Tacit Knowledge Integration Model for the Ethiopian Transport Sector

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Abstract
Knowledge development is a 'continuous' process where there is a link between 'doing' and 'knowing'. The Ethiopian transport sector, the focus of this study, suffers from an inability to develop and maintain its knowledge. As a result, it is not as successful and productive as the country needs. The first challenge is to capture and formulate tacit knowledge in verbal communication form. The second challenge is to make the knowledge easily available to the entire organization. The third and ultimate challenge is to develop an organizational culture for seeking and using tacit knowledge. The main research question is how transport authority facilitates tacit knowledge integration in the organization. The research has two sub questions. 1) What are the enabling and disruptive factors of Tacit Knowledge Integration in the organization? 2) What are the suitable information technology facilitates and infrastructure supporting Tacit Knowledge Integration in the transport sector? To tackle the above mentioned problems, the researchers follow interview to collect data from the Federal Transport Authority (FTA), Ethiopia. The approach is qualitative and the method is case study. The researchers used purposive sampling. Structural Equation Modeling (SEM-PLS) was used to test the model.). N Vivo Pro software version 12 was used as a qualitative data analysis tool. The research result indicated that the combination of the 7C model and Transactive Memory System (TMS) are significant to manage the Tacit Knowledge Integration in the authority. As a result, the structural model, test results showed that out of thirteen hypotheses/ relationships, eleven hypotheses were supported under experts' samples.

Keywords: Knowledge development, The Ethiopian transport sector, Tacit Knowledge Integration, the 7C model, Transactive Memory System

1. Introduction

The knowledge development process depends on specific contexts and settings with different mechanisms and structures. According to Gherardi (2000), knowledge development is a 'continuous' process where there is a link between 'doing' and 'knowing'. The Ethiopian transport sector, the focus of this study, suffers from an inability to develop its knowledge. As a result, it is not as successful and productive as the country needs. Contexts and settings with different mechanisms and structures have a significant impact on the process of knowledge development.

Knowledge Integration (KI) is all the activities by which an organization identifies, acquires, and utilizes external knowledge. While crucial for an organization that develops new products, KI is a complex process that is not well understood in both research and practice (Kraaijenbrink, 2006).

A key aspect of knowledge development is Tacit Knowledge Integration (TKI). Tacit knowledge is know-how gained through experience while performing activities. Takhtravanchi (2017) states that tacit knowledge is more important than explicit knowledge in an organization because it is the experience that people achieve during mission implementation, which is stored in a person's brain. In other words, managing tacit knowledge means trying to get access to the stored knowledge in a person's brain. Challenges of capturing tacit knowledge may be different from challenges associated with other processes of KI. This paper attempts to fill a void of studies on TKI in the transport sector by identifying challenges associated with capturing tacit knowledge within the Ethiopian transport sector (Daniel, et al, 2022).

One of the challenges for TKI is the process of capturing knowledge. The reasons for this challenge were identified by Williams (2007) which include; lack of employee time, lack of management support, lack of incentive, lack of human resources, lack of clear guidelines, lack of support from others in organizations, the process not capturing useful lessons, data repository too hard to search, lessons are not transferable, wrong people are involved, and feeling enough effort has already been expended.

The above listed challenges touch all organizations doing TKI although specific challenges vary between organizations. It is suspected that the Ethiopian transport organization, the focus of this study, has a lack of clear guidelines, and a lack of support from others in the organization, and lessons are not transferable. These challenges resulted in the following research questions for investigation:

RQ1: How does transport authority facilitate TKI in the organization?

RQ2: What suitable model needs to be designed to facilitate TKI in the transport sector?

To tackle the challenges of Tacit Knowledge Integration for the Federal transport organization in Ethiopia, the researchers developed the model by combining the Transactive Memory System (TMS) and the 7C models. The existing literature deals with

the Tacit Knowledge Integration related to the TMS and the 7C models separately. However, the elements of both the TMS and the 7C model can play their role when amalgamative to TKI. The elements of the TMS and the 7C models are interrelated with each other and fill the Federal Transport Authority (Ethiopia) TKI gap.

2. Related Works

2.1. Types of Knowledge

Over the centuries many attempts have been made to classify knowledge, and different fields have focused on various dimensions. This has resulted in numerous classifications and distinctions based on philosophy and even religion (Hajric, 2018).

Some researchers make further distinctions and talk of embedded knowledge. This way, one differentiates between knowledge embodied in people and that embedded in processes, organizational culture, routines, etc. (Horvath, 2000).

Knowledge is classified into a variety of types. When considering knowledge management, knowledge developers should be familiar with each type and know how to tap into it during knowledge capture (Awad & Ghaziri, 2004). Under types of knowledge, Awad & Ghaziri (2004) reveal that shallow and deep, knowledge as know-how, reasoning and heuristics, and common sense as knowledge. On the other hand, classifying knowledge is procedural knowledge, declarative knowledge, semantic knowledge, and episodic knowledge (Awad & Ghaziri, 2004). All these classifications of knowledge are describedas different characteristics of knowledge like experience, knowledge relies on it which is rarely documented. Also, the classifications could not clearly show the abstract and tangible characteristics of knowledge.

Another approach to categorizing knowledge is whether the knowledge is Tacit or Explicit. Tacit knowledge is knowledge embedded in the human mind through experience and jobs. Coined by Hungarian medical scientist Michael Polanyi (1891-1976), it includes intuitions, values, and beliefs that stem from years of experience. Polanyi, who described it in his famous quote “we can know more than we can tell”. It is the knowledge used to create explicit knowledge and is best communicated personally through dialogue and scenarios, with the use of metaphors. Therefore, knowledge is not private, but social. Socially relayed knowledge becomes part of the real-life experience of the knower.

2.2. Tacit knowledge

Drawing on Polanyi’s (1966) distinction between tacit and explicit knowledge, it has been argued that the former may be one important factor distinguishing successful experts from others (Argyris, 1999; Wagner & Sternberg, 1987). Tacit knowledge is a valuable skill and experience that has proven its efficiency and effectiveness over time (Oshtorian & Emami Meybodi, 2010) andit’s been capable of turning into a “pattern” through time.

Mankind has many patterns in his mind since birth that guarantee survival for him, and according to this essential principle of mind and the peripheral environment, consciously or unconsciously, mankind seeks order in disorder (Sharif & Mohammad Ali Nejad, 2012, p. 56).

Tacit knowledge represents what one needs to know to get along in daily life that typically is not explicitly taught or even verbalized. The knowledge is considered tacit because often it is not readily articulated by the individual or widely shared within the performance domain (Sternberg et al. 2000). Terms like professional intuition and professional instinct have been used to characterize the tacit quality of knowledge associated with individuals who are successful in their respective domains.

Tacit knowledge is believed to be a product of learning from experience that affects performance in real-world settings (Nonaka & Takeuchi, 1995; Sternberg & Wagner, 1993). The nature of the relationship between tacit knowledge and experience has not been fully established, but a range of individual differences such as intelligence, personality, prior knowledge, and psychological constructs such as cognitive style have some impacts on the knowledge acquisition process.

Tacit knowledge cannot be understood through direct articulation, however, due to its tacit nature, but it must be inferred from actions and statements (Forsythe et al., 1998). Various studies have examined differences in tacit knowledge between expert and novice (Murphy & Wright, 1984; Patel et al., 1999; Tan & Libby, 1997) or successful and typical groups (Klemp & McClelland, 1986; Nestor-Baker, 1999; Wagner & Sternberg, 1987; Williams, 1991) and most have identified differences in tacit knowledge between them. No studies have identified reasons that account for these differences, however.

Nonaka (1994) argues that the generation and accumulation of tacit knowledge is determined by the 'variety' of an individual's experiences and the individual's commitment and involvement in the 'context' of the situation (pp. 21-22). But these may be antecedents to learning, with the learning process itself representing the major source of differences between tacit knowledge accumulated by different people. A person's aptitude to learn may be yet another differentiating factor (Leithwood & Steinbach, 1995; Wagner & Sternberg, 1987).

One explanation may arise from the fact that people have consistent individual differences in their preferred ways of organizing and processing information and experience. Such differences are often referred to as cognitive styles (Messick, 1976). Baumard (1999) also drew our attention to the importance of individuals' pre-established cognitive patterns that uniquely filter incoming information when acquiring new knowledge. Its influence can be observed through a model of tacit knowledge proposed by Sternberg et al. (2000) which involves the mental processes of encoding, storing, and retrieving information from memory.

Baumard (1999) describes tacit knowledge as the result of an experience that cannot easily be shared, as the knowledge that is personal, profound, non-scientific, and "generated in the intimacy of lived experience". Such characteristics leave no doubt that tacit knowledge derives from experience (Nonaka, 1994) and analogical reasoning which forms intuitions and instincts.

In contrast, explicit knowledge is knowledge codified and digitized in books, documents, reports, white papers, spreadsheets, memos, training courses, and the like. Explicit knowledge can be retrieved and transmitted more easily than tacit knowledge.

Tacit and explicit knowledge have been expressed in terms of knowing how and knowing that, respectively. They have also been viewed as embodied knowledge and theoretical knowledge, respectively (Sveiby, 1997).

There has been a substantial amount of research into the nature of tacit knowledge in a variety of professions such as nursing (Benner & Tanner, 1987; Eraut, 1994; Herbig et al., 2001), education (Nestor-Baker & Hoy, 2001; Minstrell, 1999; Leithwood & Steinbach, 1995; Almeida, 1994), medical (Cimino, 1999; Patel et al., 1999), and Law and Accounting (Marchant & Robinson, 1999; Tan & Libby, 1997). These studies provide a valuable insight into the working of tacit knowledge in these various professions. Notwithstanding, research works of tacit knowledge on various disciplines are available, but it is difficult to find inthe transport sector.

2.3. Explicit knowledge vs. tacit knowledge

The understanding of how tacit knowledge is externalized and becomes reflected in external knowledge has been very problematic in extant management literature. It is important how such new knowledge is created, as "Organizational adaptation is also likely to be characterized by periods of dramatic revolution in which there are reversals in the direction of change across a significantly large number of variables of strategy and structure." (Miller & Friesen, 1980, p. 593). These changes are the response to new knowledge: "Like political revolutions, scientific revolutions are inaugurated by a growing sense.... that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature to which that paradigm itself had previously led the way." (Kuhn, 1970, p.92; Miller & Friesen, 1980, p. 608).

Individuals use different perspectives to think about problems and devise solutions. They share knowledge and group physical and intellectual assets in new and creative ways (Ashkenas et al., 1998). Comparing tacit and explicit types of knowledge is a way to think, not point out differences (Smith, 2001).

2.4. Knowledge Integration

Most of the definitions only considered knowledge transfer and proposed collaboration as a solution for integrating knowledge. Only the definitions that are proposed by Carlilo (2004), Haddad, and Bozdogan (2009) are close to the research topic but do not cover all sub-processes of KI. For instance, Haddad and Bozdogan's (2009) definition of KI does not support the process of capturing knowledge. Therefore, the following operational definition of KI is proposed for this research:

Knowledge integration is the process of capturing, sharing, transferring, and coordinating tacit knowledge within and across departments to improve the organization's performance.

2.5. Tacit Knowledge in the Transport Sector

When organizations are overwhelmed with information, transfer capabilities and tacit knowledge flows within organizations can be hampered, leading to underuse, misuse, and loss of potentially important information.

Tacit knowledge is defined as personal knowledge that is normally not made explicit. Tacit knowledge is transferred between individuals within and between working groups/ organizations via informal networks (Nousala, et al., 2007). Tacit knowledge exchange or transference through networks is described as being a fundamental aspect of sustainability for organizations and their extended enterprises (Nousala, et al., 2005; Jamsai, and Nousala, 2007; Nousala, 2006).

These tacit networks are important contributors to the development of internal knowledge networks and social and technological change. Organizations are not linear, and are complex and dynamic (Tasaka, 1999; Nousala, 2006). The essence of sustainability resides within a well-created contextual environment where tacit knowledge can evolve exchange and emerge via individuals in working groups within the organization.

There is related literature about various transport sectors. Conversion of tacit to explicit knowledge offers great value to organizations such as railways in terms of better decision-making and minimization of unintended consequences. The challenge, however, comes from the very nature of TK as it can't be formally communicated and easily converted to explicit knowledge. The literature highlights the significance of TK for railways specifically in the context of systems integration.

The Intelligent Transport Systems Australia (ITSA) aimed the case study to assist ITSA members share knowledge. ITSA offered an opportunity to study tacit knowledge-sharing capabilities by providing access to the interactivity of geographically dispersed members.

3. Transport Sector in Ethiopia

Five transport modes have been witnessed so far in the history of humanity's technological development: namely, road transport, water transport, rail transport, air transport, and continuous flow system (Temesgen, 2006). Transport is pivotal to economic development. On the one hand, the achievement of economic growth and poverty reduction requires good physical access to resources and markets while on the other, quality of life is generally dependent on the quality of physical access to employment, health services, homes, education, and other amenities.

When we speak of modern transportation in the Ethiopian context, the reign of Emperor Menelik holds a cardinal place (Temesgen, 2006). According to some writers, the idea of road construction started during the reign of Emperor Tewodros, when he used manual labor to clear land for a pathway across which to haul his canon, the Sebastopol to Mekdela. Since, however, the purpose of the roadway had nothing to do with serving the public, let us limit our observation to the fact alone and pass it on to the reign of Menelik.

Structural adjustment in many government institutions was first initiated in 1984 (FTA). Accordingly, while in 1984 the country's road transportation service became de-centralized, the other branches of the sector have continued to date with their previous structures intact.

1.1. Transport and Knowledge Management

Knowledge is now a major driving force for organizational change and wealth creation, and effective knowledge management is an increasingly important source of competitive advantage and a key to the success of modern organizations (Irma and Rajiv, 2001; Malhotra, 2002; Savvas and Bassiliades, 2009).

Pathriage et al (2007) argue that the construction industry needs to intensify its efforts to move to a knowledge-intensive mode. It is also believed that better decision-making towards sustainability goals can only be achieved when stakeholders are informed of and continuously updated with new concepts, knowledge, and expertise across organizational, professional, and hierarchical boundaries (Yigiteanlar, et al., 2015).

By increasing the circulation of people in a region, they are also likely to facilitate knowledge diffusion and spillovers. Many organizations have recognized that the success of knowledge management depends on people and their behavior (Sheehan, et al., 2005). Employees must be sufficiently motivated to share knowledge (Egbu, 2004). Osterloh and Frey (2000) suggest that organizational forms that emphasize participation and personal relationships are needed.

In the strategic management literature, the knowledge-based view of the firm shifts the focus to resource knowledge and proposes that knowledge is the most important resource in creating a sustainable competitive advantage (Kogut and Zander, 1992).

However, not all knowledge management activities have been shown to positively influence business performance or to result in a competitive advantage. Many parameters and their interactions need to be considered for the successful application of knowledge management initiatives in an organization (Greiner, et al., 2007). For example, different knowledge management strategies and practices were proposed to be adequate for different types of knowledge. However, the selection of a suitable strategy not only depends on the type of knowledge to be shared but also on the organizational environment the organization operates in. In recent years, many public agencies including Spy Pond Partners (2015) have lost significant institutional knowledge due to retirements, staff turnover, and other organizational changes. Over past 30 years, in-house employment at Kentucky Transportation Cabinet (KYTC) has declined while outsourcing has increased. These changing workforce dynamics have sparked conversations around knowledge management and how organizations can best retain their core knowledge bases in the face of employment instability.

The American State Department of Transportation (DOT) relies on the skills and experience of its workforce to plan, fund, design, construct, and maintain multi-modal transportation systems (National Academy of Sciences, 2015). Knowledge about what to do, when and how to do it, and what not to do is critical to success and much of this knowledge resides only in the heads of employees, especially the most experienced employees.

National Academy of Sciences (2015) deal with state DOT knowledge management key activities is improve organizational efficiency and effectiveness, strengthen organizational resilience, strengthen workforce capabilities, leverage external expertise, foster learning and innovation, and reduce vulnerability to employee transitions.

State DOTs rely on the skills and experience of their workforces to plan, fund, design, construct, and maintain multi-model transportation systems. DOT executives explain the importance of implementing knowledge management in transport organizations. Workforce planning to identify and close gaps between needed skills and existing capabilities; communities of practice that enable less experienced employees to learn from their peers; expertise directories that employees can use to identify who to contact if they have a question; capture of specialized knowledge from employees before they leave the organization; Project management methodologies that ensure project teams learn from prior experience and document lessons learned for future efforts; and use of information management methods to ensure that employees can quickly find the information they need to be effective (National Academy of Sciences, 2015).

Department of Transports (DOTs) is managing knowledge to some extent: through employee training, mentoring, team meetings, business process documentation, updates to manuals, etc. (Ibid, 2015).

2. Methodology

The researchers collected data from Federal Transport Authority experts who work in different departments using structured and semi-structured interviews, observation, and secondary data (documents). The collected data were conducted on selected experts before conducting the interview. The researcher conducted interviews with experts from eight departments who are policy executives. The researchers used purposive sampling. The number of participants in this study is 520 purposely selected experts to deeply understand and identify factors that determine Tacit Knowledge Integration (TKI) and develop a model. Related to their gender, 300 (three hundred) males and 220 (two hundred twenty) females participate in the study. The experts have different positions and their work experience ranges from 2 years up to 20 years. The interviews were conducted face-to-face and recorded in the interviewees' offices.

A group of relevant concepts werefirst clustered into TKI and Collective Intelligence categories/themes in a manner that would answer the research questions of the study. This open coding approach to analyzing the qualitative data is in line with the advice of Yin (2011), Eisenhardt (1989), and Miles & Huberman (1984). NVivo Pro software version 12 was used as a qualitative data analysis tool. The researcher re-read the transcribed notes, identified concepts, and then grouped them into their respective categories. It took place between December 2023 and March 2024.

3. Discussion

5.1. Transactive Memory System

Research asserts that knowledge is power, but without adequate management, the consequences for organizations could be devastating (Cameron, 2000). However, knowledge resides in human minds and tacit knowledge which is 90 percent of an organization's knowledge capacity is critical to an organization's competitiveness (Zhang, et al., 2012). Knowledge integration of many different individuals in the process of producing goods and services is playing a critical and constructive role. Therefore, integration for fragmented pockets of knowledge leverages individual performance and attracts more attention because of cognitive limitation and dispersancy of knowledge.

An increasing number of practice reveals that individuals often develop and rely on their Transactive memory systems (TMS) in deciding with whom to collaborate and how to collaborate (Reagans, and McEvily, 2003). Transactive memory systems (TMS) are constituted by individuals using each other as a memory source (Wegner, et al., 1991), which provides a new perspective for the interactive process of knowledge integration. Practically, someone has proven more amenable to being inquired about knowledge than

others within the same TMS. In other words, individuals have many obstacles or resistance to the acquirement of knowledge from others.

Knowledge integration depends on the degree to which an individual possesses behavioral intention and the Transactive Memory Systems including specialization, credibility, and coordination. Knowledge integration is an ongoing collective process of promoting individual knowledge development by transferring and sharing knowledge within the Transactive Memory Systems and behavioral intentions for a successful project, task or work in an organization.

Researchers investigate tacit knowledge integration based on social networks from the Transactive Memory Systems perspective (Zhang, et al., 2012). The study focuses on ties dimension and nodes dimension and presents the mechanism of social networks on tacit knowledge integration with the TMS lens.

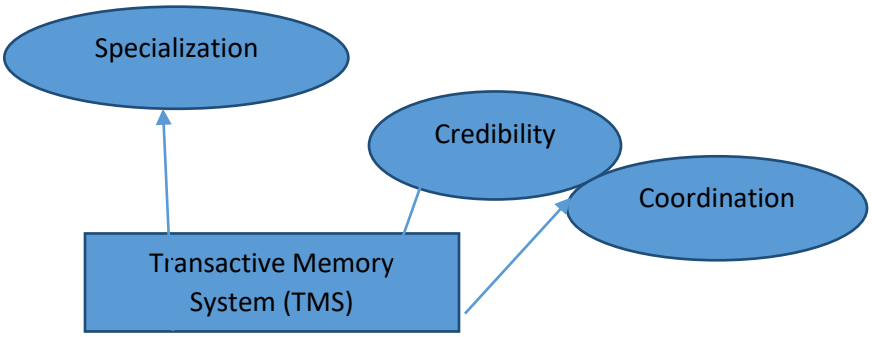


Fig. 1. Transactive Memory System. Adapted from Wegner (1987)

Specialization refers to the differentiated structure and awareness of each other's experts among team members (Moreland, & Myaskovsky, 2000; Zhang et al., 2012). Transport organizations are organizations work experts who have different professions. Task-oriented transport organization users tend to post more professional and work-related information, such as planning, clarifying, and monitoring. This task-oriented communication helps team members learn more about others' knowledge directly and accurately. At the same time, task-oriented communication was found to positively influence expertise location in virtual teams (Kanawattanachai, and Yoo, 2007).

Credibility is defined as team members' beliefs about each other's competence and reliability (Kanawattanachai, and Yoo, 2007; Zhang et al., 2012). When team members trust each other's competence and reliability, they don't need to claim their knowledge, which can help them save much time (Liang et al., 1995). Task-oriented Enterprise social networking (ESN) use tends to build instrumental ties, which focuses on regular communication concerning task problems and work advice. Regular task-oriented

communication facilitates individual meta-knowledge known to others, leading to the formation of cognition-based trust (Butler Jr & Cantrell, 1994; Kanawattanachai, and Yoo, 2007). Moreover, task-oriented ESN use facilitates team members to share professional and work information via the open ESN, which could help team members judge each other's competence. Inthis view, task-oriented ESN use could provide some detailed evidence of each other's reliability and qualification, which could promote the credibility within a team.

Coordination reflects the effective and coordinative knowledge processing. It requires the team members to work efficiently with few misunderstanding (Zhang et al., 2012). This suggests that to develop coordination, team members should develop a shared understanding of task decomposition and task allocation (Lewis, 2003). We propose that such shared understanding could be developed within teams by the use of Enterprise social networking (ESN).
Specifically, the task-oriented ESN use focuses on instrumental ties, which can facilitate team members to gather information, advice, and resources necessary to accomplish a task. For example, team members could exchange professional and work information, such as the R &D information, with each other through the ESN. This sharing would help employees update each other's work process and status, facilitating the understanding of who does what (Bennett, 2012). Frequent professional communication further enables team members to understand each other's knowledge accurately, reducing conflict and misunderstanding (Kotlarsky, Van Fenema, & Willcocks, 2008).

5.2 The 7C Model

Various KM models are developed by various KM researchers. Jennex and Bartczak (2013) developed the seminal work of revising the knowledge pyramid model. This research showed that models should be checked to see whether they need revision or are related to the state-of-the-art. This research paper presented a model interrelated to the TMS and 7C models.
One of the conceptual models for organizational knowledge creation and management is known as the 7C model. The model is based on the distinction between individual and organizational knowledge and explicit and tacit knowledge. The 7C model suggests that the seven Cs (Connection, Concurrency, Comprehension, Communication, Conceptualization, Collaboration, and Collective Intelligence) play a central role in the knowledge-creation process.
Nowadays organizations are continuously faced with the challenge of complexity and urgency in their core business activities. The business environment is changing rapidly, and organizations need to be able to cope with many different kinds of business,

technological, social, and human requirements. To be able to solve complex problems the individual and group problem-solving processes involved in computer-mediated communication systems need to be integrated (Turoff, 1991). Based on their studies of Japanese companies, Nonaka and Takeuchi (1995) proposed their widely known model of the knowledge-creating company. They argued that much of the innovation created and accumulated in a firm is actually based on tacit knowledge, i.e. arising out of experience, and cannot be easily communicated by workers within excessively formalized management procedures.

Organizations (the transport sector) need increased sharing of knowledge across organizational boundaries within their business networks. Special emphasis is placed upon knowledge management strategies utilized when working with transport employees.

The 7C model may be described through different abstraction levels. Fig. 4. Lyytinen (1987) defines the technology, language, and organizational contexts as follows: In the technology context an information system confines object systems to a view of how efficiently data are processed and stored in a given material carrier, in the language context it provides a means and environment for comprehension and linguistics communication, and in the organizational context it supports, enables, and takes part in an organizational process involving human interactions and collaboration, e.g. decision-making.

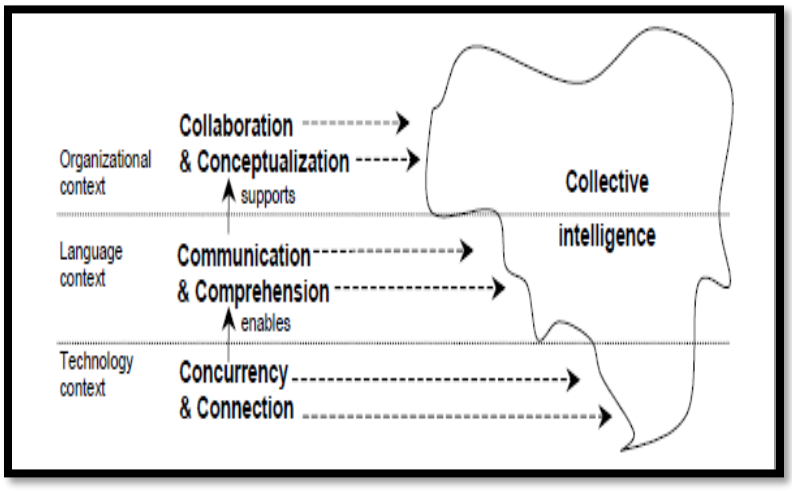


Fig. 2.7C Model. Adapted from Lyytinen (1987)

6. Description of TMS and the 7C

The framework is generated using the following hypotheses.

H1: Specialization has direct effect on Tacit Knowledge Integration. Knowledge integration describes the synthesizing of individual expertise (Tiwana and Mclean, 2005).

The diverse expertise held by different team members is recombined at the organizational level. The mechanisms that facilitate knowledge integration are diverse.

H2: Lack of credibility has direct effect on Tacit Knowledge Integration in an organization. Trust is developed in the team members' expertise. The TMS of a team characterizes its existing meta-knowledge (Lewis, 2003), which allows team members to identify the location of the required expertise judge its credibility.

H3: Loss of coordination of new knowledge and existing knowledge in an organization has a negative effect on knowledge integration. Coordination is as the team members' ability to work together efficiently. Emphasizes how team-based knowledge integration is facilitated by implicit coordination instead of communication: individuals anticipate the knowledge needs of colleagues and provide the available knowledge without the need for extensive planning and direct communication.

H4: Collective intelligence has direct effect on tacit knowledge integration. Collective intelligence, support for understanding and communication helps in the individual learning of new ideas, and organizational learning mainly takes place through the experts and their communication and collaboration efforts. All of these six preceding Cs contributes to the growth of "togetherness".

H5: Specialization has direct effect on collective intelligence. By harnessing the collective wisdom, expertise, and capabilities of individuals, we can solve complex problems, improve decision-making, and unlock new possibilities.

H6: Credibility has direct effect on collective intelligence. One of the Transactive Memory System (TMS) is credibility. All the TMS parts are interrelated each other. Therefore, when experts who are specialist on a subject can be credible for other staffs.

H7: Coordination has direct effect on collective intelligence. During a meeting different experts raise various issues and sharing their knowledge. The main problem is the coordination of sharing knowledge from experts. Sometimes a problem might have a single solution and sometimes might have various coordinated solutions. The main point is to coordinate sharing knowledge which generate from experts.

H8: Concurrency has significant effect on collective intelligence. In the computer system, concurrency is as property of systems where several processes and executing at the same time related to the experts collective intelligence. The dissemination of information is equally reaches to all concerned experts.

H9: Connection has direct effect on collective intelligence. Technology context is the part of 7C mode. In technology text included concurrency, and connection. Mostly, the information technology is enable not have direct effect on Tacit Knowledge Integration.

H10: Communication has direct effect on collective intelligence. The use of IT to communicate for tacit knowledge transfer processes has shown to improve work-related tacit knowledge flows among experts. The 7C model reflects to create and transfer the

knowledge among experts communication using computer systems is one of the significant tool.

H11: Comprehension has direct effect on collective intelligence. In the language context communication and comprehension are included. Communication and comprehension are the main tools for Tacit Knowledge Integration and collective intelligence. Mostly, experts who have similar professions can understand the knowledge easily.

H12: Conceptualization has direct effect on collective intelligence. The conceptualization of the nature of the tacit knowledge is personal, experientially acquired, has goal-attainments values and can be collective.

H13: Collaboration has direct effect on collective intelligence. To organize and use the tacit knowledge in the transport organization, this paper, researchers combine the Transactive Memory System (TMS) and 7C model for organizational knowledge creation and organize the knowledge integration in the transport organization. The components of TMS are specialization, credibility, and coordination. The 7C model components are concurrency, connection, communication, comprehension, collaboration, conceptualization, and collective intelligence.

Conducted face to face and recorded in the interviewees' offices. Group of relevant concepts were first clustered into TKI and Collective Intelligence categories/themes in a manner that would answer the research questions of the study. This open coding approach to analyze the qualitative data is in line with the advices of Yin (2011), Eisenhardt (1989), and Miles & Huberman (1984). NVivo Pro software version 12 was used as qualitative data analysis tool. The researcher re-reads the transcribed notes and identified concepts and then grouped into their respective categories. It took place between December 2023 and March 2024. The research paradigm of a research informs whether the research approach or logic is deductive or inductive. According to Bhattacherjee (2012) and Neuman (2005), in a deductive approach, a researcher is guided by a pre-defined model and further develops and tests theories and hypotheses. On the other hand, the inductive approach aims to develop a theory from empirical data. An inductive approach is used in the study. The research is followed the qualitative methods. The research design of this study is a case study.

Experts' collected data is analyzed by NVivo 11, and SMART-PLS. The model is tested using Structural Equation Modeling (SEM-PLS).

7. Proposedmodel for Tacit Knowledge Integration using TMS and 7C

To organize and use the tacit knowledge in the transport organization, in this paper, researchers combine the Transactive Memory System (TMS) and 7C model for

organizational knowledge creation and organized knowledge integration in the transport organization. The components of TMS are specialization, credibility, and coordination. The 7C model components are concurrency, connection, communication, comprehension, collaboration, conceptualization, and collective intelligence.

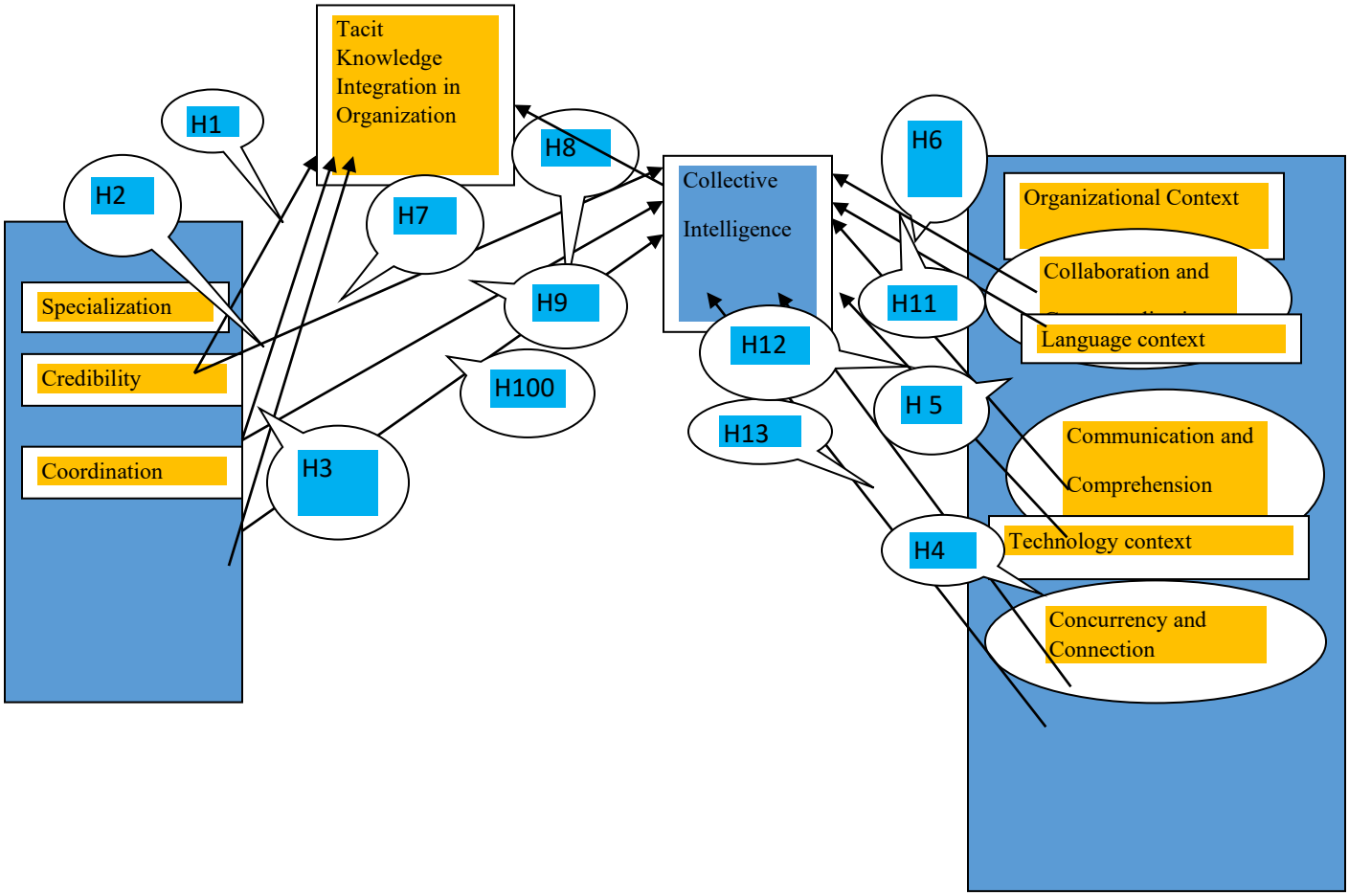
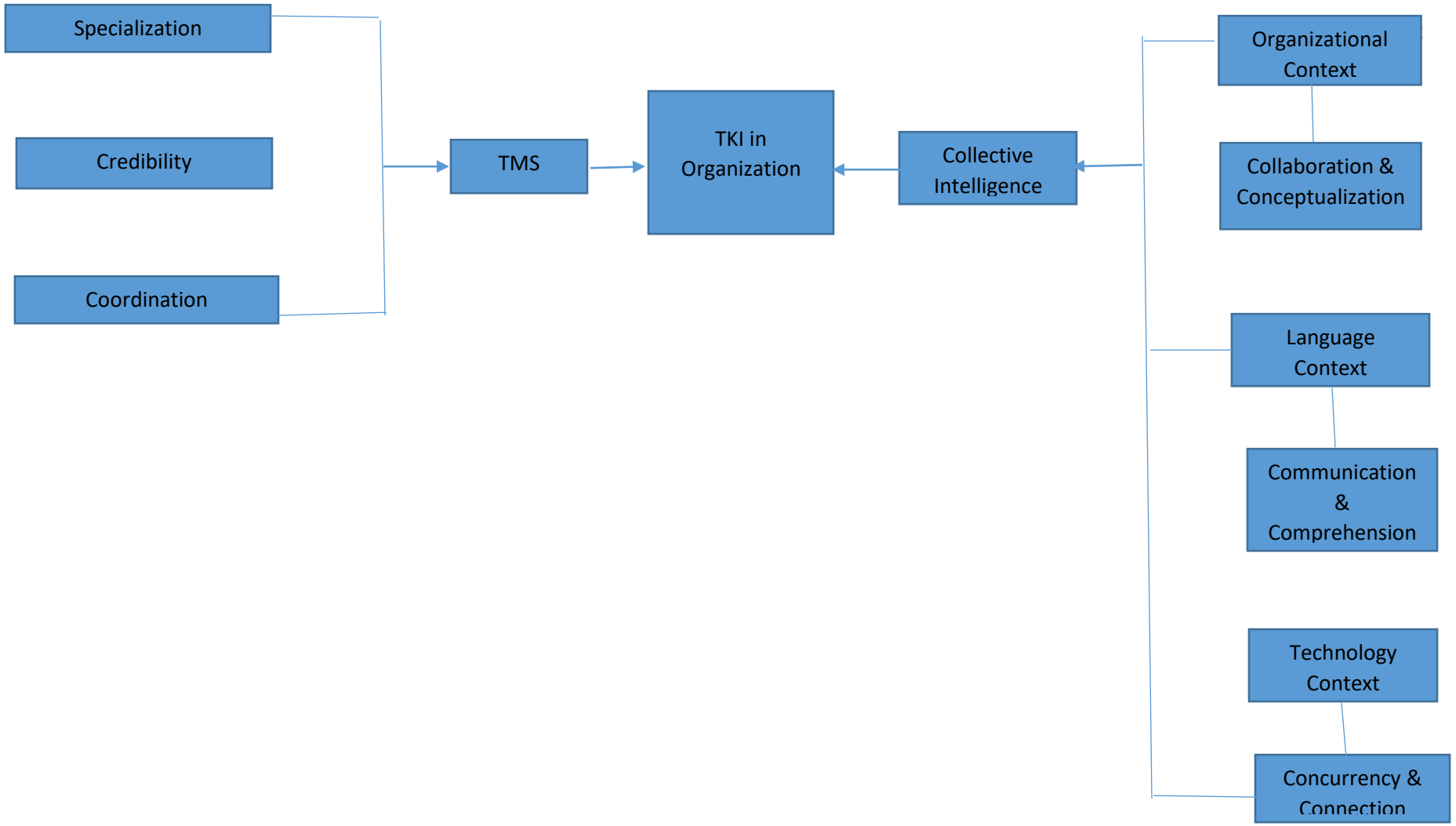


Fig. 3 Research Model for Survey

In order to incorporate tacit knowledge in the organization, particularly at the Federal Transport Authority (Ethiopia), the proposed TMS and the 7C model combination is being proposed.

Fig. 4proposed tacit Knowledge Integration Model for Federal Transport Authority (Ethiopia)



8. Testing hyphothesis

The framework is designed using the following hypotheses:

H1: Specialization has a direct effect on Tacit Knowledge Integration.

Knowledge integration describes the synthesizing of individual expertise (Tiwana and McLean, 2005). The diverse expertise held by different team members is recombined at the organizational level. The mechanisms that facilitate knowledge integration are diverse.

H2: Lack of credibility has a direct effect on Tacit Knowledge Integration in an organization.

The trust is developed in the team members' expertise. The TMS of a team characterizes its existing meta-knowledge (Lewis, 2003), which allows team members to identify the location of the required expertise and judge its credibility.

H3: Loss of coordination of new knowledge and existing knowledge in an organization hurts knowledge integration.

Coordination is the team member's ability to work together efficiently. Rico et al (2008) emphasize how team-based knowledge integration is facilitated by implicit coordination instead of communication: individuals anticipate the knowledge needs of colleagues and provide the available knowledge without the need for extensive planning and direct communication.

H4: Collective intelligence has a direct effect on tacit knowledge integration.

Collective intelligence, support for understanding, and communication help in the individual learning of new ideas, and organizational learning mainly takes place through the experts and their communication and collaboration efforts. All of these six preceding Cs contributes to the growth of "togetherness".

H5: Specialization has a direct effect on collective intelligence.

By harnessing the collective wisdom, expertise, and capabilities of individuals, we can solve complex problems, improve decision-making, and unlock new possibilities.

As mentioned in the above paragraph, the experts are specialized in specific disciplines. The experts who specialize in specific disciplines can give significant ideas to solve a problem.

H6: Credibility has a direct effect on collective intelligence.

One of the Transactive Memory Systems (TMS) is credibility. All the TMS parts are interrelated, each other. Therefore, when experts who are specialists in a subject can be credible to other staff.

H7: Coordination has a direct effect on collective intelligence.

During a meeting, different experts raise various issues and share their knowledge. The main problem is the coordinated sharing of knowledge from experts. Sometimes a problem might have a single solution and sometimes might have various coordinated solutions. The main point is to coordinate the sharing of knowledge generated by experts.

H8: Concurrency and Connection has a significant effect on collective intelligence.

Technology context is part of 7C mode. In technology, text includes concurrency and connection. Mostly, information technology does not have a direct effect on Tacit Knowledge Integration.

H9: Connection has direct effect on collective intelligence. Technology context is the part of 7C mode. In technology text included concurrency, and connection. Mostly, the information technology is enable not have direct effect on Tacit Knowledge Integration.

H10: Communication and Comprehension has a direct effect on collective intelligence.

In the language context communication and comprehension are included. Communication and comprehension are the main tools for Tacit Knowledge Integration and collective intelligence. Mostly, experts who have similar professions can understand the knowledge easily.

H11: Comprehension has direct effect on collective intelligence. In the language context communication and comprehension are included. Communication and comprehension are the main tools for Tacit Knowledge Integration and collective intelligence. Mostly, experts who have similar professions can understand the knowledge easily.

H12: Conceptualization and Collaboration has a direct effect on collective intelligence.

In the organizational context, conceptualization and collaboration are the main parts. One of the main resources for an organization is knowledge. We understand knowledge conceptually and employees should collaborate to use it.

H13: Collaboration has direct effect on collective intelligence. To organize and use the tacit knowledge in the transport organization, this paper, researchers combine the Transactive Memory System (TMS) and 7C model for organizational knowledge creation and organize the knowledge integration in the transport organization. The components of TMS are specialization, credibility, and coordination. The 7C model components are concurrency, connection, communication, comprehension, collaboration, conceptualization, and collective intelligence.

Table 1: Structural Model Hypothesis Testing for Bootstrapping Direct Effect Results

Hypotheses	Direct Effects (Path)	Path Coefficient (ß)	Path Coefficient (ß) Strength	Std error	T-value	P values 95% CIL	Decision
H1	collIntelligence -> TKI	0.276	Moderate	0.183	1.388	0.029*	Supported
H2	collaboration ->collIntelligence	0.942	Strong	0.404	0.404	0.02*	Supported
H3	Communication ->collIntelligence	0.515	Strong	2.116	2.116	0.014*	Supported
H4	Comprehension ->collIntelligence	0.378	Moderate	0.806	0.806	0.018*	Supported
H5	conceptualization ->collIntelligence	0.253	Moderate	2.175	2.175	0.016*	Supported
H6	Concurrency ->collIntelligence	0.043	Weak	1.721	1.721	$0.117^{N.S}$	Not Supported
H7	Connection ->collIntelligence	0.035	Weak	1.726	1.726	$0.118^{N.S}$	Not Supported
H8	Coocollective ->collIntelligence	0.740	Strong	0.293	0.293	0.017*	Supported
H9	coordination -> TKI	0.648	Strong	2.763	2.763	0.006**	Supported
H10	credcollective ->collIntelligence	0.482	Strong	0.418	0.418	0.01**	Supported
H11	credibility -> TKI	0.893	Strong	0.165	0.165	0.01**	Supported
H12	Specialization -> TKI	0.01	Weak	2.693	2.693	0.01**	Supported
H13	Specollective ->collIntelligence	0.972	Strong	0.219	0.219	0.01**	Supported

*Significant at level 0.05; **Significant at level 0.01; N.S: Not significant.

*Path coefficients (ß) strength: 0.2 (weak); Values between 0.2 and 0.5 is (Moderate); and more than 0.50 is (Strong).
Decision: 11 out of 13 hypothesis get support.

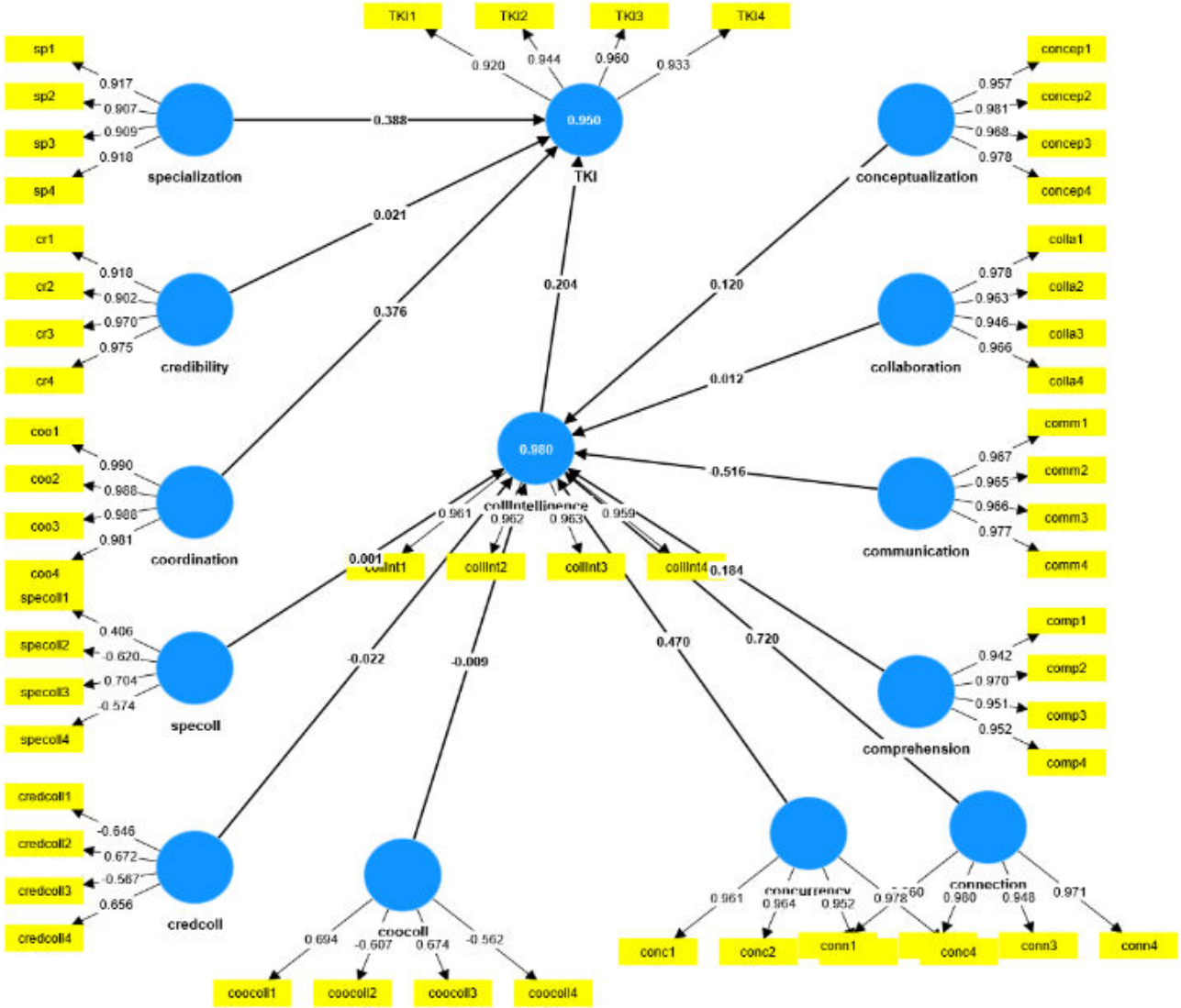
The predictive power of the proposed model was assessed in terms of Coefficient of Determination (R^2).

Table 2: Summary of Coefficient of Determination (R^2) Values.

Constructs	R^2	Predictive Power
Tacit Knowledge Integration	0.950	Substantial
Collective Intelligence	0.980	Substantial

Furthermore, Table 2, presents the overall results of the assessment of measurement and structural model tests.

Fig. 5. The Overall Proposed Model Tests over Experts' Samples.



(Source: Smart PLS Output, 2023)

9. Findings

This paper presents the test results of the proposed model presented in the next sections. Structural Equation Modeling (SEM-PLS) was used to test the model. Accordingly, the proposed model was tested based on measurement and structural model tests on experts' level. The measurement model test analysis result in the expert data set shows that all the model constructs are valid and reliable to measure Tacit Knowledge Integration (TKI) in the context of the Federal Transport Authority (Ethiopia). Furthermore, the test results were not only limited to measurement model tests but also to structural model tests. As a result, the structural model, test results showed that out of thirteen hypotheses/ relationships, eleven hypotheses were supported under experts' samples. The relationships among the model constructs were also tested in terms of path coefficient, predictive relevance, effect size, and overall predictive power. Accordingly, the analysis results showed the sound predictive power of the proposed model.

10. Conclusions and Recommendations

The study proposed the combination of 7C with TMS to facilitate the Tacit Knowledge Integration (TKI) in Federal Transport Authority (Ethiopia). The factors are focused on individual and organization aspects. Specially, the Transactive Memory System gave emphasis for human aspects and 7C model for both human and organization aspects related to information technology. However, the factors of TMS and 7C focused on different human and organizational aspects. The combination of the TMS and 7C model supported to use of the TKI from human and organizational aspects fully.

The study findings suggest that the creation, and sustainability of the system component is an antecedent of the use of the TKI model. The study discovered two constructs under the system TKI model (i.e. TMS and Collective intelligence constructs). The TMS component of the phase also predicts (i.e. as a supportive).

From the study findings, it is revealed that the use of collective intelligence ultimately determines the impact of collective intelligence on the model. It was found that experts would evaluate the use of TKI in terms of the benefit it brings while saving their time, and cost, and enhancing their performances. This last phase of the model has sound predictive power, path coefficients, predictive relevance, and effect size as impacted by the Tacit Knowledge Integration/ component of the model.

References

1. Alavi, M., and Leidner, D.E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. MIS Quarterly. Vol. 25 No. 1, pp. 107-136.
2. Ambrosini, V., and Bowman, C. (2001). Tacit knowledge: Some suggestions for operationalization. Journal of Management Studies, Vol. 38 No. 6, pp. 811-829.
3. Ashkenas, Ronald. N., Lawrence, J. De Monaco, & Suzanne, C. Francis. (1998). making the deal real: How GE capital integrates acquisitions. Harvard Business Review. Vol, 76 No. 1, pp. 165-178.
4. Aziz, N., Gleeson, D., Kashif, M. (2012). Barriers and enablers of knowledge sharing: a qualitative study of ABB, Bombardier, Ericsson and Siemens. School of sustainable development of society and technology.
5. Baumard, P. (1999). Tacit knowledge in organizations. London: Sage Publications.
6. Benner, P. and Tanner, C. (1987). Clinical judgment: How expert nurses use intuition. The American Journal of Nursing, Vol. 87, pp. 23-31.
7. Bennett, S. (2012). The benefits of communication and collaborating in a real-time enterprise social network. Paper presented at the Professional Communication Conference (IPCC), 2012 IEEE International
8. Bertels,C.P., & Nauta,D. (1969). Inleiding tot het Modelbegrip. Bussum: Uitgeverij W. De Haan.
9. Bhattacherjee, A. (2012). Social Science Research: Principles, Methods, and Practices. 2nd ed. Global text Project.
10. Blackler, F. (1996). Knowledge, knowledge work and organizations: An overview and interpretation. Organization Studies, Vol. 16 No. 6.
11. Butler Jr, J., & Cantrell, R. S. (1994). Communication factors and trust: An exploratory study. Psychological Reports, Vol. 74 No. 1, pp. 33-34.
12. Cameron, P. (2000). Managing the wealth. CMA Management, Vol. 74 No. 9, pp. 46-49.
13. Carrillo, P. (2004). Managing knowledge: Lessons from the oil and gas sector. Construction Management and Economics, Vol. 22 No. 6, pp. 631-642.
14. Castillo, J. (2002). A note on the concept of tacit knowledge. Journal of Management Inquiry, Vol. 11 No. 1, pp. 46-59.
15. Cheng, M. (2009). Research on the knowledge transfer in construction projects. Industrial Engineering and Engineering Management. IE & EM'09. 16th International Conference.
16. Chiu, C.M.; Hsu, M.H., Wang, E.T.G. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. Decision Support System, Vol. 42 No. 3, pp. 1872-1888.

17. Cimino,J., James. (1999). From data to knowledge through concept oriented terminological: Experience with the Medical entities dictionary. Journal of the American Medical Informatics Association, Vol. 7, Issue, 3.
18. Cross, R., and Cummings, J. N. (2004). Tie and network correlates of individual performance in knowledge-intensive work. The Academy of Management Journal, Vol. 47, pp. 928-937.
19. Cross, R., & Sproull, L. (2004). More than an answer: Information relationships for actionable knowledge. Organization Science, Vol. 15 No. 4, pp. 446-462.
20. Daniel, Mamo. Jennex, M. E., and Million, Meshesha. (2022). Research in Area of Tacit Knowledge: Literature review on Tacit Knowledge. Journal of Information and Knowledge Management. Vol. 12 No. 4.
21. De Leeuw, A.C.J. (1999). Kwaliteit van Bedrijfskundige kennis: Kennisproducten en hun Bruikbaarheid. In M.J. Van Riemsdijk (Ed.), Dilemma's in de Bedrijfskundige Wetenschap: 185-205. Assen: Van Gorcum & Comp.
22. Egbu, C. (2004). Managing knowledge and intellectual capital for improved organizational innovations in the construction industry: An examination of critical success factors. Engineering Construction and Architectural Management, Vol. 11 No. 5, pp. 301-315.
23. Eisenhardt, K.M. (1989). Building theories from case study research. The Academy of Management Review, 14 (4), 532-550.
24. Eraut, M. (1994). Developing Professional knowledge and competence. London: Falmer Press.
25. Federal Transport Authority (FTA). (2016). The Five Years Strategic Plan of FTA. The Federal Transport Authority Yearly Magazine.
26. Forsythe, S., Liu, C., Shannon, M. David., and Gardner, Chun, L. (1998). Development of a scale to measure the perceived benefits and risks of online shopping. Journal of Interactive Marketing, Vol. 20 No. 2, pp. 55-75.
27. Greiner, E, M., Böhmann, T., and Krcmar, H. (2007). A strategy for knowledge management. Journal of Knowledge Management, Vol. 11 ISS. 6, pp. 3-15.
28. Haddad, M., & Bozdogan, K. (2009). Knowledge integration in large-scale organizations and networks-conceptual overview and operational definition. Available at SSRN: ssrncom.
29. Hajiric, E. (2018). Knowledge management: System and practices. European Management Journal, Vol. 19 No. 6, pp. 599-608.
30. Hari, S., Egbu, C., Kumar, B., (2005). A knowledge capture awareness tool: An empirical study on small and medium enterprises in the construction industry. Construction and architectural management, Vol. 12 No. 6, pp. 533-567.

31. Hazel, T. (2007). Tacit knowledge: Conceptualizations and Operationalization. International Journal of Knowledge Management, Vol. 3 No. 3, pp. 60-73.
32. Horvath, J. A. (2007). Working with tacit knowledge. IBM Institute for Knowledge Management.
33. Huang, J.C., & Newell, S. (2003). Knowledge integration processes and dynamics within the context of cross-functional projects. International Journal of Project Management, Vol. 21 No. 3, pp. 167-176.
34. Irma, B., Rajiv, S. (2001). Organizational knowledge management: A contingency perspective. Journal of Management Information Systems, Vol. 18 No. 1, pp. 23-55.
35. Jamsai, S., Nousala, S., and Hall, P.W. (2007). Tacit knowledge network development: The comparative analysis of knowledge threads in complex systems. SSRN Electronic Journal.
36. Jennex, M, E. (2017). Big data, the internet of things, and revised knowledge pyramid. The DATA BASE for Advances in Information Systems, Vol. 48 No. 4
37. Jennex, M. E., and Bartczak, S. E. (2013). A revised knowledge pyramid. International Journal of Knowledge Management, 9 (3), 19-30.
38. Jennex, M. E., & Olfman, L. (2006). A model of knowledge management success. International Journal of Knowledge Management, 2 (3), 51-68.
39. Jonassen, D. H., Beissner, K., and Yacci, M. (1993). Structural knowledge: Techniques for representing, conveying, and acquiring structural knowledge. Lawrence Erlbaum Associates, Hillsdale, N.J.
40. Kanawattanachai, P., & Yoo, Y. (2007). The impact of knowledge coordination on virtual team performance over time. MIS Quarterly, Vol. 31 No. 4, pp. 783-808.
41. Klemp Jr., G.O., & McClelland, D.C. (1986). What characterizes intelligent functioning among senior managers in R.J. Sternberg & R.K. Wagner (eds), Practical Intelligence: Nature and Origin of competence in the Everyday World 31-50. Cambridge: Cambridge University Press.
42. Kogut, B., and Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. Organization Science, Vol. 3 No. 3, an integration of social capital and social cognitive theories. Decision Support System, Vol. 42 No. 3, pp. 1872-1888.
43. Kotlarsky, J., Van Fenema, P.C., & Willcocks, L. P. (2008). Developing a knowledge-based perspective on coordination: The case of global software projects. Information & Management, Vol. 45 No. 2, pp. 96-108.
44. Kuhn, T. (1970). The structure of scientific revolutions, second edition. Chicago: University of Chicago Press.
45. Leithwood, K., & Steinbach, R. (1995). Expert problem solving: Evidence from school and district leaders. Albany, New York: Suny Press.

46. Leonard, D., and Sensiper, S. (1998). The role of tacit knowledge in group innovation. California Management Review, Vol. 40 No. 3, pp. 112-132.
47. Lewis, K. (2003). Measuring Transactive Memory Systems in the field: Scale development and validation. Journal of Applied Psychology, Vol. 88 No. 4, pp. 587-604.
48. Liang, D. W., Moreland, R., & Argote, L. (1995). Group versus individual training and group performance: The mediating role of Transactive memory. Personality and Social Psychology Bulletin, Vol. 21 No. 4, pp. 384-393.
49. Love, P.E.D., Lopez, R., and Edwards, D.J. (2013). Reviewing the past to learn in the future: Making sense of design errors and failures in construction, structure, and infrastructure. Eng., Vol. 9 No. 7, pp. 675-688.
50. Lubit, R. (2001). Tacit knowledge and knowledge management: The keys to sustainable competitive advantage. Organizational Dynamics, Vol. 29 No. 4, pp. 164-178.
51. Malhotra, Y. (2002). Enabling knowledge exchanges for e-business communities. Information Strategy, Vol. 18 No. 3, pp. 26-31.
52. Marchant, G., & Robinson, J. (1999). Is knowing the tax code all it takes to be a tax expert? On the development of legal expertise. In R. J. Sternberg, & J.S. Horvath (Eds.). Tacit knowledge in professional practice: Researcher and practitioner perspectives (pp. 3-20). Mahwoh, NJ: Lawrence Erlbaum.
53. Markus, M.L., and Robey, D. (1988). Information Technology and Organizational Change: Causal structure in theory and research. Management Science, Vol. 34 No. 5, pp. 583-598.
54. Mayer, B., and Sugiyama, K. (2007). The concept of knowledge in KM: A dimensional model. Journal of Knowledge Management, Vol. 11 No. 1, pp. 17-35.
55. Messick, S. (1976). Individuality in learning. Jossey-Bass.
56. Miles, M. B., & Huberman, A. M. (1984). Qualitative data analysis: An expanded source book (2nd Ed.). Thousand Oaks, CA: Sage.
57. Miller, D. & Friesen, P.H. (1980). Momentum and revolution in organization adaptation. The Academy of management Journal, Vol. 23, pp. 591-614.
58. Minstrell. J., Schoenfeld, A. H., & Zee van Emily. (1999). The detailed analysis of an established teacher's non-traditional lesson. The Journal of Mathematical behavior.
59. Mong, P.R. (1990). Theoretical and analytical issues in studying organizational processes. Organization Science, Vol. 1 No. 4, pp. 406-430.
60. Moreland, R.L., & Myaskovsky, L. (2000). Exploring the performance benefits of group training Transactive Memory or unproved communication? Organizational Behavior and Human Decision Processes, Vol. 21 No. 1, pp. 117-133.

61. Murphy, G.L., & Wright, J.C. (1984). The utility of theories in intuitive statistics: The robustness of theory-based judgments. Journal of Experimental Psychology: General, Vol. 113, pp. 301-322.
62. National Academy of Science. (2015). A Guide to agency-wide knowledge management for state departments of transportation. The National Academies Press.
63. Nestor-Baker, N. S. & Hoy, W. K. (2001). Tacit knowledge of school superintendents: Its nature, meaning, & content, Vol. 37.
64. Neumann, W. L. (2005). Social Research Methods (6th Ed.). London: Pearson.
65. Nevo, D., Benbasat, I., & Benbasat, I., & Wand, Y. (2012). Understanding Technology support for organizational Transactive Memory: Requirements, Application, and Customization. Journal of Management Information Systems, Vol. 28 No. 4, pp. 69-98.
66. Nonaka, I. (1994). A Dynamic theory of organizational knowledge creation. Organization Science, Vol. 5 pp. 14-37.
67. Nousala, S., Miles, A., Kilpatrick, B., Hall, P.W. (2007). Building knowledge sharing communities using team expertise access maps.
68. Nousala, S., John, & S. Jamsai, S. (2005a). Knowledge strategies and implementation in complex organizations: A Thai engineering company case study. International Journal of knowledge, cultural, & change management, Vol. 5, Issue 5, pp. 177-182.
69. Okhuysen, G. A., & Eisenhardt, K. M. (2002). Integrating knowledge in groups: How formal interventions enable flexibility. Organization Science, Vol. 13 No. 4, pp. 370-386.
70. Orlikowski, W. J., and Baroudi, J. J. (1991). Studying Information Technology in Organizations: Research Approaches and Assumptions. Information Systems Research, Vol. 2 No. 1
71. Oshtoran, K., & Emami Meybodi, R. (2010). Tacit knowledge & technology transfer policies with emphasis an information and communication technology (1st ed). Tehran: Publication of the university.
72. Osterloh, M., & Frost, J., & Frey, S. B. (2000). The dynamics of motivation in new organizational forms.
73. Pathirage, C. P., Amaratunga, D. G., Haigh, R. P. (2007). Tacit knowledge and organizational performance: Construction industry perspective. Journal of Knowledge Management, Vol. 11, pp. 115-126.
74. Reagans, R., & McEvily, B. (2003). Network structure and knowledge transfer: The effects of cohesion and range. Johnson Graduate School of Management.

75. Ryan, S. and O'Connor, R.V. (2009). Development of a team measure for tacit knowledge in software development teams. The Journal of Systems and Software, Vol. 82 No. 2, pp. 229-240.
76. Saad, I., Grundstein, M., and Rosemthal-Saboux, C. (2003). Locating the company's crucial knowledge to specify corporate memory: A case study in an automotive company. Knowledge management and organizational workshop proceedings, IJCAI, Acapulco, pp. 75-84, August, 9-16.
77. Savvas, I., Bassiliades, N. (2009). A process-oriented ontology-based knowledge management system for facilitating operational procedures in public administration. Expert Systems with application, Vol. 36 No. 3, part 1, pp. 4467-4478.
78. Shaw, T., and Jarvenpaa, S. (1997). Process Models in Information Systems. Science Business Media
79. Sheehan, T., Poole, D., Lyttle, I., and Egbu, C. (2005). Strategies and business case for knowledge management. Knowledge management in construction, Blackwell, UK.
80. Spy Pond Partners. (2015). A Guide to Agency-wide knowledge management for state departments of transportation. National Cooperative Highway Research Program, Report 813.
81. Sveiby, K. (1997). A knowledge-based theory of the firm to guide in strategy formulation. Journal of Intellectual Capital.
82. Szulanski, G. (2000). The process of knowledge transfer: A diachronic analysis of stickiness. Organizational Behavior and Human Decision Processes, Vol. 82 No. 3, pp. 9-27.
83. Takhtravanchi, M. (2017). Tacit Knowledge Integration within the Traditional Construction Procurement System. University of Salford, Salford, UK.
84. Tan. Hun-Tong, & Libby, R. (1997). Tacit managerial versus technical knowledge as determinants of audit expertise in the field. Journal of accounting research.
85. Tasaka, Dr H. (1999). Twenty-first century management and the complexity paradigm. Emergence, Vol. 1, Issue 4.
86. Temesgen Aklilu. (2006).The role of the transport sector in Ethiopia's Economic Development. Ethiopian Economic Association, Vol. 9 No. 4.
87. Tiwana, & Mclean. (2005). Expertise in integration and creativity in Information Systems Development. Journal of Management Information Systems.
88. Turoff, M. (1991). Computer-mediated communication requirements for group support.
89. Wan, J., Zeng, M., and Zhu, Y. (2013). Case study on tacit knowledge management systems within X Company.

90. Wang, J., Zhao, S., & Yang, J. (2004). Research on the sharing model and mechanism of tacit knowledge. Science of Science and Management of S. &. T, Vol. 15 No. 10, pp. 65-67.
91. Wegner, M. D., Raymond, P., &Erber, R. (1991). Transactive memory in close relationships. Journal of Personality and Social Psychology, Vol. 61 No. 6, pp. 923-929.
92. Williams, M. (1991). Memory assessment scales. University of Vermont.
93. Williams, T. (2007). Post-project review to gain effective lessons learned: Project Management Institute, Newtown Square, PA.
94. Yigitcanlar, T., Dur, D., Dizdaroglu, D. (2015). Towards prosperous sustainable cities: A multiscale urban sustainability assessment approach. Habitat International, Vol. 45, pp. 36-46.
95. Yin, R.K. (2011). Qualitative Research: Design and Methods. The Guilford Press: New York.
96. Zhang, C., Hong, D., & Ling, H. (2011). A study on the mechanism of tacit knowledge integration: The role of social ties and Transactive Memory systems. International Journal of Innovative Computing, Information & Control, Vol. 8 No. 8.
97. Zhong, X., Huang, Q., Davison, R.M., Tang, X., & Chen, H. (2012). Empowering teams through social network ties. International Journal of Information Management, Vol. 32 No. 3, pp. 209-2