2003; Shujahat *et al*., 2017), knowledge application (Alavi and Leidner, 2001), knowledge integration and acquisition (Grant, 1996), knowledge management barriers (Oliva and Kotabe, 2019) and knowledge sharing barriers and enablers (Riege, 2005; Lilleoere and Hansen, 2011). In addition, recent research on interorganizational projects has mainly focused on interorganizational relationships (Lumineau and Oliveira, 2018), interorganizational collaborations (Van Marrewijk *et al*., 2016), interorganizational team building (Manning, 2017) and interorganizational knowledge sharing (Swan *et al*., 2010; Iftikhar and Ahola, 2020). Despite growing interest in interorganizational projects, there is limited research on interorganizational knowledge sharing barriers (factors that prevent knowledge sharing) and enablers (factors that facilitate knowledge sharing) particularly in small medium enterprises (Jaegersberg and Ure, 2011), high-tech multinational corporations (Teagarden *et al*., 2008), the shipbuilding industry (Solli-Sæther *et al*., 2015) and the oil and gas industry (Olaniran, 2017).

Interorganizational projects are temporary and complex, involve interdependent tasks (Lundin and Söderholm, 1995; Jones and Lichtenstein, 2008), and typically involve several heterogeneous organizations (Manning, 2017). These temporary organizations are formed for completing a unique and complex task (Turner, 2006); defined as a set of organizational actors working together on a complex task over a limited period of time (Grabher, 2002). Shujahat *et al*. (2017) described how all elements of knowledge management processes complement each other and are as important as each other; however, knowledge sharing is more significant, as knowledge residing within an organization is of no importance until shared. Knowledge sharing is a focal element of knowledge management (Alavi and Leidner, 2001), which has the potential to lower costs, optimize processes, etc., whereas lack of sharing may harm organizations and even render their processes ineffective (Rutten *et al*., 2016). Knowledge sharing through an interorganizational setting can bring organizations the competitiveness they could not achieve alone. The literature on interorganizational knowledge sharing has widely recognized the critical role of an organization's external constituents, such as competitors, suppliers, and customers, as a source of knowledge and competitiveness (Feng *et al*., 2010). It is believed to enhance the creation of knowledge. Hall (2001, p. 19) puts it succinctly by stating: "knowledge creates knowledge only when it is shared". Without knowledge sharing it is difficult for an organization to take full advantage of knowledge creation (Dow and Pallaschke, 2010).

Knowledge sharing in interorganizational contexts has become increasingly relevant. To ensure that knowledge can be smoothly communicated and exchanged between employees within and across organizations, the impact of knowledge sharing barriers and enablers needs to be well understood, as interorganizational projects encounter challenges in terms of knowledge sharing (Alsharo *et al*., 2017). The raison d'être of an interorganizational project is different because it includes diverse participants who have disparate interests and represent various organizational identities, obligations, and commitments (Hu *et al*., 2019). Moreover, there is a paucity of research on knowledge sharing in interorganizational projects because interorganizational knowledge

sharing is more difficult than intra-organizational knowledge sharing (Easterby-Smith *et al*., 2008). Thus, the current research available consists of: (i) knowledge sharing barriers and enablers within an organization, leaving the interorganizational level out of the scope (Szulanski, 1996; Vuori *et al*., 2019); (ii) studies that primarily address knowledge sharing barriers at individual, organizational and technological levels (Riege, 2005) with little guidance on how to overcome knowledge sharing barriers; and (iii) focusing on specific barriers such as organizational culture (De Long and Fahey, 2000; Sun and Scott, 2005) and national culture (Michailova and Husted, 2003; Moeller and Svahn, 2004). This suggests a need to (i) identify factors for knowledge sharing barriers and enablers in temporary interorganizational projects, and (ii) conduct empirical research to address factors that can facilitate knowledge sharing and overcome barriers to eventually increase the effectiveness of knowledge sharing practices.

This paper investigates and provides deeper insights about knowledge sharing barriers and enablers at different levels of units (individual, team, organization and across organizations) in an interorganizational project where knowledge sharing takes place between organizations that are cooperating and competing (i.e., co-opetition) simultaneously (Vuori *et al*., 2019). Together with providing a theoretical framework and empirical evidence of knowledge sharing barriers and enablers within an interorganizational setting, this paper 's originality lies in considering different levels of units: individual, team, organization, and across organizations.

This paper answers the following research question:
What are the knowledge sharing barriers and enablers at different levels of units in an interorganizational project?

The unit of analysis is an interorganizational project as a nexus of activities that allows multiple organizations to collaborate to achieve their individual and collective goals. Our study makes four contributions. The first is to identify different sets of knowledge sharing barriers and enablers. Second, we present knowledge sharing barriers and enablers at different levels of units: individual, team, organizational, and interorganizational; team and interorganizational levels have been largely ignored in previous research. Third, this paper presents a comprehensive framework of interorganizational knowledge sharing barriers and enablers. The development of the framework is an effort to refine and extend knowledge management processes in general and knowledge sharing processes in an interorganizational setting in particular. Finally, this research supports managerial efforts by offering guidelines that facilitate knowledge sharing among diverse participants with divergent interests for interorganizational projects.

Literature review

Knowledge sharing

Knowledge sharing is defined as the provision and reception of know-what and know-how to enable organizational members to perform tasks (Foss *et al*., 2010). It includes dissemination of existing knowledge among organizations and bringing of new knowledge into each organization (Rosen *et al*., 2007). Knowledge sharing is the means by which organizations obtain access to their

own and to other organizations' knowledge (Nooshinfard and Nemati-Anaraki, 2014). It is the process of making knowledge, skills, expertise, and information available to others (Lee *et al*., 2018). It is a voluntary and conscious act of disseminating and exchanging knowledge among individuals or networks of individuals, from small groups of people to the wider organization and across organizations (Alavi *et al*., 2005). The main purpose in sharing knowledge is to make the knowledge visible, to show the role of knowledge in organizations and to encourage employees to foster behaviors such as knowledge sharing and building the knowledge infrastructure (Argote *et al*., 2003).

Moreover, knowledge can be shared at four different levels of units: individual, team, organizational, and interorganizational (including important customers, suppliers, competitors, etc.), which enhances their capacity to define a situation and apply their knowledge to solve the problem (Hedlund, 1994). Knowledge sharing at the individual level is defined as an act that can lead to new experience or understanding for the knowledge sharing recipient. At team level, knowledge sharing depends on the interaction between the members of a project and their leader (Nooshinfard and Nemati-Anaraki, 2014). In an organizational context, individuals share organizationally relevant information, ideas, suggestions, and expertise with one another (Bartol and Srivastava, 2002). At interorganizational level, knowledge sharing occurs through contractual relations with partners, such as subcontractors, suppliers, or clients (Nooshinfard and Nemati-Anaraki, 2014).

Knowledge exists not only within organizational boundaries, but also outside the organization (Silva *et al*., 2018). Internal knowledge generated within an organization is generally controlled by the organization itself. External knowledge originates from the interaction of the organization with its external environment and is controlled by other entities, such as competitors, sponsors, clients, contractors, universities, research laboratories, suppliers, and customers (Ardito and Petruzzelli, 2017). Knowledge sharing is a process through which internal and external knowledge is communicated, executed by disseminating knowledge from the organization, whether the source is internal or external (Silva *et al*., 2018). In an interorganizational project, external knowledge sources are required to share knowledge with different stakeholders such as clients, contractors, sub-contractors, and consultants (Manning, 2017). Organizations cannot focus on the creation of internal knowledge alone; they also have to seek complementary knowledge from outside the organization (Cohen and Levinthal, 1990). Hence, it is important for an organization to manage knowledge internally, and equally important to effectively manage external knowledge (Papa *et al*., 2018). Typically, in an interorganizational project, knowledge sharing is especially important in where multiple organizations work together to perform complex and temporary tasks (Nesheim and Hunskaar, 2015), which cannot be achieved by the stand-alone organizations.

Knowledge sharing barriers

Knowledge sharing can be complicated by the existence of knowledge barriers. Paulin and Suneson (2012, p. 82) describe a knowledge barrier as follows: "where there is a knowledge barrier, new information cannot be understood or interpreted". Knowledge barriers are factors that

hinder knowledge sharing from source to recipient (Szulanski, 2003; Riege, 2005), and, consequently, diminish the likelihood of network members benefiting from collaboration, as they inhibit the understanding and interpreting of new information (Paulin and Suneson, 2012). Knowledge barrier can be an explicit barrier or the absence of a critical success factor in knowledge sharing (Schwartz, 2007). If knowledge sharing is not supported efficiently, the probability of the presence of knowledge barriers increases (Vuori *et al*., 2019). Some of these barriers include: no knowledge of where knowledge is available, no knowledge about the existence of valuable knowledge (O'Dell and Grayson, 1998; Gupta and Govindarajan, 2000), not having access to knowledge (Hansen *et al*., 1999), the epistemological differences between tacit and explicit knowledge (Nonaka and Takeuchi, 1995; Szulanski, 2003), and large physical and social distances between individuals (McLaughlin *et al*., 2008).

Riege (2005) categorized knowledge barriers into individual, organizational and technological barriers with a view to assisting and improving existing practices regarding knowledge sharing and identifying the possible hurdles. This is termed as "the triad of knowledge-sharing barriers". At an individual level, knowledge sharing barriers are often related to factors such as lack of communication skills and social networks, differences in national culture, overemphasis on the status of particular positions, and lack of time and trust. At an organizational level, barriers tend to be linked to, economic viability, lack of infrastructure and resources, accessibility of formal and informal meeting spaces, and physical environment. At a technological level, barriers seem to correlate with factors such as unwillingness to use applications due to a mismatch with need requirements, unrealistic expectations of IS/IT systems, and difficulties in building, integrating and modifying technology-based systems (Riege, 2005).

Moreover, Zhang *et al*. (2005) summarize interorganizational knowledge sharing barriers into three categories: technological, organizational, and legal and policy barriers. Technological barriers include adaptability of IT systems to change and ability of professionals to maintain adequate levels of expertise (Holden *et al*., 2003). Knowledge sharing initiatives represent a new way of thinking and require radical process and behavioral changes. Frequently, organizations and individuals resist change because of structural conflicts, managerial practices and evaluation and incentive systems that discourage sharing. Adding to such complexity, interorganizational knowledge sharing initiatives may involve large numbers of organizations with diverse missions, goals and priorities. Legislation and policies can influence the process of interorganizational knowledge sharing. On one hand, the existence of stable and accountable legal or policy guidance about who can access what information can alleviate issues related to risk taking and trust development (Rousseau *et al*., 1998). On the other hand, legal factors can harm the development of collaboration, if they create rigidity (Sitkin and Roth, 1993).

Knowledge sharing enablers

Knowledge sharing enablers are defined as mechanisms that facilitate knowledge sharing within an organization (Lin, 2007). According to Lilleoere and Hansen (2011), knowledge sharing enablers are anything that supports and facilitates the sharing of knowledge at individual, team and

organizational levels. Some authors use terms, such as facilitators (Pinho *et al*., 2012) or catalysts (Yeh *et al*., 2006) to indicate positive factors that can significantly contribute to fostering knowledge sharing processes (Cavaliere *et al*., 2015).

Von Krogh *et al*. (2000) proposed relationships exhibiting a high degree of care for the other, i.e., mutual trust, active empathy, access to help, leniency in judgment and courage, as enablers of knowledge sharing. An employee feels motivated to share knowledge once he or she has a good relationship with another person (Deci and Flaste, 1995), or social relations have proven to be helpful (Von Krogh *et al*., 2000). Incentives can also facilitate an individual's willingness to participate in knowledge sharing (Cabrera and Cabrera, 2002). Furthermore, shared identity often facilitates knowledge sharing, as individuals within a team understand each other better than people from outside the team, i.e., people are embedded in the same practice, speak the same technical language, and have a similar identity (Adler and Kwon, 2002). Lilleoere and Hansen (2011) demonstrate the interdependencies of knowledge sharing enablers with synergistic influences on knowledge sharing. These links are valuable as it may take little effort to significantly increase the impact on knowledge sharing practices. Cavaliere *et al*. (2015) considered three different critical enablers: individual, organizational and technological, as an extension of Riege's (2005) work on barriers, following the idea that barriers and enablers are two sides of the same coin and can be examined in parallel.

Interorganizational projects

An interorganizational project is defined as a project in which multiple organizations temporarily work together on a shared activity to coordinate and realize complex products and services (Jones and Lichtenstein, 2008). An interorganizational network leads to outcomes that could not have been achieved by individual organizations (Schulz and Geithner, 2010). It requires constellations of different organizations to work together to pool various resources and types of expertise to complete the project successfully (Oliveira and Lumineau, 2017). However, each organization focuses on its distinctive competency, leaving secondary activities to others that specialize in those activities; it is an integrated effort to produce a product or service (Barringer and Harrison, 2000). An interorganizational project involves multiple legally independent, yet functionally interdependent, organizations working towards the accomplishment of complex products and services (Jones and Lichtenstein, 2008; Lumineau and Oliveira, 2018). Central characteristics of interorganizational projects are (a) temporariness: projects are temporary because they have a specific beginning and a defined endpoint (Lundin and Söderholm, 1995); and (b) temporal embeddedness: this refers to the time periods before and after a focal project, during which the participants may already have worked together or may expect to work together again (Jones and Lichtenstein, 2008). An important feature of interorganizational projects is the flexibility they offer, i.e., lead organizations create and recreate new organizational structures around the demands of a project or the needs of clients, and because the project is a *temporary* organizational setting, organizing through projects is thus inherently flexible and reconfigurable (Bechky, 2006). When new projects are initiated, lead organizations can select the partner organizations which they

perceive to be best suited to performing the task at hand, and these partner organizations can adapt their involvement in different projects to their capacities (Ligthart *et al*., 2016).

The literature on interorganizational knowledge sharing has widely recognized the critical role of a firm's external constituents, such as suppliers, clients, customers, etc., as a source of knowledge and competitiveness (Feng *et al*., 2010; Manning, 2017). Interorganizational knowledge sharing involves two or more organizations that may be from the same branch, from complementary branches or even from competing organizations (Lawson *et al*., 2009; Husted and Michailova, 2010). An interorganizational network is a form of aggregated structure, where a set of organizations are linked to each other through multiple interconnected relationships. These relationships are the key building blocks of networks. It is typical for an organization to have relationships with different types of actors, for example with customers, distributors, suppliers, competitors, etc., which usually share common interests and, hence, motivate them to establish and engage in network relationships for their mutual benefit (Johanson and Vahlne, 2003). Such relationships are a common means of enlarging the resource base of the organizations through the exchange of different kinds of resources such as money, goods, services, and knowledge (Håkansson and Ford, 2002) to cope with the tasks required in a complex project. However, knowledge sharing barriers and enablers, such as knowledge protection, network proximity, trust, etc., make it difficult to share knowledge in an interorganizational setting. When an organization seeks external knowledge from a network to complement its own resource base, it simultaneously faces the risk of exposing its critical knowledge to others (Quintas *et al*., 1997; Husted and Michailova, 2010). In some cases, knowledge protection can hinder the sharing of even non-critical knowledge, especially in a coopetition setting (i.e., members of the network are simultaneously cooperating and competing) (Solitander and Tidström, 2010). The likelihood of coincidental knowledge spillovers increases alongside the proximity of the network (Liao, 2010), and proximity may thus lead to excessive knowledge protection, causing risks for knowledge sharing (Trkman and Desouza, 2012). Trust also impacts the existence of knowledge barriers and enablers (van Wijk *et al*., 2008; Solitander and Tidström, 2010); consequently, the level of knowledge sharing within the network is an uncertain outcome due to hindering and facilitating contradictory forces.

Methodology

Research design

Since knowledge sharing in an interorganizational project is built upon the existence of social actors, a subjective, socially constructive position is preferred for this research. We conducted an in-depth single case study to identify knowledge sharing barriers and enablers in an interorganizational project. The case study method is particularly suited to addressing research questions that require detailed understanding, because of the richness of data that can be collected in a case study context (Hartley, 2004). Limitations of a single case study are acknowledged (Yin, 2009); however, we believe that findings with this paper are applicable across similar types of interorganizational setting facing many of the same issues. We selected this case to explore

knowledge sharing barriers and enablers in an interorganizational project, focusing on factors that could hinder and facilitate knowledge sharing when multiple organizations are involved. When closely examining the data from several organizations, the scope of the analysis is broadened, through the contextual novelty of the studied environment, as well as its potential for enhancing the understanding of interorganizational knowledge sharing dynamics. The Peshawar Bus Rapid Transit project is a typical interorganizational project that allows us to cover two of the three critical categories of factors (individual and organizational (Riege, 2005) and managing a complex set of resources due to the number of organizations involved and the complexity of their interconnections. We address our research questions through an interpretivist inductive and in-depth study.

Case description: Peshawar Bus Rapid Transit Project

The Bus Rapid Transit (BRT) was constructed in Peshawar, the 6th largest city in Pakistan, with a population of over 2 million. The BRT corridor of 25.8km is designed as a signal free corridor. A total of 32 stations were designed, including 26 at grade, 5 elevated and 1 underground stations. The project included the construction of the dedicated BRT with seven BRT feeder routes integrated with the main corridor, covering major trip generation areas of the city. The BRT is designed to carry up to 21,000 passengers per hour per direction. The total cost of the project was Rs. 57.86 billion (USD 587 million), with the project being expected to be completed in a span of 12 months, starting in mid-2017. The old transportation system had faced multiple problems, such as lack of planning and regulation, absence of public transport infrastructure, poor design and management of road infrastructure, no traffic management and reliance on private vehicles, which were ultimately causing dire traffic congestion, as well as severe environmental issues. Therefore, there was a need to address these problems in a holistic manner via the BRT. The BRT project aimed to: (i) introduce a well-planned and designed, efficient, reliable, and comfortable user-friendly bus rapid transit system which would be integrated with existing transport facilities; (ii) reduce travel time and delays for the whole transport system in Peshawar, and (iii) improve the quality of life of commuters in Peshawar. The BRT project comprised 11 different organizations consisting of a client, a designer (foreign-based organization), a consultant, two sponsoring agencies, two executing agencies and four different contractors. The civil works were divided into 4 reaches (sub-projects) assigned to contractors. The BRT became operational in August 2020 (archival data).

Interorganizational project as temporary organization do have a time limitation because they have a specific beginning and a defined endpoint which is known to all project participants and rely on teamwork – interdependent sets of people working together (Cummings and Pletcher, 2011). When the project finishes, the team dissolves, and its members move on to other projects or are reabsorbed into the organization (Brady and Davies, 2004). In the case of Peshawar BRT project, temporary organization venture is interorganizational project where several multiple organizations are involved and impact the environment of temporary organization.

Data collection

We collected data using interviews and archival documents. We relied on interviews as the primary source of data. The archival data served as an important source for building the case background. We conducted 11 interviews with 11 participants, ranging from 26 minutes to 88 minutes in length (details are provided in Table I). We conducted interviews with project director, project manager, general managers, and other team members (deputy project manager, deputy project directors, project coordinator, director of coordination and transport planning specialist). Informants included members of the executing agencies, the consultant, and the contractors. The interviews were semi-structured. Informants were asked a core set of structured questions and open-ended probes. We also encouraged informants to use their own terminology and to steer the interview toward issues and concepts that they felt best represented their own experiences. Initially, we utilized a snowball technique, asking each informant who they believed could help us to understand knowledge sharing barriers and enablers. The interviews were recorded and transcribed. Ethical guidelines were followed. Harm to participants, informed consent**,** invasion of privacy and deception were carefully considered to minimize the risk of breaking ethical and societal principles.

Insert Table I about here

We also utilized archival sources of data provided by informants. The archival data consists of 15 internal and publicly available data, including an environmental impact assessment report, design details (preliminary design report, design layout and drawings), an economic and financial analysis, a conceptual report, a project administration manual, a pre-feasibility study, and a planning commission (PC-1) document. We asked the executing agencies, consultant, and contractors to provide necessary documents. Archival data was useful in developing a better background of the case context.

Data analysis

For data analysis, we used thematic analysis. Thematic analysis systematically identifies, organizes, and offers insights into meaningful patterns (themes) (Braun and Clarke, 2012). The thematic analysis in this study was highly inductive (Howitt and Cramer, 2007), and was driven by what is in the data, meaning that the themes identified emerged from the content of the data (Braun and Clarke, 2012). We followed Braun and Clarke's (2012) practical guide for applying thematic analysis. First, the transcriptions were read and explored inductively to identify knowledge sharing barriers and enablers. Second, we coded data, keeping in view research questions that we wanted to answer. Third, we found patterns in the coding and based on that we developed sub-themes of knowledge sharing barriers and enablers. Fourth, by reviewing the sub-themes, the main themes were defined. Table II below illustrates how the sub-themes are derived from interview transcriptions and how these sub-themes then lead to themes.

Insert Table II about here

Findings

Our findings provide evidence of knowledge sharing barriers and enablers in an interorganizational setting. Iftikhar and Ahola (2020) comprehensively described interorganizational knowledge sharing at individual, team, organizational and interorganizational levels (including important customers, suppliers, competitors, etc.). At individual and team level, knowledge sharing requires the employees' motivation to actively communicate with colleagues, as well as to consult with colleagues to learn from them. At organizational level, knowledge sharing includes capturing, organizing, reusing and disseminating the knowledge which resides within the organization (Razmerita *et al*., 2016). The interorganizational domain is also critical for sharing valuable knowledge with partners, such as subcontractors, suppliers, or clients, to develop new capabilities and opportunities for effective actions (Cheng *et al*., 2008).

Knowledge sharing barriers

We categorize knowledge sharing barriers into four levels: (i) individual, (ii) team, (iii) organizational and (iv) interorganizational. Among the individual level barriers, we find sub-themes of individuals' motivation and job insecurity. Team level barriers comprise time constraints and lack of trust. Organizational level barriers are organizational culture and organizational structure, and interorganizational level barriers are conventional mediums, conflict of interest, language barriers and time zone differences.

Individual level barriers

An individual is the source of the knowledge but distribution of the right knowledge from the right people to the right people at the right time is one of the biggest challenges in knowledge sharing (Riege, 2005). We identify two major barriers that encourage individuals to hoard their knowledge, their motivation and job insecurity.

Individual's motivation

Individuals need to be sufficiently motivated to share knowledge (Terhorst *et al*., 2018). Individuals prevent sharing of knowledge due to personal motivation and interest, depending on their personalities, communication skills and ability to interact with others (Argote *et al*., 1990). If employees are not motivated to share their knowledge, no amount of investment, infrastructure or technological intervention will change this (Nooshinfard and Nemati-Anaraki, 2014). Personal interests and behavior are thus important issues for knowledge sharing. This individual barrier is supported by our findings, as illustrated below:

> The most important thing is your personal behavior. What is your personal behavior towards knowledge, or how is your personal interaction with different people? Either you want to share your knowledge, or you do not want to share knowledge, from which perspective others are asking? (Deputy director 1, Executing agency 1)

Job insecurity

There is a fear amongst employees that sharing knowledge reduces job security, so that they risk losing their position, power, or status within the organization (Tiwana, 2002); they fear that other

employees will outperform them because people are uncertain about the sharing objectives and intentions of others (Lelic, 2001). Interviewees agree on job insecurity as being an individual barrier, as one of the informants illustrated:

> People are hesitant to share knowledge because if they will share then the other person will be on the same level... Mostly seniors do not share knowledge with juniors because they are producing their competitors and replacements. For that very reason, they are hiding their knowledge. (Deputy Director 2, Executing agency 1)

Team level barriers

Teams provide an opportunity for collaboration and communication among team members (Senge, 1990). Rosen *et al*. (2007) argued that assigned constraints (i.e., time, trust and failure to develop a transactive memory system) affect how people relate to each other in teams and thus represent barriers to knowledge sharing in teams. As team members become familiar with one another and develop trusting relationships, they become comfortable in knowledge sharing (Propp, 1999). Time constraints and lack of trust are team level barriers.

Time constraints

Time is identified as a barrier (Riege, 2005). O'Dell and Grayson (1998) highlighted, that managers are aware of the benefits of knowledge sharing, but they often struggle because of time constraints. They are generally overloaded with work and have difficulty finding time to share knowledge. Time restrictions are also a reason why people may potentially hoard their knowledge rather than spend time sharing it with others. This causes people to focus on those tasks that are more beneficial to themselves (Michailova and Husted, 2003; Bloice and Burnett, 2016). We find that time constraints are a team barrier, as one of the informants stated below:

> Basically, in this project… there was a challenge of time constraint. We had to deliver it within the short span of time. There was huge pressure to achieve timelines. So, in that context, we focused more on achieving timelines… Unfortunately, we did not share because there were certain pressures that people could not absorb and remained in silos with sole focus on completion of the project. (General manager planning & construction, Executing agency 2)

Lack of trust

Trust is a collective phenomenon, it as a faith that "another member will perform an action that is beneficial or at least not detrimental (Imam and Zaheer, 2021). Trust plays an important role in improving the effectiveness of knowledge sharing (Wiewiora *et al*., 2014; Tiwari, 2015; Buvik and Tvedt, 2017). In addition, lack of trust is a knowledge barrier as it hinders knowledge sharing (Teagarden *et al*., 2008). Degree of trust between project team members affects knowledge sharing, and that a low level of trust may mean that team members are unwilling to participate in interdependent actions (Imam and Zaheer, 2021). Our findings clearly identify that most people are unlikely to share their knowledge without a feeling of trust: trust that people will not misuse their knowledge. As illustrated below:

> Pictures are being shared on WhatsApp. Some of the pictures are of very early stages of work, some pictures are to explain what is happening at site and it does not feel right... So, in that picture where it is

> being explained that this problem is going to happen, imagine that picture got uploaded on Facebook, or reached to some media group and then you read about issues in newspapers… Now, a picture can get leaked from anywhere… it gets projected somewhere from a certain angle... So, knowledge gets misused as well. (Deputy project manager, Contractor 2)

Organizational level barriers

Knowledge has to be shared to the wider organization (Crossan *et al*., 1999). Since knowledge alters the beliefs and assumptions of the organization, the organization's worldview changes, and this is reflected in changes in the organization's dominant routines, procedures, and systems (Sun and Scott, 2005).

Organizational structure

Organizational systems and structures can generate barriers by affecting time, flexibility, and complexity (Sun and Scott, 2005). Formal and centralized structures often dampen knowledge sharing, while a more flexible and informal structure facilitates it (Nonaka and Takeuchi, 1995; De Long and Fahey, 2000); organizational structure is important for effective knowledge sharing. However, there is often either "red tape" or unwillingness to share and gather knowledge within and across organizations (Bloice and Burnett, 2016). Michailova and Husted (2003) concluded that managers are often resistant to, and dissatisfied about, working with people from hierarchically lower levels and even more so about learning from them. Our findings suggest that organizational structures can generate barriers, as illustrated below:

> If a person is senior, he will hesitate seeking knowledge from a junior…If there is a junior with higher knowledge and education, and senior can benefit from him, but senior will always hesitate to acquire knowledge from that junior because of different class level. (Deputy director 1, Executing agency 1)

Interorganizational level barriers

The interorganizational domain is also critical for sharing valuable knowledge with partners, such as subcontractors, suppliers, or clients, to develop new capabilities and opportunities for effective actions (Cheng *et al*., 2008). Knowledge sharing is the process of exchanging knowledge and communicating among different organizations (Nooshinfard and Nemati-Anaraki, 2014). Interorganizational barriers operate between organizations (Sun and Scott, 2005). We find sub-themes of communication barriers, conflict of interest, language barriers and time zone differences.

Communication barriers

It is imperative to understand how and in what way participants communicate. Communication barriers are defined as barriers that limit the amount of knowledge shared concerning organizational development and system development. Therefore, understanding the communication patterns is perhaps one way to understand if there are communication barriers in the project (Andersson, 2016). Technology facilitates knowledge sharing and makes it faster, easier and more effective; for example, e-mail systems assist in reducing formal communication barriers (Reige, 2005). However, we found that electronic communication tools such as emails

were not used efficiently, but rather that a paper-based work environment was preferred. As illustrated below:

> There are challenges; if we send emails, they tell us that emails are nothing and if we have the verbal discussions then they tell us that verbal talk has no importance. The way our governments work, papers are must, so we send them the papers. (General manager planning & construction, Executing agency 2)

Conflict of interest

In an interorganizational setting, several organizations are coordinating to accomplish complex tasks (Jones and Lichtenstein, 2008). Each organization has its own unique set of expectations, needs and values (Greenley and Foxall, 1997). Organizations have distinct vested interests; what is important for one might be insignificant for another (Hillman and Keim, 2001); therefore, failure to address these different interests may be detrimental to performance (Clarkson, 1995), as illustrated below:

> We have quite a lot of stakeholders in this project and dealing with them is quite challenging because everyone has their own demands. So, we are trying to fulfill their demands.... There are some stakeholders who are working remotely in different countries, different offices, different cities… it needs a lot of correspondence before you get to conclusion. (Project coordinator, Consultant)

Language barriers and time zone differences

Speaking a foreign language can make it difficult to interact, and therefore work as a barrier to knowledge sharing. Knowledge sharing will be affected due to language and time differences (Solli-Sæther *et al*., 2015). The interorganizational setting leads to specific barriers such as time zone and language barriers. Organizations working in different time zones are a barrier to knowledge dissemination (Espinosa *et al*., 2003; Teagarden *et al*., 2008). Terpstra and David (1991) and Teagarden *et al*. (2008) argued that a large diversity in spoken languages could restrict business operations and inhibit knowledge sharing. Our findings highlight that obstacle related to language barriers have little relevance on a local scale but are certainly a factor that cannot be ignored by organizations that rely on sharing practices across multinational organizations, as illustrated below:

> The biggest problem is language barrier… The complete team was a Pashto speaking team and consultants and designer's team were all non-Pashto speaking... They do not trust each other because of language issues. The moment we had to start the meeting everybody would just start speaking in Pashto.... So, anybody who was non-Pashto speaking there cannot understand things. (Project director, Consultant)

Knowledge sharing enablers

We categorize knowledge sharing enablers into (i) individual, (ii) team, (iii) organizational and (iv) interorganizational levels. Within individual level enablers, we find sub-themes of interpersonal relationships and social interactions. Team level enablers consist of well-defined objectives of knowledge sharing. Organizational level enablers include converting tacit knowledge into explicit and training sessions and workshops. Interorganizational level enablers are openness to change and research collaborations.

Individual level enablers

At the individual level, knowledge is personal and difficult to share without a social exchange involving individuals or teams (Kogut and Zander, 1992). To foster effective knowledge sharing, organizations must pay attention to individual enablers (Bartol and Srivastava, 2002; Foss *et al*., 2010). Knowledge sharing could be explained not only by individuals' beliefs and attitudes but also by factors specifically related to human and social exchange processes, which provide a better explanation of human behaviors (Lin, 2007). We find interpersonal relationships and social interactions to be knowledge sharing enablers.

Interpersonal relationships and social interactions

Knowledge sharing involves listening and talking to others, sharing solutions, giving examples, and, at the same time, learning from others' experience and developing new ideas (Cummings, 2004). Tsai and Ghoshal (1998) emphasized the role of interpersonal relationships and social interactions as channels for knowledge sharing, because the sharing of knowledge is a social phenomenon that involves interpersonal relationships and social interactions (Buvik and Tvedt, 2017). We find that these channels are key vehicles for knowledge sharing and conducive to building trust and facilitating the development of respect and friendship, all of which are considered to contribute to knowledge sharing (Nooshinfard and Nemati-Anaraki, 2014), as illustrated below:

> We all have our own social setup or circle for knowledge sharing and enhancement. I have my friends, engineers e.g., sometimes I go to them. I would share my experience with them, and I would gain their experience at the same time…. It would help dissemination of knowledge and experience. (General Manager, Contractor 1)

Team level enablers

Team members make it possible to share knowledge. Teams were involved in discussing problems and finding solutions (Iftikhar and Ahola, 2020). We find that well-defined objectives are team level enablers.

Well-defined objectives

We find that if the objectives of knowledge sharing in the network are not clear to some, team members cannot understand the knowledge needs of other participants, and therefore knowledge sharing remains ineffective (Vuori *et al*., 2019), as illustrated below:

> Basically, your objectives should be defined. For example, if you want to have a mobile app, you should be clear about why you need it? If you are working in a transport sector, mobile apps are being used all over the world, and only on this basis you say that we need it too. So, basically you should know what your need is. (General manager operations, Executing agency 2)

Organizational level enablers

An appropriate knowledge sharing requires organizations to design their structures adequately to be consistent with both the environment and the necessary level of interaction among employees. An organizational structure that supports openness, intra-organizational creativity and innovation

is likely to enhance knowledge sharing and the creation of a learning environment (Cavaliere *et al*., 2015), in which employees perform a variety of tasks and are engaged in continuous improvement. We find two sub-themes for organizational level enablers.

Converting tacit knowledge into explicit

Knowledge is a stock of expertise, not a flow of information (Starbuck, 1992), it includes know-how and experience (Kogut and Zander, 1992) that cannot be easily transmitted and communicated because of their possible tacitness, which makes them hard to formalize (Terhorst *et al*., 2018). Documentation is required to convert tacit knowledge into explicit knowledge, because knowledge in the written form is easy to understand and enhances knowledge sharing practices (Vuori *et al*., 2019). Thus, externalization is adopted from the SECI model, which codifies tacit knowledge into explicit concepts, e.g., the articulation of best practices or lessons learned (Alavi and Leidner, 2001). As one of the informants stated:

> I believe knowledge must be shared. We should document major lessons learnt every week and put on website. This should be done to share if there are any issues, how did we address it and what new lessons were learnt. So that, if someone else is facing that challenge then they may be able to adequately address that. (General manager planning & construction, Executing agency 2)

Training sessions and workshops

Training opportunities should be facilitated frequently, as lack of organizational training resources would limit sharing opportunities (Riege, 2005). According to Alavi and Leidner (2001), scheduled meetings, requests for information, training sessions, workshops and visits to apprentices or personnel transfers may ensure a greater distribution of knowledge. As illustrated below:

> There should be interactive trainings, international trainings, and workshops… different organizations organize training sessions and seminars. Our people should go there… We should send people abroad from the team that is working on a project for international exposure... When you share the knowledge internationally, you will be able to see. You learn new techniques from there that you later implement here. (Deputy director 2, Executing agency 1)

Interorganizational level enablers

Interorganizational knowledge sharing is about sharing knowledge across multiple organizations, such as clients, contractors, consultants, and suppliers (Manning, 2017). These organizations are in coopetition, engaging in competition and cooperation at the same time (Solitander and Tidström, 2010). Our findings reveal the following knowledge sharing enablers that are specific to interorganizational networks.

Openness to change

Openness to change is valued, with knowledge development being viewed as an evolving process among actors. If project participants have a closed attitude to changes, it creates barriers for flexibility and knowledge development (Andersson, 2016). Our findings identify common objectives that are a driver of openness to change, as illustrated below:

> I think across organization and the government will have brought changes in their way of working, as the focus is not given to knowledge sharing. The focus is generally limited to paper file that runs in their system… we have to create a new environment in which people feel there is a common objective... I think to create an environment where projects involving government, civil engineering, and others, it should have a common objective despite being from different organizations. (General manager planning & construction, Executing agency 2)

Research collaborations

Research collaborations across industry and academia would provide solutions to industry problems and promote knowledge sharing (Sauermann and Stephan, 2013). Our findings highlight those skills and knowledge from both groups are critical to answering important questions about influencing operations and ultimately finding more effective ways to address them (van Rijnsoever and Hessels, 2020), as illustrated below:

> In developed countries, every department has their own R&D, here we can establish R&D department by taking academia and work department on the same page… brought an ongoing industry issue and provided a solution for it to the industry. The research that is happening in the university should be according to their demand, they are implementing it on the practical level. (Deputy director 1, Executing agency 1)

Discussion

This research has identified knowledge sharing barriers and enablers in interorganizational settings at four different levels (individual, team, organizational and interorganizational) in the context of the Peshawar Bus Rapid Transit project. We dig deeper to provide better insight into knowledge sharing barriers and enablers at different levels of units. These barriers and enablers are depicted in Figure 1 below.

Level	Barriers	Enablers
Individual	Individual's motivation Job insecurity	Interpersonal relationships and social interactions
Team	Time constraints Lack of trust	Well-defined objectives
Organizational	Organizational structure	Converting tacit knowledge into explicit Training sessions and workshops
Interorganizational	Communication barriers Conflict of interest Language barriers and time zone differences	Openness to change Research collaborations

Figure 1: Interorganizational knowledge sharing barriers and enablers

Figure 1 shows that knowledge sharing barriers and knowledge sharing enablers exist at all four levels studied. Our findings are consistent with Vuori *et al.*'s (2019) studies in which they

show that the presence of knowledge sharing barriers hinders knowledge sharing and decreases the efficiency of knowledge sharing. Our findings are also aligned with previous research in identifying factors that facilitate knowledge sharing. Figure 1 confirms that there are enablers that can significantly increase the effectiveness of knowledge sharing practices. The findings shown in Figure 1 could have an influence on decision-making and action forming processes, since they all impact the flows of both tacit and explicit knowledge within the nexus of organizations.

Contemporary researchers imply that barriers and enablers, i.e., factors that can either boost or hinder knowledge sharing, are two sides of the same coin, and turning the coin around changes the circumstances for knowledge sharing (Wang and Noe, 2010; Vuori *et al*., 2019); we have investigated separate set of knowledge sharing barriers and enablers. Positioning and placing them in parallel, which consequently increase their visibility and identification, in turn enhances knowledge sharing by either minimizing barriers or maximizing enablers with separate impacts.

A structured examination of the literature, together with a thematic analysis of the BRT project, provide a framework for managing and evaluating interorganizational knowledge sharing at four levels. According to Iftikhar and Ahola (2020), interorganizational knowledge is shared at all these levels, so it makes sense to identify knowledge sharing barriers and enablers at the same levels. By including team and interorganizational levels, we extend the prior research of Riege (2005), which considered individual and organizational barriers within an organization.

An interorganizational project requires an aggregated structure; our study overcomes the interdependency by proposing a framework decomposing barriers and enablers into four levels each, providing eight sets of factors. Due to the complexity and the heterogeneity of organizations involved, the decomposition of knowledge sharing factors into detailed sets contributes to better understanding of the benefits of knowledge sharing at different levels. Based on a real-world situation, this research structures knowledge sharing barriers and enablers into fourteen different factors that can unify the interests of diverse stakeholders, such as executing agencies, consultants, and contractors. Actors in an interorganizational project are able to identify components to include in decision-making and negotiating. Once these factors are decomposed according to Figure 1, actors can orientate their actions in a model of change towards the desired outcomes.

Conclusion

This paper sought to answer the research question “What are the knowledge sharing barriers and enablers at different levels of units in an interorganizational project?” In this study, we present the main factors that could hinder and facilitate knowledge sharing. This research identifies eight interorganizational knowledge sharing barriers, namely individual’s motivation, job insecurity, time constraints, lack of trust, organizational structure, communication barriers, conflict of interest, language barriers and time zone differences. We identified six interorganizational knowledge sharing enablers, namely interpersonal relationships and social interactions, well-defined objectives, converting tacit knowledge into explicit, training sessions and workshops, openness to change, and research collaborations; these facilitate knowledge sharing at individual, team, organizational and interorganizational levels.

This paper contributes to the knowledge management and knowledge sharing in complex interorganizational project literature. First, it extends the dimensions that describe knowledge management in general, and knowledge sharing in particular, to include factors that could hinder and facilitate knowledge sharing at different levels. Second, key findings are related to the relationship between knowledge sharing barriers and enablers in an interorganizational setting. Third, the identified knowledge sharing barriers and enablers from an interorganizational project and from a pool of diverse stakeholders, project team members and organizations could increase the robustness of an upcoming project. Fourth, our findings demonstrate barriers and enablers at multiple levels, such as individual, team, organizational and interorganizational levels. Finally, we believe that Figure 1 can serve as a refined basis for further research concerning some of the distinctive features of knowledge sharing in interorganizational projects, particularly in identifying the determinants of knowledge sharing barriers and enablers, by analyzing how these determinants interplay with each other and whether they are of equal importance.

Regarding the practical implications, it is understood that this research offers managers some guidelines and assistance to prepare and plan to overcome the barriers that may prevent knowledge sharing and to enhance the enablers which facilitate knowledge sharing during project's execution. The list of barriers and enablers presented herein offers a more comprehensive and structured starting point to senior management about knowledge requirements, and about understanding existing communication and knowledge flows. Moreover, the sources of barriers and enablers derived, operating at different levels, provide a valuable guideline to practitioners who wish to optimize the effectiveness of knowledge sharing within and across organizations. This contributes to the development of better insights into knowledge sharing, which could lead to the improved management of interorganizational settings.

Our study opens several new avenues for further research. First, we examined an interorganizational project – a unit of analysis in which multiple organizations engaged simultaneously in knowledge sharing – at an aggregate level. Future research might consider the organization as a unit of analysis and compare the knowledge sharing barriers and enablers within different organizations in an interorganizational setting. Second, some of the barriers and enablers overlap across different levels. For example, lack of trust is treated here as a team level barrier, but it could be an interorganizational level barrier as well. However, we grouped it with team level barriers as our data provides evidence of lack of trust at the team level. Moreover, the interrelationships among knowledge sharing barriers and enablers at different levels of units is out of scope of this paper. So further research should focus on how these factors can interact should be included in a particular situation analysis. Future researchers might find interwoven or distinct knowledge sharing barriers and enablers. Third, the paper provides grounds for minimizing the barriers and facilitating the enablers, that future research should address. Fourth, we believe that the Peshawar BRT project is an excellent example of an interorganizational setting. However, it raises questions about the transferability of our theory. While caution is necessary with single-case studies, we believe that our findings are transferable beyond interorganizational projects since data is collected from a heterogeneous set of organizations.

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Table I: Interview participants' details

Role	Designation	Education	Experience (years)	Interview duration (minutes)
Consultant	Project director	Master (US)	35	64
	Project coordinator	MSc.	19	59
Executing agency 1	Director coordination	BSc.	32	39
	Deputy director 1	-	7	83
	Deputy director 2	Master	26	26
Executing agency 2	General manager planning & construction	Master	24	49
	General manager operations	Master	17	85
	Transport planning specialist	-	8	62
Contractor 1	General manager	-	28	88
Contractor 2	Deputy project manager	-	30	68
Contractor 3	Project manager	-	18	40

Table II: Example of coding procedure

Themes	Sub-themes	Illustrative quotes
Individual level barriers	Individual's motivation	If someone is interested and keen to learn something only that person can learn. You cannot feed someone with knowledge. That person must have anticipation and keenness. (Project coordinator, Consultant)
	Job insecurity	Some people also do not want to share because they think of job insecurity…. if they share knowledge, it will make them less valuable and someone else will come, they might lose their jobs. (General manager planning & construction, Executing agency 2)
Team level barriers	Time constraints	The challenges in knowledge sharing are lack of time – if there are senior people, they do not have the time to share the knowledge and if someone goes to them to seek knowledge, they do not have time for it. (Deputy director 1, Executing agency 1)
	Lack of trust	If there is trust that you are getting the knowledge for learning, you are taking document for learning, team members will share it with you. If they are not trusting you, they will never share their knowledge or their documents with you because that can be used for any kind of act. (Project manager, Contractor 3)
Organizational level barriers	Organizational structure	The access of knowledge is given only to officers of [name of organization] and not to an outsider. … If some external organization would like to get access from us… They would officially request and then we would decide if that can be given or not. So, that will move through a proper channel. (Deputy director 2, Executing agency 1)
Interorganizational level barriers	Communication barriers	We do send email across the organization but for the follow-up purpose, I tend to send email along the covering letters. (General manager planning & construction, Executing agency 2)
	Conflict of interest	Every organization involved in project has its own competing priorities and agendas that they do not want compromise upon. (General manager operations, Executing agency 2)
	Language barriers and time zone differences	Design consultants, and sponsor team is sitting in Manila office and our remaining team is in Holland, so it is quite challenging. Time difference and language barrier are there. (Project coordinator, Consultant)
Individual level enablers	Interpersonal relationships and social interactions	I think the policy of open-door should be such that junior staff should not be scared, if I asked something it would affect my efficiency and performance. (General manager planning & construction, Executing agency 2)
Team level enablers	Well-defined objectives	Knowledge sharing for a purpose can be done, but it cannot be done without purpose. (Deputy project manager, Contractor 2)
Organizational level enablers	Converting tacit knowledge into explicit	Everything that happened in here and all the changes that have come at the micro level and the learning that has happened on the part of consultant, the client and contractor, that should be documented. This literature should be public, through social media, through newspapers and through books so that the people, all the stakeholders involved, should be taken on board. (Deputy director 1, Executing agency 1)
	Training sessions and workshops	There should be different seminars, presentations for the future so that when such projects come in future, we are able to perform as better as possible in them, from management point of view, execution point of view, design point of view. We should be able to do all these things to our best. (General manager, Contractor 1)
Interorganizational level enablers	Openness to change	People are moving towards paper less environment. These things should be introduced within the government offices, which I think they are trying for paper less environment. An intra-networking would be involved in this. (Project manager, Contractor 3)
	Research collaborations	Link between industry and academia should be developed…. So, our industry if linked with academia could become the best product for the upcoming projects and for people who are working on that. If academia and industry are linked, that industry will get to understand the importance of why to share the knowledge. (Deputy director 2, Executing agency 1)