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Project Managers' Communication Strategies for Team Collaboration in Software Development

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Walden University

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Walden University

College of Management and Technology

This is to certify that the doctoral study by

John Wani

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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The Office of the Provost

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2019

Abstract

Project Managers' Communication Strategies for Team Collaboration in Software

Development

by

John Rubena Wani

MSc, American University in Cairo, 2004

BSc, Future University, Khartoum, 1998

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Information Technology

Walden University

October 2019

Abstract

Effective communication among team members in software development projects is increasingly significant for the success of the project. Successful software projects are the catalyst for achieving profitability objectives and creating shareholder value in organizations. The purpose of this single case study was to investigate communication strategies information technology (IT) project managers used for successful team collaboration in software development. The population for this study comprised senior IT project managers. The project managers had supervision responsibilities from a midsize IT company in Alberta, Canada. The sociotechnical theory guided this study as the conceptual framework. Data were collected from semistructured interviews with 13 senior IT project managers on their experiences using effective communication strategies for team collaboration. A review of 11 company documents was conducted. Using methodological triangulation and member checking of original interview transcripts served to establish the trustworthiness of final interpretations. Through thematic analysis, 4 significant themes emerged from the study: effective communication, attributes of communication, the importance of social and emotional intelligence, and the impact of postwork activities for team collaboration. The findings of this study might bring about positive change by supporting senior project managers use of communication strategies for team collaborations in midsize IT companies to increase job satisfaction and project completion.

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Dedication

This study is wholeheartedly dedicated to my beloved parents. My father, late Dr. Rubena Lumaya Wani, and my mother, late Ustaza Rachel Keji Alfonse Pita Dumo, are my sources of inspiration. They gave me strength when I thought of giving up, and they continually provide their moral, spiritual, emotional, and financial support. In addition, I want to dedicate this study to my wife, Suzana Dumo. Thank you for your support and for helping me see one of my lifelong dreams happens.

I want to express my special feeling of gratitude to my brother, Dr. Justin, to my wonderful sisters, Dr. Joy, Dr. Julia, and Dr. Grace. Your words of encouragement have made me move forward. To relatives, friends, and classmates who shared their words of advice and support, I am grateful to all of you. Lastly, I dedicated this study to the Almighty God, thank you for the guidance, strength, power of the mind, protection, and healthy life. All of these, I offer to you.

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Nobody has been more important to me in the pursuit of my studies than the members of my family. I want to thank my late parents, whose love and guidance are with me in whatever I pursue. They are the ultimate role models. Most importantly, I am grateful to my loving and supportive wife, who provides unending inspiration. Finally, I thank my God for letting me through all the difficulties. I have experienced your guidance day by day. Thank you, Lord.

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Section 1: Foundation of the Study

Background of the Problem

Successful software projects are the catalyst for achieving profitability objectives and ultimately creating shareholder value in organizations. Although similarities exist between projects, researchers have argued that communication-related issues are among the leading reasons for the low rate of success in software development projects (Alzoubi, Gill, & Al-Ani, 2015). Ineffective communication plans account for more discrepancies in software projects due to the lack of collaboration among team members. The researchers Storey, Zagalsky, Figueira Filho, Singer, and German (2017) have documented recurring problems related to the lack of adequate communication among all stakeholders involved in the project. A software development project starts well, the team is briefed, and tasks are assigned. However, as the project advances, team members lose track of their tasks because of inadequate communication plans.

Today, software companies are increasingly moving to the global software development model because of the significant benefit that can accrue, including the large pool of labor, and access to skilled labor (Giuffrida & Dittrich, 2015). However, despite these benefits, these companies face many challenges related to communication and coordination; project managers (PMs) play a crucial role in communication at every level of project phases (Pernstal, Gorschek, Feldt, & Floren, 2015). Without a well thought out communication strategy, many companies are throwing millions of dollars out the window with every project they attempt to execute (Yeo, 2002).

Problem Statement

Poor communication among team members in software development affects project success (Lindsjörn, Sjøberg, Dingsøyr, Bergersen, & Dybå, 2016). Forty-three percent of software development projects are over budget, and 56% deliver less value than expected (Mohanarajah & Jabar, 2015). A comparable study showed that in more than 50% of projects, ineffective communication strategies were critical contributors to project failures in software development (Alzoubi, Gill, & Al-Ani, 2016). A breakdown in communication can negatively impact a project as team members struggle to work with one another during the lifecycle of the software development project (Pernstal et al., 2015). The general IT problem was that some project managers often fail to align communication and team dynamics in software development projects, which negatively affects software project success. The specific IT problem was that some IT PMs lack communication strategies to facilitate successful collaboration between software development teams for mid-sized companies in Alberta, Canada.

Purpose Statement

The purpose of this qualitative case study was to investigate communication strategies IT PMs use to facilitate successful collaboration between software development teams in mid-sized companies in Alberta, Canada. The population for this study comprised senior IT leaders with supervision responsibilities from a mid-sized IT company in Alberta, Canada. The PMs participated in semistructured interviews and answered questions designed to determine the successful communication strategies they used to promote team collaboration in software development. The implications for

positive social change include the potential to impact software development practices by contributing new knowledge for use by IT organization leaders looking to improve team culture, which may result in higher job satisfaction and projects that are more successful, possibly leading to decreased unemployment numbers.

Nature of the Study

The approach I employed in this study was qualitative. A qualitative method allows the researcher to see phenomena from the viewpoint of the participants and explore themes based on what the participants experienced (Lewis, 2015). A qualitative method relies on a combination of participant observation, interviews, and historical research (Yin, 2013). In this study, I explored communication strategies from the standpoint of PMs; therefore, the qualitative approach was suitable for this study.

Another method was quantitative, which generates proved and unproved results because it quantifies a problem by proving or disproving a hypothesis (Nan & Sansavini, 2017). I did not use the quantitative method in this study because no testing of hypotheses was involved, and no numerical data was used to deduce statistics. Another potential approach is the mixed method with which researchers collect, analyze, and integrate both quantitative and qualitative information in a single study to address research questions (Turner, Cardinal, & Burton, 2017). Developing sound mixed research requires the collaboration of different expertise, more time, and attention to design more than may be necessary for a single method.

A qualitative exploratory case study was the most appropriate design for this qualitative study. A case study design is an in-depth exploration from multiple

perspectives of the complexity and uniqueness of a particular phenomenon in real life (Yin, 2013). An investigation through a case study design enables the researcher to conduct exploratory research and ask *how* or *what* questions to comprehend the characteristics of real-life events (Rymaszewska, Helo, & Gunasekaran, 2017). I chose a case study as the design to explore in-depth the particular phenomenon in the real-world context. I intended to ask *what* questions to understand the events in their real-life setting.

I also considered the phenomenology and ethnography approaches as designs for this study. The phenomenological approach is a description of phenomena as consciously experienced by participants without theories about their objective reality (VanScoy & Evenstad, 2015). However, the phenomenological method was not suitable for this study. The purpose of this study was to explore communication strategies PMs use to facilitate team collaboration and, therefore, an exploratory case study was more appropriate. Likewise, an ethnographic research design was not relevant since the goal of such research is to explore an entire culture of people to gain perceptions (Lane, 2016). Additionally, ethnographic research involves trying to understand how people live their lives (Bass & Milosevic, 2018). Unlike the case study, where the researcher asks specific and highly practical questions, ethnographic researchers visit participants in their locations to observe and listen in a nondirected way (VanScoy & Evenstad, 2015).

Research Question

The research question that guided this qualitative case study was: What communication strategies do IT PMs use for successful collaboration in software development teams of midsized companies?

Interview Questions

The following were the open-ended interview questions for the participants:

1. What communication strategies do you use to facilitate team collaboration in software development?
2. What is the most important process you use for successful communication between team members in software projects teams?
3. What are the critical factors you use to establish communication strategies to promote team collaboration?
4. What communication strategies do you use that are least useful in team collaborations in software development?
5. What communication strategies do you use that are most useful in team collaboration in software development?
6. What obstacles have prohibited your communication strategies from being successful in your software development projects?
7. What other information would you like to provide that we have not addressed already?
8. What communication strategy or strategies do you now use to facilitate team collaboration?
9. Why do you decide to use this communication strategy or strategies to promote team collaborations?
10. What advice would you give to some of the PMs who lack communication strategies in the software development industry?

Conceptual Framework

The conceptual framework of this study was the sociotechnical system (STS). Notably developed at the Tavistock Institute in London in early fifties (Trist, 1981), the STS model serves as a lens to explain communication strategies needed to enable collaborations in an organization. Initially, the model addressed the principles of systems and interdependencies (Wu, Fookes, Pitchforth, & Mengersen, 2015). The model was expanded by Clegg (2000) to encompass new information communication technology strategies based on the Internet. The driving idea behind the model is the notion of recognizing the interaction between people and technology in an organization to produce social physiognomies leading to active collaborations and efficient systems (Kim, Shin, & Lee, 2015). Exploring communication strategies through this model offered the understanding upon which PMs envisage communication strategies as a subset of the full coordination of software development efforts and of upholding team productivity.

As applied to this study, the STS model allowed me to explore the critical communication strategies necessary to promote team collaboration. Also, the STS model can be used to analyze research on predictors of communication success in complex work domains and focus on knowledge sharing within organizational settings (Chen & Qi, 2015). In general, the STS model continues to evolve to include a broader range of complex engagements in more predictive management practices (Carayon et al., 2015). Furthermore, the concept continues to offer intriguing and potentially valuable insights into strategies to sustain productive working environments.

Definition of Terms

Project manager (PM): An IT professional charged with overseeing the process of planning, executing, and delegating responsibilities around an organization's IT pursuits and goals. Project managers play a critical role in the success of software projects and responsible for relating overall quality, team members, and professional activities (Rezvani et al., 2016).

Senior IT leaders: The group of senior executives in an organization responsible for the IT infrastructure and applications that enable and drive the overarching business strategy and goals (Thomas, 2015). Senior IT leaders include such positions as chief information officer, chief operating officer, senior application developer, and senior PM.

Team: A software development team collaborates to build software applications and usually makes up the largest financial cost within an IT department or software company. The effective collaboration of a software team could add significant value to a company through increased productivity (Strode, 2016).

Communication strategies: The blueprints for the information exchanged in software development projects. Communication strategies allow PMs to implement and evaluate communication within software development projects, which can enable achieving goals and objectives (Yagüe, Garbajosa, Díaz, & González, 2016).

Assumptions, Limitations, and Delimitations

In a research study, the assumptions, limitations, and delimitations allow the focus of the investigation to remain on participants' understanding of the problem as experienced (McCusker & Gunaydin, 2015). It is essential to clarify the assumptions,

limitations, and delimitations to make sure readers understand the potential impact of the study, and without stretching the merits of what the research could achieve. In the following subsections, I describe how the assumptions, limitations, and delimitations affected this study.

Assumptions

Assumptions are realistic expectations, and they support a clear, logical rationale for the study (Barnham, 2015). The first assumption in this study was that the interview questions would produce thoughtful responses from the participants and that the IT PMs would provide honest feedback during the interviews. I also assumed that the sample of participants represented the small IT population under study. My final assumption was that the semistructured interviews would offer an opportunity to explore common themes involving the communication strategies IT PMs use and the effectiveness of these strategies.

Limitations

The limitations refer to the influences that the researcher cannot control and that could disrupt the findings' trustworthiness (J. Richardson, 2018). One limitation of this study was the sample size, which might not have proven to be representative of the small IT firm population throughout the Alberta region. Second, the geographical area of the study might not apply to other companies with different IT challenges, levels of employment, and opportunities. Another limitation was conducting interviews over a specified time period. A study over more extended periods and under different software development environments and conditions may yield a more thorough analysis. Finally,

the unwillingness of study participants to share the full extent of their communication strategies and experiences could have posed a limitation.

Delimitations

Delimitations describe and set the boundaries of the study during the research design (Yin, 2015). The first delimitation was that I did not consider IT PMs who were not in senior leadership. Interviewing only senior IT PMs represented a delimitation because I could have interviewed IT professionals who are not in IT PM leadership positions; however, these professionals may not have known what communication strategies IT PMs are practicing to improve team collaboration in software development. The second delimitation was the relatively small sample size; a larger sample would have added more time and cost. Finally, the geographical location of the study population was confined to a metropolitan area in Alberta for convenience.

Significance of the Study

Contribution to IT Practice

The results of this study may fill a gap in the literature and contribute to IT practice by adding knowledge for PMs looking to promote and improve team collaboration in software development. Understanding communication strategies that senior IT leaders are exercising may provide insight into successful and ineffective approaches to encourage cooperation among team members as well as productivity. IT leaders may use the outcomes from this study to assess the effectiveness of the current strategies practiced to improve team collaboration. This research demonstrated that leaders in a software development business need to understand the issues surrounding

communication factors that influence cooperation to manage teams (Alzoubi et al., 2015). Identifying and understanding effective strategies used by senior IT leaders can assist in promoting team collaboration, improving project knowledge on communication strategies, and increasing team morale.

Implications for Social Change

Exploring what communication strategies IT project managers practice may be a significant step towards ensuring successful projects in software development. From a social change perspective, the results of this study may be beneficial to organizational culture by empowering team members. Supportive leadership, characterized by a combination of open communication and team spirit, feeds back into strengthening the sense of collective efficacy in an organization. An empowered culture may result in higher job satisfaction and more successful projects, which may improve morale and unemployment numbers.

A Review of the Professional and Academic Literature

In this qualitative study, I intended to identify communication strategies IT PMs use to facilitate team collaboration in software development. Using a case study design, I examined the communication strategies influencing team collaboration by focusing on IT PMs in a midsize IT firm in Alberta. The following research question guided this study: What communication strategies do IT PMs use to facilitate team collaboration in software development?

I reviewed the extant literature on communication strategy, which included peer-reviewed articles and journals, books, dissertations, and websites. The following keyword

search terms were used to locate relevant sources: *the sociotechnical system theory*, *sociotechnical concepts*, *sociotechnical approach*, *social and technical elements of sociotechnical system*, *joint optimization principle*, *communication and collaboration*, *software development in sociotechnical*, *competing frameworks*, *IT project management*, *communication plan in IT projects*, *project manager and leadership*, and *software development team culture*. I located sources through the following databases accessed through the Walden University Library: ProQuest, Science Direct, ACM, IEEE, Google Scholar, Thoreau, and SAGE. The total number of all references used in each category was: (a) three books, (b) 264 articles, (c) two dissertations, and (d) 19 others. Of the 288 references, 267 (i.e., 93%) were published within the last 5 years, and 246 (including dissertations; i.e., 92%) were peer-reviewed and published in the previous 5 years. The literature review contains 187 (i.e., 94%) peer-reviewed journal articles, of which 180 (i.e., 91%) were published within the last 5 years.

Table 1

Number of Research Articles Consulted in Literature Review

	Reference (w/in 5 years)	Reference (Not w/in 5 years)	Total
Books	2	1	3
Dissertation	2	0	2
Peer-reviewed articles	180	7	187
Web pages	0	0	0
Other resources	13	6	19

Socio-Technical Systems (STS) Theory

The conceptual framework for this qualitative case study was the socio-technical system (STS) theory, which has its origins in system theory. Trist (1981) and associates at the Tavistock Institute in the United Kingdom conducted a series of studies that led to this insightful approach to understanding organizational functions. The conceptual origins of approach traced to the 19th century (Bentley et al., 2016). The STS theory emphasized the social and the technical aspects of an organization, maintaining these two features as intertwined (Dalpiaz, Giorgini, & Mylopoulos, 2013). In further defining the system theory concept, Trist envisioned an organization as a STS involving people using technical artifacts to carry out sets of tasks related to a particular purpose. The Tavistock approach to STS inspired many researchers in the field of information systems (Carayon et al., 2015). The approach reflected a strong orientation towards employees' involvement in designing information systems and attended to both the quality of

working life and potentially humanizing power of information communication technologies (Lee, Thomas, & Baskerville, 2015).

The STS theory is the most extensive body of conceptual work underlying human involvement and systems. Hinkelmann et al. (2016) pointed out that one of the central factors of a STS approach is interactions. When adapted to systems development, the STS method can lead to systems that are more acceptable to users and that deliver better value to stakeholders (Kant, 2018). Other researchers opined that the STS theory encourages team collaboration and impacts workers' job satisfaction (Körner, Wirtz, Bengel, & Göritz, 2015). Moreover, such systems characterized by supporting work teams lead to higher productivity and employee job satisfaction (Fleischmann, Schmidt, & Sary, 2015). This emphasis on the way technical and human resources interact to serve the needs of a collective task is at the core of STS theory.

STS theory interactions involve individuals interacting with machines and other individuals interdependently. As technology advances, the STS theory has evolved to the way people work and communicate (Tsvetkova et al., 2017). Researchers have suggested that communication and collaboration support effective interactions between people and machine in STSs (Lee et al., 2015). For example, in social media systems, technical systems mediate all communications between people in the social network (Jin, 2015). In organizational settings, engagement with large tasks can lead to the division of labor between the people involved, and this produces task interdependencies between them (Painter et al., 2016). Because of the interdependencies between technology and humans, communication and collaboration in STSs are essential for efficient work.

In software development, the STS concept involves management strategies built on effective collaboration and coordination (Niazi, Mahmood, Alshayeb, & Hroub, 2015). Ferdous and Ikram (2017) discussed that in a distributed software development environment, developers use various channels, such as chat or comments on Facebook, to achieve coordination. They associated this idea with STS congruence because of the balance between coordination requirements and actual coordination activities in software development. Their approach examined task dependencies as relational entities defined at any level in the software development process. They found that matching the work coordination needs that arise from the technical dependencies with appropriate coordinative actions benefits software quality and development productivity. However, a STS can also realize an outcome when the interaction takes place between the social subsystem and the technical subsystem (Van der Kooij, Zwarteveen, & Kuper, 2015). Supporting the Van der et al. (2015), researchers Painter et al. (2016) maintained that STS concepts provided a realistic view of organizations, where insufficient fit among task characteristics and system characteristics may impede coordination effectiveness. They also emphasized that software development represented as a STS could enable coordination and play a role in the success of projects. The results of these different research studies supported and grounded my use of STS as the conceptual framework for this study, in which I focused on communication strategies that promote team collaboration to increase the chances of project success in software development.

For many years, the STSs research has predominantly applied to the domains of new technology as a framework for organizational change (Davis, Challenger,

Jayewardene, & Clegg, 2014). Davis et al. (2014) envisioned the STSs framework as a set of goals involving people who use a range of technologies and tools within a physical infrastructure and operating with a set of cultural assumptions and processes. Their framework provided a simple, compelling representation of the interdependent nature of work systems. In contrast, Righi and Saurin (2015) conducted a study on a patient health care system at a major university hospital in Brazil and disputed that the associations between the subsystem elements of STSs could be a very complex mixture. Their study focused on the characteristics of subsystem elements, such as their increasing interdependencies, and concluded that the significant presences of a vast number of subsystem elements are part of the complex, dynamic interactions of the STS. Other researchers agreed with Righi and Saurin and added that with the advance in technology, STSs application has continued to grow as have adaptive systems emerging from the interaction of people using tools, techniques, and knowledge to deliver a product or service (Norman & Stappers, 2015). Moreover, the components of the STS (i.e., people, technology, and the environment) worked together so that an organization can function optimally (Weichhart, Guédria, & Naudet, 2016). The complexity of the STSs emerges through the interactions of various actors in work organization (CITE).

Social and Technical Elements of Sociotechnical Systems (STSs)

STSs represent a social subsystem (i.e., the people) using tools, techniques, and knowledge (i.e., the functional subsystem) to produce a product or service (Carayon et al., 2015). The underlying premise of socio-technical thinking takes into account both social and technical factors that influence the functionality and usage of systems (Norman

& Stappers, 2015). From an organizational design perspective, some researchers emphasized that interdependence between the social and technological elements of the STS need to be balanced (Kim, Chan, & Gupta, 2016).

Social element. The social aspect of a STS constitutes the human component, which interacts with other subsystems of the organization (Bentley et al., 2016). The interactions among people and all other elements of the STS is a set of balanced, interrelated entities collaborating with a common purpose (Kim et al., 2016). At the center of the human aspect of the STS are communication and collaboration, which affect other subsystem elements because they are interdependencies (Wu et al., 2015). Therefore, an organization employs people with capabilities, who work towards goals, follow processes, use technology, operate within a physical infrastructure, and share specific cultural assumptions and norms.

Other researchers have linked socio-technical concepts to other attributes that contribute to human aspects of STS, such as motivation, group performance, commitment, and satisfaction (Deak, Stålhane, & Sindre, 2016). Deak et al. (2016) found that in software development, the quality of communication could affect developers' motivation within an organization. Their views strongly aligned with the fit and interdependence of the social elements of a STS, as suggested by Kim et al. (2016). In STS theory, the social aspect contributes to the behavior of the system and is fundamental to creativity and innovation (Cooper & Foster, 1971). Particular task characteristics help to evoke task orientation or intrinsic motivation in the team, which will, in turn, facilitate

innovation (Lee, 2018). The social aspect of the STS affects human performance and inevitably influences the work of the organization and the behavior of its members.

As previously noted, collaboration is an essential attribute of the social element and influences team performance and organizational well-being. Bentley et al. (2016) examined the interactions among teleworkers and managers in an organization and found out that lack of proper communication and collaboration were risks to the organization and that adequate social cooperation was essential to negating this result. Similarly, the interactive nature of social networks within the STSs is critical (Murphy, 2015). Murphy (2015) noted that the interactive, social aspect of a STS could take different levels, such as interactive personal involvement, interactive focus, interactive message, and interactive control. In each of these levels, the users try to establish relationships to improve communication and the exchange of information and knowledge to achieve outcomes (e.g., in online, virtual social communities; Lingel & Golub, 2015). It is critical that the socio-technical framework foster collaboration through its social aspect in an organization.

In contrast, although social aspects of the STS are essential, more can be achieved by exploring both the technical and social dimensions of the STSs. Human activities are central to software development projects, where strong relations between the human role in coordination and software development tools can influence software success (Storey et al., 2017). Furthermore, understanding communication strategies and cooperation among team members in software development will require balance between the technical aspects, despite the growing evidence of the importance of human factors in software

development (Waterson et al., 2015). The focus on humanistic values is the impetus for conceptualizing the STS as two separate, yet interconnected parts: a social aspect and a technical aspect (Storey et al., 2017).

Technical element. The technical aspect of the STS theory constitutes the process responsible for the conversion of system inputs into outputs (Kim et al., 2016). Much more than the set of functional control tasks to be performed by people, the technical aspects include the tools, knowledge base, and technology required to acquire and transform inputs into outputs and provide services to customers in the organization (Bolton & Foxon, 2015). The complexity and dynamics of the STS require the technological infrastructures to be reliable and well performing to manage the increasing interactions in organizations (Fleischmann et al., 2015). The technical tasks are combined with specific jobs and responsibilities assigned to groups, which may impede the quality of working life for the individuals and the groups involved in the production (Waterson et al., 2015). These technical tasks or aspects influence the group's behavior on the individual, department, and organization levels within an organization.

At the individual level of analysis, the technology and the behavior of people are factors that subscribe to the socio-technical framework and can influence personal productivity (Kim et al., 2016). For example, using a survey of 216 participants on productivity factors, Licorish and MacDonell (2017) reported that the success of software development processes depends significantly on the individual developer's personality, motivation, self-perception, and cooperation drawn upon psychology. According to

Licorish and MacDonell (2017) individuals' perceptions are framed by system boundaries and purposes that relate to interactions between social and technical systems.

Other researchers explained that the department level of analysis could influence the outcomes of software projects, where the technical elements of the STS affect roles structures, interaction patterns, team dynamics, communication, and network sociologically (Carayon et al., 2015). Sixty-six software teams were examined from 15 companies in China by Dutra, Prikladnicki, and França (2015) who discovered that team skills, managerial engagement, and team experience enables efficient processes in software departments. As applied to this study, using Dutra et al.'s profound discoveries and knowledge will allow me to explore PMs' perceptions and understanding of the communication strategies they use to enhance collaborations between team members in software development.

Others observed projects success from the organization level analysis. They maintained that the technical elements of the sociotechnical could affect relationships among departments, organizational structure, corporate culture, intercorporate cooperation and overall competitiveness (Bentley et al., 2016). For example, these authors concluded that in a software development organization, the technical elements affect the work of software developers from an organizational structure perspective such as management strategy, business model, etc. Likewise, the distribution of work among different software developers creates the need to discuss and coordinate design efforts (Storey et al., 2017). Storey et al (2017) emphasized that such a level of interaction and development implies an understanding of the organizational behavior in term of structure

and the software development team. In sociotechnical environments, the technical aspects are of equal importance as the exchange of information as they allow actors to collaborate among organizational structures (Alahyari, Berntsson Svensson, & Gorschek, 2017).

Technical subsystem elements in sociotechnical environment or systems can influence organizational structure.

Engagement and Participation in STS

With the advancement in the field of information system (IS) , many information technology (IT) practitioners embraced the sociotechnical concept and observed the social and technological aspects of information systems (Majchrzak, Markus, & Wareham, 2016). The focus was on work engagements issues in IS, such as the role of information infrastructure as an enabler of trans-organizational work arrangements.

Majchrzak et al. (2016) concluded that the social and technical aspects the sociotechnical framework fit best at the information infrastructure work engagements, and cannot be used to promote collaboration in IS development, implementation, and use. While the participation of workgroups seems a vital part of the sociotechnical system, other researchers disputed the right balance between the social and technical aspects of the STS in a complex working environment such as manufacturing (Moghaddam & Nof, 2017).

Similar to the previous authors, Moghaddam and Nof did not deliberate on the social consequences of processes and technologies involved with employees working in such an environment.

In contrast to the conclusions drawn by Majchrzak et al. (2016), Moghaddam and Nof (2017) required the high engagement of social and technical activities in software

development environments (Bolici, Howison, & Crowston, 2016). Bolici et al. (2016) claimed that developers in open source software (OSS) development projects need the skills to engage efficiently and in a collaborative fashion; such skills highlighted in the form of the multiple user roles, work processes, the technical infrastructure involved in interactions in OSS development projects. However, the authors also realized that such skills could be challenging in globally distributed software development. Other researchers maintained that the social context of STS theory could not adopt well-established communication strategies such as face-to-face in distributed team environments (Giuffrida & Dittrich, 2015). The complexity of virtual communication that characterizes globally dispersed teams, and participation in and management of globally dispersed teams comes with its unique opportunities and challenges.

Approach and Application of STS

STSSs are dynamic systems, and their operational settings can change unexpectedly in various applications. Despite their unpredictable nature of configuration variations, sociotechnical systems in other applications such as patient care are capable of adjusting its settings as they change (Nielsen & Sæbø, 2016). Researchers Dalpiaz et al. (2013) discussed other health sociotechnical applications based on a requirement-based model to a) monitor actor's behavior and context changes, b) diagnose failures, and c) find ways to resolve problems by enacting compensation actions to reconcile desired behavior. The model found feasibility in a smart-home application for supporting handicap people; where a patient lives in a smart home and is a part of a sociotechnical system assisting the patient in daily activities. However, the model demonstrated by

Dalpiaz et al. has shortcomings and only focused on reconfiguration and did not consider that human agents can have very different preferences and skills. The model described above did not focus on how users interact with technical systems, which is essential to the socio-technical features.

Health IT is an area where the sociotechnical concept frequently changes, for example, as observed in the safe and efficient use of electronic medical record (Christensen & Ellingsen, 2016). Electronic medical record systems are highly configurable, and different providers will implement them in a variety of ways, with considerably complex processes (Roman, Ancker, Johnson, & Senathirajah, 2017). Complex sociotechnical systems such Electronic Health Record (EHR) required software product designed to meet the needs of multiple different users working across geographic, organizational, and cultural boundaries. The two researchers have similar views on the complexity of sociotechnical application systems. A sociotechnical application like EHR must meet the complex, rapidly changing, and high-stakes information needs of clinicians.

On the other hand, the application of STSs in emerging meta-design frameworks extended boundaries by supporting users as active contributors. According to Ardito et al. (2015), such a framework empowers all relevant stakeholders of groups and organizations to engage actively in the continuous development of a sociotechnical framework that will not restrict to a prescribed way of interacting with its users. Users could discover mismatched needs and the support that an existing sociotechnical system can provide for them, pointed out by Ardito et al. Another application of the STS

envisioned in meta-design structures comprised of concepts and processes for creating new environments that allow users as members of a social network to act as designers (Ceschin & Gaziulusoy, 2016). Compared to the requirement, the based model explained earlier meta-design structure promotes quality, and the roles of involved users are highly dynamic (Dalpiaz et al., 2013).

In addition, the sociotechnical concept found application in decision systems (Evers, Jonoski, Almoradie, & Lange, 2016). The State Department of Social Development and Human Rights in Brazil in 2007 developed a sociotechnical model for group decision support, where the politicians and other actors such as stakeholders participated in building public strategic planning processes (e Costa, Lourenço, Oliveira, & e Costa, 2014). The model is a platform for politicians and interested parties to share views to reach a consensus or compromise and prioritize complex issues. Moreover, under this STS model, it was possible for the stakeholders to discuss the questions posed, articulate, and structure actions (Fearnside, 2016). According to the Fearnside (2016), the benefited from the engagement and development of strategic plans as different stakeholders collaborated. The modeling of decision processes in the STS reached beyond technical components and included additional social and business dimensions, with emphasis on human elements.

Similarly, clinical decision support systems are highly sociotechnical systems. Dementia Management and Support System (DMSS) used for improving dementia care is highly socio-technical systems with activity-centered methodology and user participation throughout the process (Ibrahim et al., 2017). Though its effect partly manifested in a

change of routines for patients, DMSS mostly provided educational support at the point of patient care. Other sociotechnical decision support systems such as computerized Intervention-Management-System facilitate dementia care management by matching individual patient characteristics to a knowledge base (Wilcock et al., 2016). Both DMSS and IMS sociotechnical decision systems provide collaborative dementia care activities.

Over the years, organizations adopted sociotechnical models to become more reliant upon a wide variety of information technologies to deliver significant efficiency and gains to their business processes and management practices (Luo & Bu, 2016). Benefits realization management (BRM) approaches applied the sociotechnical concept as a means of proactively leveraging value from IT investments (Doherty, 2014). Doherty found that application developers preferred the sociotechnical approach designing application that embraced the social and technical aspects equally. He also recommended the following propositions upon which the evolution of BRM profoundly depended:

- Application or system should be design to target sociotechnical elements capable of serving organizational purposes, and not just delivering a technical service.
- The participation of all appropriate stakeholders is significant to the design of efficient sociotechnical application or systems.
- The organization will gain more when sociotechnical developments address substantial changes targeted at opportunities or solving problems.

BRM as a discipline is still in its relative infancy. Despite these propositions, it continued to evolve from a sociotechnical perspective and contribute to the literature of

underlying fundamental practices of benefits realization management (Doherty, 2014). Similarly, other researchers claimed that organizations are failing to realize the expected benefits from their IS/IT investments because they were unable to recognize the human aspects of being entangled with technical aspects of the sociotechnical application, such as BRM (Coombs, 2015). As a tool, benefits realization should ensure the appropriate balance between the social and the technical in the planning of future IS/IT investments.

Sociotechnical and Principal of Joint Optimization

Joint optimization principle is fundamental to the sociotechnical concept. This principle involves an organization embracing a holistic systems approach (Mahundu, 2016). In a sociotechnical setting, the social and technical elements work together to accomplish tasks and yield positive outcomes (Kim et al., 2016). Some sociotechnical organizations have applied joint optimization principle to varying degrees to realize organizational advancement (Mahundu, 2016). Several researchers deliberated on the substantive elements of the sociotechnical system with a focus on the interactions (Spagnoletti, Resca, & Sæbø, 2015). These researchers analyzed and matched the social and technical elements of the sociotechnical system at different levels, i.e., the individual analysis, department analysis, and organizational analysis of an organization to perform optimally. Spagnoletti et al. determined that by matching and operationalizing the principle of joint optimization, the most converging is the interrelationship between the social aspects (human factor) and technical aspects (tools and knowledge). Software engineering is fundamentally human activity, not just a technical matter technology where both social and technological elements interact in an optimal fashion (Wohlin,

Šmite, & Moe, 2015). The team members should recognize that software development is a sociotechnical practice (Sedano, Ralph, & Péraire, 2017).

Furthermore, software managers can attest that significant failures in software projects eventually come down to teams interaction and collaboration (Giuffrida & Dittrich, 2015). The joint optimization principle aligned closely in exploring all the sociotechnical elements that come together for PMs use to achieve effective strategies to improve team collaboration in software development, which is the question asked in this study. As applied to this study, knowledge of ensuring balance cooperation among elements of the sociotechnical system with emphasizes to improve chances of project success potentially addresses the central research question, what communication strategies do IT project managers use to facilitate successful team collaboration between software development teams.

On the other hand, Wu et al. (2015) argued that STS changes, which do not take into account the interdependent relationships of the sociotechnical elements, run the risk of suboptimizing corporate performance. Organizations should plan to adopt social, and technology changes as STSs are efficient and useful when the social and technical elements are jointly optimized (Wang, Lu, Wen, Knopp, & Gupta, 2016). From the literature, clear evidence that STS functionality is optimized when there are synergy and collaboration between people, technology, and the environment, tasks, and process.

Communication and Collaboration

Processes and resources required for successful communication required in complex sociotechnical domains can be challenging. For example, communication and

collaboration in a complex sociotechnical environment such as the healthcare industry are considered complicated (Marsilio, Torbica, & Villa, 2017). Team members in such a complex sociotechnical environment need to promote adequate communication and collaboration among themselves. Other researchers expressed similar understanding but reiterated that to ensure groups mutually understand information and acted on as intended; the communication strategy should enable shared model information and benefit decision-making and action (Evers et al., 2016). Jiang and Chen (2018) suggested that it is crucial to have the right individuals on the team that capable of adding their brilliance and creativity to the project. They stated that collaboration works best when team members have complementary skill sets required to complete the project. When information flows smoothly among team members in software development, not only can it influence team's motivation and collaborations, but also it can enhance decision-making that could lead to successful products or services, and the organization will profit (Ghobadi, 2015). The studies of Evers et al. (2016) and Ghobadi (2015) are relevant to this study because they established that the project manager style and characteristics such as creating the collaborative climate for team members to participate in the decision-making process could improve project success. As fitted to this study, identifying strategies to improve the quality of the communication and collaboration processes used by PMs to support software teams is necessary to the overall project success of organizations.

Similarly, organizations coordinate complex tasks by distributing them into small interdependent work groups and then assigning such groups to teams, according to Oliva

et al. (2015). By studying and focusing on how key developers communicate and coordinate their tasks in the Apache Ant project, Oliva et al. revealed that key developers socialized more than other developers, acted as bridges connecting other developers, and were close to them in the social structure. Their result also compared communication channels with the coordination requirements network and concluded that key developers had high sociotechnical congruence (Ferdous & Ikram, 2017). Therefore, coordination and collaboration in an organization among teams arise as a response to such interrelated work (Storey et al., 2017). Consequently, coordination and communication within these teams play more roles that are substantial in productivity and software quality.

Today's Internet-age IS requires communication over sociotechnical structures. Contemporary IS involves not only management systems and enterprise resource systems but also applications that promote various communication processes in a sociotechnical context such as discussion forums (Luo & Bu, 2016). However, many users are still struggling to view IS as being rooted in a social context to recognize the sociotechnical system as a whole, including the people and their relationships (Durkin, Mulholland, & McCartan, 2015). There is evidence to indicate that communication is tied to collaborative activities and rooted the organization structure in social networks.

Researchers have examined social and technical interactions in the workplace. Bentley et al. (2016) conducted an online survey with 804 teleworkers to determine their perceptions of telework outcomes. They discovered that social collaboration in organization improved psychological stress and influence job satisfaction. Their investigation results also revealed that effective team collaboration could also affect

employee job satisfaction in an organizational setting (Körner et al., 2015). In the same manner, other researchers shared the same perspective with Körner et al. (2015), and through the lens of communicational congruence framework, the researchers explained why intercommunication of technology dependencies in software development could influence team collaborations.

The sociotechnical concept in distributed software development is drawing more attention to communication and cooperation among groups is critical to software project success (Dingsøy, Moe, Fægri, & Seim, 2018). Dingsøy et al. noted that team members should manifest better communication skills to improve the chances of software to succeed to avoid impact on the schedule, quality, and satisfaction outcomes of projects. Other researchers supported the idea that effective teamwork dynamics can shape software projects outcomes, primarily when team members engaged actively in the project (Seabra & Almeida, 2015). Similarly, poor communications among team members in a distributed software project could constitute the primary obstacle to successful collaboration in software development projects (Šmite, Moe, Šāblis, & Wohlin, 2017). Notably, that knowledge about desired methods of communication is critical for improving communication in a globally distributed project, and significant success factor to distributed software projects.

In contrast, Tang (2015) studied the communication quality in 86 software development teams in China and found that competence-based trust mediates collaboration within development teams. He furthered noted that the role of perceived trustworthiness is a mechanism by which enabled team engagement and cooperation.

Dwivedi et al. (2015) maintained that with better communication tools, team collaborations could transcend functional and organizational boundaries. The evidence by these researchers indicated that it is vital to ensure adequate collaboration tools to enable sharing information and knowledge among the team members in a distributed development environment.

Software Development in Sociotechnical Context

Software development activities are sociotechnical. Fundamental to STS performance is interdependency and interaction of the social and technological aspects (Kim et al., 2016). The social and technical relationship between developers through their code can reveal valuable findings (Kononenko, Baysal, & Godfrey, 2016), and uncover the sociotechnical relationships and dependencies between developers and their coding method (Braunnagel & Leist, 2016). Software code can provide elements for analysis such as knowledge of software design processes, its development history, and the author relationship. Knowledge of the coding method can lead to an understanding about what the developers had comprehended (Nilsson, Castro, Rivas, & Arts, 2015), and provide support information that could help understand the team engagements in the different phases of development (Kim et al., 2015). Kim et al. (2015) noted that software activities characterized as STSs affecting social, organizational, psychological, cultural, and collaboration perspectives in an organization. Following each of these elements, the discussion to represent aspects of the software activities, taking into account the organizational culture and social integration.

Social perspective. Developing software code involves both individual and collaborative activities (Sempolinski, Thain, Wei, & Kareem, 2015). Moreover, as intense cognitive activity, building the code for systems requires concentration, and in many cases, developers prefer to work in a single environment to concentrate (Gobbo & Benini, 2015). However, due to the complex interdependency of developers work caused by the division of labor and the distribution of information required for the creation of software systems, developers have to interact with peers for various reasons (Wang, Shih, Wu, & Carroll, 2015). Collaborative collaboration is fundamental in software development; the work of individuals in teams and organizations need to mesh in just the right way for the developed product to work as intended.

Similarly, technical dependencies among software components create social dependencies among software developers implementing these components (Wohlin et al., 2015). For example, developers coordinate tasks within the team and ensure the smooth flow of work during software development (Fagerholm et al., 2015). Developers share each other specialty knowledge, coding techniques, and styles (Wang et al., 2015). Effective communication between developers provides an atmosphere that contributes to the success of software development projects (Soomro et al., 2016). There is undeniable evidence that software development is a fundamental social process embedded within organizational structures.

Organizational perspective. The structure of the organization, management strategy, business models, etc. shapes the work of software development in the organization (Bergek et al., 2015). Often the design of software reveals the organization

chart that developed the software (Son, Lee, & Kim, 2015). Software components interface and communicate with each other to match organization structure, especially the organization's communication structure. Moreover, software models reflect the organizational structure and social atmosphere of the software development team, the organization drives particular software architecture, and software design, in turn, drives a specific organizational structure (Zahedi, Shahin, & Babar, 2016). Developers who work in close cooperation together and communicate often will create software that reflects organization structure and vice versa.

Psychological perspective. The psychological rationale is central to communication and collaboration in software development decisions. Researchers claimed that software development is an intellectual activity, dominated by often-neglected human factors (Suh & Oh, 2015). Most software designs are representing system behavior as perceptual processes (Oosterwijk, Mackey, Wilson-Mendenhall, Winkielman, & Paulus, 2015). Furthermore, developers think about the behavior of a program in mental terms before engaging. Similarly, software designs represent a psychological framework shared among software developers (Navimipour, Rahmani, Navin, & Hosseinzadeh, 2015). The frame serves high-level knowledge thoughts of a developer for system structure and functions, implementation strategies, and psychological perspectives that influenced the development of the software system (McNeil, 2015). The mental frame of a program contributes more towards the understanding of software development processes in the sociotechnical environment.

Cultural perspective. Organizational culture can influence software development methods. From a sociotechnical perspective, software development processes entailed the understanding of cultural context, practices, and sensitivities involved with these processes (Jain & Suman, 2015). Therefore, culture can influence software development methodologies such as code reuse, scripting languages, etc. where methods thought to be useful for some cultural groups often turn out to be challenging to implement for developers from other cultural groups (Storey et al., 2017). Another example, researchers suggested that American software development teams are culturally well suited to interactive software development, whereas Japanese software developers prefer waterfall development methods (Selvadurai & Dasgupta, 2016). The evidence indicates that it is becoming increasingly crucial that software development processes and methodologies be adapted to fit various cultures.

In contrast, Tong, Tak, and Wong (2015) claimed that team culture plays several critical roles to enhance employee job satisfaction. First, culture creates a sense of commitment; people feel that they are part of a clear organizational structure. Second, with a strong team culture comes a sense of identity; the more clearly an organization defines its values, the more strongly people can associate with its mission and feel a part of it. Third, culture reinforces standards of behavior by guiding employees', providing behavioral stability. Therefore, culture as a shared belief system ultimately affects the actions of people and work groups (Lee, Shiue, & Chen, 2016). For example, employees build a collaborative culture in software development, and although the tools they use can

support software development, only the people can make it alive by spreading the collaborative culture.

Collaboration perspective. The significance of tools is immense in effective communication and cooperation among people performing Agile software development according to García et al. (2015). Effective communication and collaboration are primary contributing factors in attaining success in agile software development, which exploits SocioTechnical (Alzoubi et al., 2015). Alzoubi et al. (2015) observed that the principal reason for the low rate of success in agile distributed software development is communication-related issues among team members. Similarly, software development organizations have shown significant interest in adopting communication-oriented Agile practices, although colocated project teams presented communication challenges in a distributed software development environment (Hoda, Salleh, Grundy, & Tee, 2017). The increasing use of useful communication tools in software development project enable and support collaboration regardless of the physical location of the involved parties.

In the same manner, agile software development methods stimulate intra-team knowledge sharing through face-to-face interactions, which positively influence collaboration and cooperation across teams (Krumm, Kanthak, Hartmann, & Hertel, 2016). Other researchers stressed that encouraging close communication expectations is the key to upholding the agile process on distributed teams (Inayat, Salim, Marczak, Daneva, & Shamshirband, 2015). Given the above pieces of evidence, software development teams in a distributed software development environment teams can work to overcome some communication challenges in an agile development environment.

Researchers argued that team size, complexity, and diversity influenced team collaboration in software development (Magdaleno, de Oliveira Barros, Werner, de Araujo, & Batista, 2015). Magdaleno et al. (2015) noted that in Agile projects, typically, fewer people are needed to build software, the coordination requirements become less critical, and an often simple email will be sufficient to coordinate smaller teams. They pointed out that members of multiple groups are less likely to share knowledge and interaction, therefore the tendency to collaborate decreases. In addition, Magdaleno et al. claimed that as projects continue to grow in term of diversity, there is a need for collaboration between project members other than just developers. The higher the varieties of background and experience, the less likely the team members are exhibiting collaborative behaviors.

Effective collaboration among members of diverse teams can be challenging because of the disadvantages posed by their structure and composition. Other researchers raised awareness on issues around the team maximum capacity to collaborate while minimizing these disadvantages (Boughzala & de Vreede, 2015). These researchers examined collaboration model designed to measure the quality of cooperation among teams in a development environment. They focused on a collaboration maturity model for assessing people, information management, process, and technology interaction. Furthermore, Boughzala and de Vreede (2015) suggested that the team collaborations could vary significantly with size and purpose as the team share understanding and adjust their tasks to produce high-quality outcomes in an organizational setting. In global software development, many different activities require effective coordination among

groups (Nguyen-Duc, Cruzes, & Conradi, 2015). However, Nguyen-Duc et al. (2015) claimed that team familiarity and adoption of collaboration technology could help to reduce the negative impact of geographical dispersion. Solutions to overcome global software development barriers such as geographic distribution could include synchronous communication technology and knowledge sharing infrastructures to improve project outcome (Niazi et al., 2016). A team success or failure at collaborating reflects the trust and philosophy of the organization.

Furthermore, Tang (2015) examined the role of perceived trustworthiness as a mechanism to enable collaboration among team members in 86 software development teams in China. The findings of Tang (2015) revealed that when members of the project team trust among themselves, member's participation, and cooperation are improved, and team performance enhanced. In support of Tang, tools such as Web 2.0 technology provided means for individuals to trust and discuss with groups of like-minded people, and reinforced social skills like communication and collaboration, are vital to the success of software development projects (Walker, Davis, & Stevenson, 2017). Some people suggested that relationship-oriented leadership can be most appropriate in large and diverse teams, where members of the project are more likely to share knowledge in an environment of trust (Bolici et al., 2016). The above narrative shows that it is crucial to building a collaborative team, emphasizing the importance of trust-based personal relationships.

Frameworks Competing with STS

The framework leading this study was the STS Theory. However, while conducting a review of the literature on the research question for this study, I identified two competing frameworks that could have potentially guided my research question. The social capital theory (SCT) (Warren, Sulaiman, & Jaafar, 2015) and capability maturity model integration (CMMI) (Chen & Wang, 2018), both are summarized here but not used as frameworks to guide my study.

Social capital theory. The framework theory describes the value of social networks by bonding similar people and bridging between diverse people (Vaughan, Sanders, Crossley, O'Neill, & Wass, 2015). The origin of the social capital concept is in the eighteenth and nineteenth centuries and rooted in economics, sociology, and political science literature (Farr, 2004). Over the years, SCT received a variety of definitions applied to diverse applications; Coleman (1988) description of SCT focused on the resource that actors derive from social structures and the changes in the relationship among actors or the people. The point of view of Coleman (1988) focused on how social capital connected the actors and implied that social networks are at the core of social capital. Other researchers interpreted social capital theory as the existence of particular norms shared among members of a team that permit cooperation among them (Ghobadi, 2015). Fukuyama (2001) suggested that trust is essential primarily because it enables collaboration in organizations. There is no set agreed upon interpretation of social capital; the particular definition adopted by a study depends on the discipline and level of investigation. Not surprisingly, in the field of information technology, social capital is

considerably embedded in the information sharing, trust, and norms of exchange inhering in one's social networks.

The social capital concept is a crucial network-based intangible asset. It has the potential for maximizing team interactions in a social setting like software development (Lee, Park, & Lee, 2015). In their research, Lee, Park, et al. (2015) noted that social capital theory provides a valuable framework for knowledge sharing behavior in managing IT project. He further pointed out that human connectedness and their relation to social structure in an organization are essential aspects of the SCT. Therefore, the complex and knowledge-intensive nature of IS development projects requires collaboration between business and technology experts.

Social capital influences team willingness and their ability to share knowledge. Likewise, the social capital concept plays a role in the shared vision and culture within an organization and influence bonding mechanisms (Omotayo & Babalola, 2016). The researchers noted that in IT offshoring relationships, the crossing of national boundaries, over-reliance on virtual interactions and restrictions on face-to-face communication are explicit barriers to overcome in this regard. Although the fundamental concept of social capital appears to be most relevant, the relational aspect can be particularly important (Lee, Park, et al., 2015). Social capital theory approach adopted in a knowledge sharing environment such as software development contribute not only to collaboration but also enhance team performance.

In the same manner, the concept of social capital can have an adverse result if used for improper purposes rather than support of individuals as they network. As

relevant as it is, the adverse effects of the social capital concept could include social exclusion and decrease in participation in informal activities as many groups achieve internal cohesion at the expense of outsiders (Schwanen et al., 2015). Additionally, instead of focusing on building the bond between the members of a team, the SCT emphasized on bridging the gap between them, the result is a barrier to social mobility (Walter, 2015). Instead of building the interaction among members of the team, increased social capital could have unfavorable outcomes for projects and might aid intragroup coordination by enhancing group identity, and promotes intergroup exclusion (Schwanen et al., 2015). As applied to this study, using SCT as a framework would not necessarily improve team collaboration and network across teams in a software development environment. Therefore, the social capital framework concept is not appropriate for this study.

Capability maturity model integration. CMMI concept is rooted in the works of Walter Shewhart, who examined process improvement within the principles of statistical quality control (Shewhart, 1931). Walter principles extended, and in the late 1980s, Software Engineering Institute at Carnegie-Mellon University began developing process maturity frameworks to assist organizations in improving process management in areas of software development, systems engineering, and product development (Dijkman, Lammers, & de Jong, 2016). In 1991, SEI developed the capability maturity model for software intended to identify where an organization's software process needed improvement (Perkusich, Soares, Almeida, & Perkusich, 2015). In contrast, the systems engineering capability maturity model outlines the essential elements of an organization's

systems engineering process that need to exist to ensure proper systems engineering, and not necessarily the process itself (Uskarci & Demirörs, 2017). Following the release of systems engineering capability maturity model, CMMI added more models, including the integrated product development capability maturity model (Boughzala & de Vreede, 2015). As process improvement evolved with time, the single CMMI emerged and comprised of models for software, systems engineering, and integrated product development.

The first CMMI model designed for use by development organizations in their pursuit of enterprise-wide process improvement (Chevers, Mills, Duggan, & Moore, 2016). CMMI constituted best practices and collaborative efforts, which enables behaviors that improve team performance (Benmoussa, Abdelkadir, Abd, & Hassou, 2015). The CMMI framework reconciles action in organizational change activities and promotes employees' shared cooperation among subjects and activities through tools and rules (De Carvalho, Patah, & de Souza Bido, 2015). When it comes to CMMI implementation, many embedded process issues in the model result in degradation in effectiveness.

Additionally, CMMI adoption is a mostly managerial process. The framework serves as a tool to analyze the change process and conduct an in-depth analysis of the potential implications embedded in organizational change (De Carvalho et al., 2015). In their study to understand the organization processes during CMMI adoption, these researchers found that the CMMI framework adds documenting overhead as well as considerable time and effort, therefore setting an unrealistic expectation. While CMMI is

concerned with the improvement of management related activities, other researchers noted that improved quality of code might be a vital issue in the context of the software development process, and CMMI may not necessarily improve the quality of the software (Okike & Rapoo, 2015). Because of the above concerns, CMMI is not the ideal framework for this study.

IT Project Management

As IT systems become an important competitive element in many industries, software projects management is on the rise (Ebert & Hoefner, 2015). The scope and breadth of IT projects continue to grow as well as the involvement of multiple stakeholders, all coordinating and collaborating to achieve a common goal (Mishra, Chandrasekaran, & Maccormack, 2015). Mishra et al. (2015) pointed out that the primary responsibility of project management is to ensure effective communication and collaboration established with all the stakeholders, and more attention channeled toward exploring the knowledge of healthy relationships with the interested parties. IT projects are unique, and lots of understanding is required to develop a communication support model that promotes interactions and teamwork that can ensure project success (Seabra & Almeida, 2015). Other researchers considered managing software projects as a socio-technical practice, each team member in the software project should get the opportunity to share and contribute to improving teamwork and productivity (Lima, dos Santos, Oliveira, & Werner, 2016). The evidence indicated that project management selection of appropriate team members could ensure proper team dynamics as IT system/projects continue to be the competitive industry. Project communication management has evolved

into a key success indicator. Researchers and IT practitioners argued that there is no better way to make sure that everyone has the same goals, expectations aligned, and the right work performed at the right time than with proper project communication management (Al-Aufi & Fulton, 2015; Jain & Suman, 2015). Effective project communication and management in an Information technology project empower team members to make more thoughtful and educated project decisions (Jain & Suman, 2015). Therefore, project management requires a good communication plan prepared based on the scale and depth of the project to promote the interactions among team members as well as stakeholders (Walker et al., 2017). Project management applying ineffective communication strategies can lead to misunderstanding between stakeholders and consequently unsuccessful projects.

IT Project Communication Plan

PMs play a significant role in communication planning to ensure a successful project. Like all other communication plans, IT project communication planning provides relevant, accurate, and consistent project information to project stakeholders (Papke-Shields & Boyer-Wright, 2017). Planning project communication entailed the understanding of what the project requires from its communication system, and therefore, PMs need to know what communication methods might be appropriate (Varajão, Colomo-Palacios, & Silva, 2017). Project managers play a significant role in communication plan determining what information to communicate, who delivers the information, what medium to provide the communications, who receives the communications, and the frequency of the communications (Meng & Boyd, 2017). While

planning project communication strategies, project managers ensure the use of tools and methods to communicate effectively.

PMs create a communications strategy to enable team communications and collaboration is essential to project success. With an effective strategy, team members understand better their specific tasks, responsibilities and commit to accomplishing project goals (Magdaleno et al., 2015). Project teams will increase their chances of achieving project goals if the project managers adopt successful communication strategies for keeping everyone informed about what is going on (Kopmann, Kock, Killen, & Gemünden, 2017). PMs can use effective project management strategies that they use to keep their projects running smoothly and efficiently.

The PMs communication strategies that take into account appropriate project communication tools are at the core of every successful project. Project teams continuously communicate via e-mail, webcasts, collaboration websites, video conferences, telephone calls, texts, face-to-face discussions, and even nonverbal interactions (Niazi et al., 2015). These tools can be useful to those located in the same place and involved in the same project. Many communication tools can help project managers establish effective communication, including the use of a web-based dashboard to provide teams snapshot of the overall status of a project (Mitchell, 2018). Furthermore, project communication and collaboration tools are becoming more popular as teams spread around the globe. As applied to this study, effective communication strategies used by PMs enhance team collaboration in a software development environment.

Project Manager and Leadership

While project success attributes to the collective team effort, effective project management is dependent on individuals with excellent leadership skills (Aga, Noorderhaven, & Vallejo, 2016). In a study, Muller and Martinsuo (2015) examined the leadership competency profiles of successful project managers in different types of projects and found that leadership is the attribute most lacking in PMs. PMs with the technical background and with seniority based on attention to detail realize that other skills become more critical as projects become more complex (Ramazani & Jergeas, 2015). Among some of the essential skills needed by managers to lead a project team are excellent communication and team building (Medina & Francis, 2015). Team building activities improve motivations and team morale (Shore, Cleveland, & Sanchez, 2018). The PM is accountable for communicating with team members at all levels within the project. Clear and detailed communication is essential to maintaining seamless project progress and project completion (Bathallath, Smedberg, & Kjellin, 2016). PMs must communicate project objectives, timelines, and expectations to team members while also maintaining inputs and feedback from the team (Bathallath et al., 2016). Without a good project leader, a project is questionable to succeed.

Similarly, one of the essential skills of the leader, such as in the role of the project manager is to be a great team builder (Aga et al., 2016). Successful project teams tend to maintain positive dynamics and stick together to achieve project goals (Lee, Park, et al., 2015). Team building ensures productivity, success, and most importantly job satisfaction. It motivates and encourages team members to be creative, which in turn

develops the spirit of positivity and teamwork. Thus, these values of team building are imperative for project success (Harrison & Wagner, 2016). PMs need to understand the personalities, relationships, skills of each team member of the project, and manage conflicts; these are critical to improving team morale (Medina & Francis, 2015). These different researchers shared a common theme that can be employed to support this study. The communication skills used by PMs to facilitate team collaboration in software development matter significantly. For a project to reach a successful result, the project team needs to work well together.

Team Culture

Building a collaborative team culture at all levels of a project is vital to its ongoing success. Team culture attribute to the belief or system of a group of people within an organization (Storey et al., 2017). Moreover, team culture provides an atmosphere for the members of the team to understand where the work of their organization fits in the total context of the project plan and success goals (Matthews & McLees, 2015; Romans, Romans, Tobaben, & Tobaben, 2016). The teams view themselves as mutually accountable for their outcomes and provide each other with the support to achieve their common goal. In the same manner, team members that feel that they are part of something more significant tend to experience increased engagement and work satisfaction (Lee et al., 2016). According to Açıkgöz and Günsel (2016), project managers need to create an atmosphere of safety, trust, and respect through team-building activities, including off-site events. Castellano, Davidson, and Khelladi (2017) pointed out that project managers should encourage multiple perspectives, diverse viewpoints,

and creativity, this keeps members energized through stimulating, quality discussions around cutting-edge issues. PMs need to nourish the team's culture by facilitating open communications, trust, and accountability among team members in an organization.

Open communication. Several researchers reported that open and transparent communication helps build rapport among team members in software development environments (Tang, 2015). Other researcher discussed why it is vital to identify project team's roles, responsibilities from the outset, and to ensure that communication will flow efficiently, and project managers will elicit the right kind of information from their team members (Wickramasinghe & Nandula, 2015). From a software development perspective, drawing on social context; team members spend time defining their team culture by agreeing upon norms and expectations within a project's overall team context (Vick, Nagano, & Popadiuk, 2015). When considering factors that make the software team successful, understanding the projects expectations is top on the list (Henderson, Stackman, & Lindekilde, 2016). Communication reinforces and enhances the team culture and the understanding of what they are expected to contribute.

Similarly, the perceptions of team culture among those more demographically different from their workgroup can affect team culture. Often, projects have a distinct culture, work norms, and social conventions, and people in a particular project think and apply their values, which affect their behavior and performance during the project lifecycle (Vick et al., 2015). Moreover, the same researchers state that project managers need to acknowledge the uniqueness of team members to balance with how best to work

efficiently together to achieve project success. An indication that cooperative cultures will promote the relationship between group composition and work outcomes.

Communications in globally distributed in software development collaborations can affect team culture. Global projects consisting of virtual teams working together to accomplish project goals from various geographical locations (Olaisen & Revang, 2017). These geographically dispersed teams face cultural differences that include different languages, national traditions, values, and norms of behavior, and therefore project managers will require coping with the multiple cultures (Zahedi et al., 2016). To overcome global collaboration challenges among team members, primarily when working with team members from high-context cultures, researchers recommended meeting face-to-face, discover team member's individual cultural preferences, and share professional knowledge (Buvik & Rolfsen, 2015). The same researchers claimed that creating a safer climate and building trust could arise from stronger relationships among team members. Despite the challenges, cultural diversity in globally distributed teams can enrich cooperation and generate more innovative solutions.

Trust and accountability. PMs should set clear expectations through accountability for the team members to improve team culture. The majority of IT projects tend to fail due to their complexity, which in turn can quickly create negative emotions among team members and negatively impact the confidence among team members (Wick et al., 2015). Other researchers continue to stress that project managers should nourish team's culture through accountability and trust among team members in a project

(Monaghan et al., 2015). PMs should realize that project success does not depend solely on technologies or communication methods but also accountability.

Accountability and trust are vital to promoting team culture in software development projects, which in turn, deliver successful software products. Without accountability, project execution suffers, there is a tendency to become even more lenient and forgiving for slippages, and lack of accountability can affect project planned works, potentially datelines and exponentially delay project (Nguyen & Watanabe, 2017). For example, in a low-trust development atmosphere, accountability is inadequate, team members often focus on negativity as compared to high trust development environments (Mukerjee & Prasad, 2017). The above demonstrated that accountability has a clear link to higher performance, improved competency, increased employee morale, and work satisfaction, which in turn, promote good team culture.

Lack of accountability and trust among team members can lead to ineffective team culture and the reason for project failure. Building and sustaining team culture on trust can be a game-changer and will require PMs to employ mitigation strategies (Jan, Dad, Amin, Hameed, & Shah, 2016). For example, a good PM will let team members know, up front, who is responsible for what and setting clear expectations with the members (Bourne, 2016). PMs can promote trust by using mobile collaboration tools to better engage with team members especially those in different locations and time zones, rather than work within any restrictive technical limitations (Zahedi et al., 2016). Moreover, PMs could check in regularly with team members to address any professional or personal issues that could affect the project (Boies, Fiset, & Gill, 2015). By doing this,

the PM will relate to team members and gain their trust, in turn; the team effort in the project will increase.

Summary of Main Points

STS theory guided this study. Other competing theories or models identified that could potentially support the research question are the SCT (Ghobadi, 2015) and the CMMI (Chevers et al., 2016). SCT concept is about the value of social networks, bonding similar people, and bridging between diverse people (Warren et al., 2015). As relevant as it is, the adverse effects of the social capital concept could include social exclusion and decrease in participation in informal activities as many groups achieve internal cohesion at the expense of outsiders (Schwanen et al., 2015). The SCT does not guide this study because although social capital might aid team coordination, by enhancing group identity, it promotes intragroup exclusion as evidenced by Schwanen et al. (2015). Using social capital theory as a framework for this study would not necessarily improve team collaboration and network across distributed teams in a software development environment. The CMMI is a framework that examined process improvement within the principles of statistical quality control (Shewhart, 1931). CMMI framework is mostly managerial process and adds overhead documenting as well as considerable time and effort, setting an unrealistic expectation (Lee et al., 2016). It may not necessarily improve the quality of the software (Okike & Rapoo, 2015), and is not the ideal framework for this study.

STS theory serves as the lens to explore the research question of this study. The concept is people using technical artifacts to carry out sets of task related to a particular

purpose (Trist, 1981). Researchers Bolici et al. (2016) characterized socio-technical as interactions in a software development environment where developers coordinate activities effectively during product development. The socio-technical framework constituted social and technical elements (Kim et al., 2016); where the technical part formed the knowledge and expertise, and the social aspects of the socio-technical represent the people and tasks in an organization. Joint optimization principle is fundamental to the socio-technical framework and involves the elements embracing a holistic systems approach (Mahundu, 2016). Because the social and technical aspects work together to accomplish tasks and yield positive outcomes, a socio-technical setting promotes joint optimization. The socio-technical framework also builds on communication and collaboration as driving the socio context in software development. Effective communication and cooperation are the primary contributing factors in attaining success in software development projects.

IT PMs may explore communication strategies through the viewpoints of leadership and STS theory. For the proposed exploratory qualitative case study, based on the research, some of the essential skills needed by PMs to lead a project team are excellent communication and team building as discussed in Medina and Francis (2015). Clear and detailed communication is essential to maintaining seamless project progress and project completion (Bathallath et al., 2016). Leadership styles of IT PMs may influence team collaboration in software development projects. Promoting cooperation among team members in software development project depends on culture. Team culture is an important determinant as to whether a project succeeds or fails (Storey et al., 2017).

PMs realized that project success does not depend solely on technologies or methods (Wickramasinghe & Nandula, 2015). PMs own and nourish the team's collective culture through accountability and trust among team members in a project. Some of the communication strategies uncovered by this literature review include e-mail, webcasts, collaboration websites, video conferences, telephone calls, texts, face-to-face discussions and even nonverbal interactions, quality of leaders, and team culture. The literature review provides the knowledge to understand the topic area of the study. The knowledge will support to explore effective communication strategies PMs used to facilitate collaboration among team members in a software development environment.

Transition

Section 1 was an introduction to the streams of literature that formed the background of this study. It included defining the IT problem, the research question, and review of literature that developed the conceptual framework for this subject area. The review of literature covered social and technical aspects of STS theory, communication, and collaboration in the socio-technical environment such in software development, and discussed IT project management from the leadership perspective, project communication plans, and team culture. The scope of Section 2 of my study constitutes my role as the researcher, how participants identified, data collection, data collection techniques, data collection analysis, population and sampling, and research method and design. In addition, Section 2 covers the ethics of qualitative research and strategies to ensure the reliability and validity of the study.

Section 2: The Project

I conducted a qualitative case study to understand the communication strategies PMs used to facilitate team collaboration in software development. I collected data from IT PMs serving in senior positions levels through semistructured interviews. These communication strategies improved employee morale and unemployment numbers. In Section 2 of this study, I restated the purpose of the research and discussed the role of the researcher, research participants, research method, and design. In addition, this section includes the population and sampling, ethical research, data collection instruments, data collection techniques, data organization techniques, and reliability and validity of the study.

Purpose Statement

The purpose of this qualitative research study was to explore what communication strategies some IT PMs employed to promote team collaboration among team members in software development. The targeted population for this research study was IT PMs with supervising responsibilities from a mid-sized IT firm in a metropolitan area of Alberta, Canada. The senior PMs participated in semistructured interviews because they were most qualified to describe the communication strategies PMs needed to promote team collaboration in a software development environment. The implications for positive social change include the potential to affect software development practices and contribute new project knowledge. New knowledge for use by IT organization leaders looking to enrich team culture, which may result in higher job satisfaction and projects that are more successful.

Role of the Researcher

In this study, I was the primary research instrument of data collection. In qualitative research, the researcher acting as the research instrument is acceptable (Hammarberg, Kirkman, & De Lacey, 2016). The researcher observes details, conducts in-depth interviews, and reflects on the meaning of interview data for qualitative research to be successful (Råheim et al., 2016). My role in this study included to design interview questions, determine potential participants, interview potential study participants, and ensure I followed interview research ethics.

I was familiar with the topic of this study because I am currently a software consultant in the IT field with experience in managing software development/testing teams. This experience helped me better understand and develop questions that were open ended to encourage the participants to give substantive, elaborated answers. The open-ended interview questions were useful for gaining insight into and the context of the phenomena of this study and allowed the participants to describe what was important to them (see O’Keeffe, Buytaert, Mijic, Brozović, & Sinha, 2016). My role was to ensure that I identified appropriate participants and remained objective with them. I selected potential participants based on the following criteria: IT PMs who had supervisory responsibility for at least two IT professionals within 1 year of commencing the interview. I maintained ethical standards to protect the rights of the participants throughout the study by adhering to the guidelines in *The Belmont Report* (Miracle, 2016). *The Belmont Report* stated that the rights of the study participants should not be

jeopardized and that the principles underlining the ethical conduct of research include respect, beneficence, and justice for human study participants (Miracle, 2016).

I picked interviews as the primary method with which to collect data from my study participants. The interviews were particularly useful for getting the story behind the study participants' experiences and pursuing in-depth information on the topic (see Thomas, 2017). In addition to asking questions, I audio recorded the interview. After I had introduced myself to the participant, I asked for their permission to record the conversation and explained why I was conducting the interview. If a study participant wished to not be recorded, I followed and respected their wishes. However, I asked the study participants to comment on my notes or summary afterwards. I took notes to supplement recordings during the interview. Throughout the interview, I maintained neutrality and avoided framing questions with a strong positive or negative association. If there were any discrepancies, I planned to prevent and alleviate biases, as noted by Noble and Smith (2015). Researchers who determine their viewpoint and accept their bias better understand the perspective of others (Murray et al., 2016). To enhance each interview session, I followed an appropriate interview procedure (see Appendix).

My role also required that I obtain the consent of the participants in my study. Informed consent is an integral part of ethics in qualitative research (Elliott, Husbands, Hamdy, Holmberg, & Donovan, 2017). The following guidelines were established for the informed consent for the study: I thoroughly informed participants of different aspects of the studies in a comprehensible language and clarified the nature of the research, the participants' potential role, my identity as the researcher, the objective of the research

study, and how the results will be published and used. I ensured participants felt free to make an independent decision without fear of negative consequences and maintained the ethical standards during the study by adhering to the interview protocol described in Appendix.

Participants

I researched a single, mid-sized IT company in a metropolitan area of Alberta, Canada. I determined the participants for the qualitative research study based on a process recommended by Lewis (2015). The participants for this study represented senior IT PMs with supervision responsibilities who used strategies that promoted team collaboration between team members in software development. The criteria for selecting participants were those who were senior IT PMs that had supervisory responsibilities for at least two IT professionals within 1 year of commencing the interview. Any IT PM at the company that met the criteria was eligible to participate in the study.

I selected the study participants through a census sampling approach. A census sampling strategy was suitable for this study because the population was small, and it was reasonable to include the entire population, as noted by Woodley and Lockard (2016). I gained access to the participants and data by securing permission and approval from the research site. The mid-sized company consisted of various departments and accounts managed by these senior IT PMs, who enabled business users to carry out their roles efficiently, productively, and securely.

I sought the permission of the organization before engaging its employees as participants in the study. I obtained permission from the company of the research site,

which included authorization to access lists of employees who were potential study participants. The list included basic information about potential participants, which helped narrow my list without doing any additional screening. Since potential participants had relationships with and were already employees of the company, I used e-mail to approach and recruit them. The existing relationship enabled the participants to notice, open, read, trust, and consider my request to participate in the study. I interviewed all the identified IT PMs within the company to ensure there was adequate data collected to analyze. I secured enough data to explore the topic of study. I had to make sure that I collected sufficient data where no new information was available to reach data saturation (Fusch & Ness, 2015).

I made sure that the participants provided their informed consent before every interview by having them sign the informed consent form. Informed consent is a fundamental ethical obligation for researchers (Elliott et al., 2017). The informed consent guaranteed that I would maintain confidentiality and protect the information collected from research participants. I provided anonymity of data collected from research participants and used alphanumeric codes to avoid linking individual responses with participants' identities. Furthermore, I ensured confidentiality and retained the documents containing the information gathered from research participants in a secured location and with restricted, password-protected access. These documents are kept in the password-protected flash drive in a locked storage cabinet and will be destroyed 5 years after completion of the study.

During and after the data collection, I maintained good relationships with the study participants. The relationship between the researcher and their study participants is integral to the research (Pacho, 2015). Successful qualitative research mostly depends on building healthy relationships between the researcher and participants (Råheim et al., 2016). Through the data collection period, I managed to build respectful, opened, and trusted partnerships with the participants of this study, which allowed smooth access to their knowledge and experience. Furthermore, I ensured that I clearly expressed my intentions, principles, and position in the research process to the participants. I understood from the beginning of the research that a successful relationship depended on how I, as the researcher, approached potential participants about participation in a study, as noted by Martínez-Mesa, González-Chica, Duquia, Bonamigo, and Bastos (2016). Through informed consent, I ensured the study participants were adequately informed about the purpose of the study they were asked to participate in. Additionally, I made sure that the study participants understood the use of the information collected from the interviews and that they felt free to make independent decisions without fear of negative consequences. I ensured that the participants felt comfortable withdrawing from the research study at any point in the research process. Moreover, I kept the study participants informed about research progress and results, as recommended by Thomas (2017). Above all, I established consistent communication by either phone or e-mail to foster a trusting relationship between the study participants and myself as the researcher.

Research Method and Design

Method

The qualitative research methodology is critical when the purpose of the study is to analyze opinions, attitudes, or behaviors (Lewis, 2015). Researchers who use qualitative methods gain an in-depth understanding of the underlying phenomena from the viewpoint of the participants while exploring themes based on what participants experienced (Hammarberg et al., 2016; Yin, 2013). I developed my research question to address communication strategies from the standpoint of PMs. I conducted in-depth interviews to collect data, which made the qualitative approach suitable for this study.

I also considered using the quantitative method for this study. According to Nan and Sansavini (2017), researchers who use the quantitative approach tend to generate proven and unproven results. McCusker and Gunaydin (2015) added that the quantitative method is suited for testing hypotheses through the measurement of specific variables and quantifying a problem by proving or disproving. Additionally, the quantitative research method focuses on searching for quantities in something and establishing research numerically (Larson-Hall & Plonsky, 2015). In this study, I did not employ the quantitative approach because no testing of hypotheses was involved, and no numerical data were collected to deduce statistics.

Another potential approach is mixed-method research. With this approach, researchers use a combination of both qualitative and quantitative methods enabling them to collect, analyze, and integrate data in a single study (Gentles, Charles, Ploeg, & McKibbin, 2015). Developing sound mixed method research requires the collaboration

of different expertise more than it may be necessary for a single method. Additionally, a mixed method research approach remains complex and takes much more time and resources to plan and implement (Molina-Azorin, 2016). Ferro (2017) recognized the challenges of mixed-method research, stating that generalizability, compiling, and analyzing the mixed-method data require more time and money to be effective and efficient. In this study, I explored the communication strategies PMs used to promote team collaboration in a software development project. Therefore the mixed method approach was inappropriate to complete the goal of this study.

Research Design

I selected the case study as the design to explore in-depth communication strategies among teams in software development in the real-world context. In qualitative research, the research questions drive the research design and attempt to answer the question of what, why, or how (Lewis, 2015). I asked the “what questions” for the study to understand the research subject in the real-life setting. Kruth (2015) stated that case studies are widely employed in the social sciences and found to be valuable in addressing research questions. Kruth (2015) furthered that case studies require an exhaustive understanding of social or organizational processes. Also, the case study design is well suited for investigating modern real-life phenomenon through detailed contextual analysis of a limited number of conditions, and their relationships (Rymaszewska et al., 2017). Several researchers used a case study design to examine how communication tools shape a participatory culture in software development (Storey et al., 2017). Storey et al. (2017) stated that a participatory culture, where developers engaged with, learned from,

and co-operated with other developers. Therefore, I found the case study design the most suited for this study.

Furthermore, phenomenology and ethnographic designs were considered for this study. The phenomenology model describes a phenomenon as consciously experienced by study participants without theories about their objective reality (VanScoy & Evenstad, 2015). Those who used phenomenology design in their research try to understand the phenomenon by examining the views of people or participants who have experienced that particular aspect (Quay, 2016). Like the case study design, Quay (2016) suggested that phenomenology usually involves lengthy, in-depth discussions with subjects. Sometimes researchers will interview the same participant many times to get a full understanding of their experience with the event. Although using phenomenology approach was suitable when the purpose was to understand lived experience (Beard & Russ, 2017), it remained inappropriate method to investigate phenomena such a communication strategy employed by PM for team collaboration in software development.

Similarly, as mentioned earlier, ethnographic was another approach that I examined. Ethnography has its roots in anthropology and a method that enables researchers to observe and interact with research participants in their real-life environment (Kruth, 2015). In contrast to the case study and phenomenology designs, ethnography approach emphasizes the detailed observation of people in naturally occurring settings and stressing on exploring an entire culture (Bass & Milosevic, 2018). Participant observation relied on living amid the people studied for a lengthy period and gathering data through continuous involvement in their lives. Because of the subjective

nature of the ethnography approach, it can be instrumental in uncovering and analyze critical user attitudes and emotions (Rapp, 2017). However, this design is time-consuming and expensive (Lane, 2016). It requires researchers who are highly skilled to include the detail and completeness of observations, as well as potential bias in the analysis to avoid all the pitfalls of an ethnographic study (Lane, 2016). At its core, ethnography is a method for learning about human cultures, and for many years, it remained almost exclusively the field methodology of anthropology (Ingold, 2017). The focus of ethnographic research is not to understand the phenomenon from the perspective of the participants, but to understand the behaviors of culture. For this reason, ethnography was ruled out as a design for this study.

Population and Sampling

Population

The population for this study represented senior IT PMs with supervision responsibilities from a mid-sized IT company in Alberta, Canada. Every eligible PM I interviewed met the following criteria to participate in this study. First, I selected the participants based on their records of successfully promoting team collaboration in software development projects. Second, in addition to their senior position in the mid-sized IT company, the participants have supervisory responsibilities for at least two IT professionals within 1 year of commencing the interview. PMs who did not meet all of these parameters were not eligible to participate in the study.

I collected data by interviewing the participants in a suitable interview setting. I scheduled interviews for 60 minutes. Before engaging participants in the study, I asked

each one of them where he/she would like interviewed. All the participants preferred and comfortably interviewed at the research site. For meaningful discussions, I ensured the participants of the study were at ease with the location of choice. I secured the aspects of the interview environment that are of particular importance to my interviews, such as comfort, and privacy to avoid physical and psychological discomfort. I ensured the interview location was relatively quiet, which helped make the environment relaxing and reduce the likelihood of problems with the audibility of recording.

Sampling

I applied the census sampling method for this qualitative study. Generally, researchers use census sampling in a qualitative case study to identify information-rich cases related to the phenomenon of interest (Palinkas et al., 2015). The primary goal of using census sampling was to focus on particular aspects of a population that are of interest, and which best enable them to answer my research questions. Also, the census sampling was suitable because the entire population was relatively small; supported by Woodley and Lockard (2016). I collected data from all participants who met the criteria of selection. Census sampling technique matched this study as the population was a particular small group of senior PMs, and the research question addressed was unique to this group of participants. The total number of PMs that I interviewed from the company was 13, and each had different roles. To determine the sample size was challenging. Some researchers suggested that representing an adequate sample size is ultimately a matter of judgment and experience in evaluating the particular research method and strategy employed (Marshall, Cardon, Poddar, & Fontenot, 2013).

In the qualitative case study, data come mostly from the documentation, archival records, interviews, direct observations, participant, and physical artifacts (Yin, 2013), which can deter the call for a large sample size. Other scholars stated that the concept of saturation is the most relevant factor to consider when thinking about sample size decisions in qualitative research (Fusch & Ness, 2015). Where data collected no longer offers any new or relevant information (Constantinou, Georgiou, & Perdikogianni, 2017). Other researchers noted that saturation occurs when adding more participants to the study does not result in additional information (Tran, Porcher, Falissard, & Ravaud, 2016). Hagaman and Wutich (2017) proposed that saturation often occurs around 16 or fewer participants in a similar group. Guest, Bunce, and Johnson (2006) suggested that the saturation of data could happen with 12 participants. Consistent with Guest et al., another researcher showed that saturation occurred with 11 study participants (Latham, 2013). I used the census approach for sampling to ensure that I have reached saturation. I went beyond the 12 participants number stated by Guest et al. and wasn't getting any new information. Additionally, I made sure that no new major themes emerge in the subsequent interviews.

Ethical Research

It is a fundamental research practice that studies that involved human participants were ethical (Bromley, Mikesell, Jones, & Khodyakov, 2015). I seek the permission of the Walden University International Review Board (IRB) before commencing the study. Also, I asked for the approval of the research site to perform the research study. The Walden University IRB approval number for this study was 07-05-18-0465526. After

obtaining the required permissions, I started the process of identifying potential study participants in the IT company. I approached potential participants who met the criteria for participation in the study. I required the participants to sign the informed consent form to show their voluntary willingness to participate in the study.

The participants of this study needed to understand the consent form and the confidentiality terms, which was in line with the research study by Tarrant et al. (2015). I explained to the participants the extent to maintain confidentiality in this study. Maintaining the privacy of participants as well as the information collected from them meant that only the researcher could identify the responses of individual subjects. I ensured the participants understood their rights clearly. These rights included knowing the purpose of the research study, and the potential benefits resulting from participating in a research study, if any. Also, I made sure the participants were aware that they have the right to take the time necessary to decide whether to participate in a research study. I also made sure that they freely made their decision without feeling forced or required to attend. Additionally, I communicated and made the participants aware that they have the right to stop their participation in a study at any time. They are also made aware that their decision in no way jeopardize them. I did not grant incentives for involvement for the participants in the study to minimize the possibility of coercion or undue influence.

As a researcher, I followed the guidelines presented in *the Belmont Report* to safeguard the rights, dignity, and welfare of individuals participating in the study, and ensured that the confidentiality of participants key to ethical research. To maintain confidentiality and protect the information collected from research participants, I

provided anonymity of data collected from participants by using alphanumeric code on data collected. I ensured that I do not record identifying information. To avoid linking individual responses with participants' identities, I concealed the participants' identities by labeling and using pseudonyms to ensure confidentiality (Saunders, Kitzinger, & Kitzinger, 2015). I gave a fake name to represent the IT company to mask the organization's identity. Furthermore, I maintained the confidentiality of the information collected from research participants by keeping the documents locked in a secured location and restricted access to the information on these documents by using a password-protected flash drive. Data collected are kept on a password-protected flash drive, including consent forms and interview recordings in a locked file cabinet. All these data are destroyed by clearing and pulverizing the password-protected flash drive with a hammer in 5 years.

Data Collection

Instruments

For this study, I was the primary data collection instrument. I observed, took notes, talked to the participants. I conducted semistructured qualitative interviews. I ensured that the data gathered from the participants of my study in the discussions were appropriate, and provided sufficient information. I used the open-ended semistructured interview as the data collection method. Researchers LaDonna, Taylor, and Lingard (2018) recommended that open questions semistructured interviews are ideal for exploring in-depth knowledge. Using this type of data collection, I worked out a set of questions that addressed the research questions beforehand but were thought for the

interview to be conversational. I prepared 10 open-ended interview questions, that covered the perception of communication strategies used by IT PMs in software development projects. The questions aimed to uncover rich descriptive data on the personal experiences of each study participant. Moreover, the interview questions were a balance of probes questions, central research questions, and follow-up questions. The probe questions established the credentials and background of the participants in the area of IT. The primary research questions were designed to seek an in-depth understanding of the ideas raised by each study participant. The success of the interview depended on the questions and direction of the conversation. This is in line with what was noted by Kallio, Pietilä, Johnson, and Kangasniemi (2016). I finished with follow-up questions.

Yin (2013) stated that qualitative case study data obtained from secondary sources are acceptable. I used data from the company of my research as a secondary source of data. The use of secondary data sources served to develop a comprehensive understanding of phenomena under study as well as test validity through the convergence of information from different sources through triangulation (Hussein, 2015). I adopted the seven steps of the interview investigation, as noted by Kvale (2007). These steps were thematizing, designing, interviewing, transcribing, analyzing, verifying, and reporting. The thematizing stage set the concept of the subject under inquiry and realized the purpose of the interview investigation (Beedholm, Frederiksen, Frederiksen & Lomborg, 2015). The interview questions I designed ensured engagement with study participants throughout the interview process. The interview protocol in Appendix guided the interviewing steps, following a thoughtful approach to the knowledge considered. I

transcribed the data collected from the interview, which was also the first step in analyzing the data gathered, as noted in Kvale (2007). A researcher can systematically check the narrative account to verify the interview findings (Birt, Scott, Cavers, Campbell, & Walter, 2016). I ensured that the story was corrected using member checking. Finally, I communicated the results of the study to the respective participant to make sure of the narrative documented. All I described above represent a linear progression starting from the original plan of the interview investigations to the final report of the research following the guidelines from Brinkmann (2016). I used the member checking technique to explore the credibility of the results. I used the triangulation method to confirm the validity of the data collected for the study. This method ensured the trustworthiness of results because it is the bedrock of the quality of my qualitative research (Hussein, 2015).

Member checking. Member checks improved the reliability of qualitative research by seeking feedback from research participants, according to Birt et al. (2016). The researcher uses the viewpoint for establishing validity in a qualitative study (Morse, 2015). The member checking process shifts the merits from the researcher to participants to understand the phenomena of interest from the participants' view. Member checks are good research practice; the reviews of drafts by study participants can improve reliability and useful for obtaining participant approval (Thomas, 2017). I used member checking to help validate the research data or information. I met with participants to review my interpretation of their responses to the interview questions. I presented the participants of the study with the results after obtaining their opinions. In this way, my study participants

contributed to the analysis process, and their interpretations became a step in my analysis. I recorded all the changes suggested by the study participants and scheduled further follow-up sessions with them. I continued follow-up with the participants to ensure we agreed to the information, and there is no new additional information to include in the findings. Each participant was aware that I expected feedback or comments on my interpretation from them within a given period. I arranged to follow up on the phone in case we cannot meet in person. All feedback and changes to my interpretations noted, and I followed up with the participant until we reached consent on the information. Member checking was the most valuable way to confirm the credibility of the study. Participants were able to decide if the results reflected the phenomena studied, as noted by Birt et al. (2016). As applied to my study, member checking allowed me to interpret the results of my research accurately, which enhanced reliability.

Methodological triangulation. Methodological triangulation is a way of assuring the validity of the research. It always a variety of methods to collect data and to capture different dimensions of the same phenomenon (Joslin & Müller, 2016). Triangulation of data increases confidence (Hussein, 2015). I used methodological triangulation for this study and collected data from multiple sources, such as interviews and company documents. This approach benefited providing support for my findings, more extensive data, increased validity, and I better understood the studied phenomena. As I drew data from secondary sources, it expanded the insight into the different points underlying the communication strategies used by IT PMs in a software development project.

Data Collection Technique

To ensure I collected data from the interviews successfully, I set proper expectations for the participants. Researcher's skill in conducting interviews can influence the quality and accuracy of research findings (Peters & Halcomb, 2015). I described to my research participants the purpose of the semistructured interview and the processes. The semistructured interview I prepared consisted of several fundamental questions that serve to define the area I explored and in turn, collect enough data. The interview protocol in Appendix, guided the participants on what to talk about as they participate in the discussion. The following are the steps:

- I introduced myself first, and communicated to the participants the purpose of the interview.
- I ensured that each study participant gave signed informed consent and agreed on the level of confidentiality of the interview.
- I let the research participants choose the location for meetings, and I made sure the selected area was convenient and comfortable for the participant. The participant's choices included places like their office, which was on the research site, and two private rooms in the company where small meetings were conducted.
- I scheduled face-to-face interviews around times that suited the study participants, and I let them know that the interview was 30-60 minutes.
- I used a digital recorder to record the conversations of the areas explored during the meeting, and I wrote notes to capture relevant information during

the interview. Before commencing the interview, I asked for permission to record the conversation, and I explained why I was conducting the interview. All the participants agreed to be recorded during the interview. From an ethical perspective, if any of the participants declined to be recorded, I would have respected their wish, and not record the interview. I asked the study participant to comment on my notes or summary, which most of them did. During the semistructured interview with study participants, occasionally I checked and ensured the digital recorder was working, and I was capturing all the discussions.

I employed the following tactics to have smooth the interview experience. I listened attentively to the participants during the interview, allowing them to qualify their statements or provide more insights. Throughout the interview, I remained neutral. I did not show emotional reactions to the participant's response while asking one question at a time, and I allowed the study participant to answer adequately and comfortably. I encouraged an open conversation style and developed a friendly relationship with the study participants to elicit the most thoughtful, considered responses. During the interview, I politely informed the study participant when it was time to move to another question. I maintained control of the conversation to avoid running out of time as a method to ensure a successful meeting. My interview strategies are supported by the researcher, who stated that for an interview to be successful, it is critical for the researcher to maintain focus (Castillo-Montoya, 2016). The interview questions adequately conveyed my actual research question. What communication strategies do IT

PMs used for successful collaboration in software development teams of midsized companies, but I kept in mind, my study participants? The vocabulary I used in my interview questions were at the appropriate level for my study participants to understand. The data I collected for this study came from the semistructured interviews and archival documents. Each of the data collection techniques had advantages and disadvantages of the data collection method. The open-ended interview techniques were useful for gaining insight into the phenomena of the study and allowed the participants to describe what was essential to them. This was mentioned in the research by O'Keeffe et al. (2016). However, some of the impediments of the interview technique included time-consuming and expensive compared to other data collection methods, as stated by Brinkmann (2016). I reviewed the documents provided by the company as a secondary source of data. The data collection technique was relatively inexpensive and suitable for background information about the area of study and brought up knowledge. The dilemma I had with some of the documents reviewed was that some of the information was inapplicable. Also, some were out of date, incomplete, or inaccurate. Collecting, reviewing, and analyzing many records to consider can be time-consuming and not necessarily, a good experience for researchers (Harry & Fenton, 2016). As related to my research question, I figured out and understood which documents or archives in the short span. That has helped me identify and exclude the materials I don't need, and which ones most usefully.

Particular to this study, I described member checking as a process of asking each participant to confirm or disconfirm the interview narratives. I conducted multiple

validation interviews with each study participant to ensure the study participant account for the stories. I noted all the changes suggested by the research participants and scheduled a further follow-up session with them. I continued to follow-up with the participants to ensure we agreed to the information. As the study participants reflected on their interview questions, I asked them to highlight what they disagreed with. I informed participants whether they would be receiving full or partial transcripts. Also, I explained to the participants the reasons why, which helped the participants focused on their primary contributions and not be distracted by sections where they were off-topic. Finally, I provided clear directions and instructions for member checking to the participants. Study participants felt confident when presented with more precise member checking instructions, which enhanced the feedback. As applied to my research question, member checks were useful for obtaining the participant's approval. With the lens focused on participants, and I was able to check the data and the historical account systematically.

Data Organization Techniques

I collected the data for the qualitative case study from the in-depth interviews and document review that explored issues related to my research questions. The interview protocol in Appendix guided the identified questions and elicited verbal responses from participants in a face-to-face meeting. Organizing the research data was an integral part of the study process because it ensured the integrity and accessibility of data (Noble & Smith, 2015). Initially, I used a research log to keep track of details and avoid the frustration of trying to figure out where was the information. I organized data in the

research record according to the source, type of information, and the categories that I designated. I included entries like reference information such as authors' and editors' names, titles of works, publication dates, and places. Also, I incorporated specific notes, including paraphrased points, and my comments. Researchers used tools such as excels and others to format their data (Fluk, 2015). I stored my research logs in the Microsoft Excel format, which allowed me to cut and paste into category sections, and eventually reworked into essay form.

It was critical protecting data collected in research related to the identifiability of participants and use and disclosure of personal information (Saunders et al., 2015). I made an effort to maintain the confidentiality and anonymity of information collected from the research participants. I used alphanumeric codes, as described by Kaiser (2009), as an effective method for protecting the confidentiality of research participants. Also, I used codes to identify information to safeguard participant responses/data when documents are stored or out in the open. I kept in a separate file type, each study participant names along with their unique study code (e.g., 001P). Where 001 is the number of the study participant preceded by the letter P.

Meanwhile, the audio recordings of the interviews, I transcribed with no identifying information. I maintained the cleaned text and quality of the transcripts, which I reviewed against the original audio recording. I uploaded into the qualitative analysis software - Nvivo Version 12. This software was able to store data for coding and exploration of themes while maintaining the confidentiality of research participants (Paulus, Woods, Atkins, & Macklin, 2015). Using Nvivo, I organized the research data

into themes and ensured the retrieval of these data efficiently. Furthermore, after organizing and sorting the data correctly, through the analysis of various codes, it was easy to identify themes across data sets. Based on the accounts of time and efficiency, NVivo was a suitable tool. I stored the finalized content and written records of each participant in a folder in word processing files on a password-protected flash drive in a locked storage cabinet. I planned to retain data for 5 years, until such time, I can destroy both the paper notes and the flash drive.

Data Analysis Technique

I analyzed this qualitative case study to uncover and understand the research topic. The data collected described the communication strategies used by PMs that promoted team collaboration in software development in the company of research. I used the interview protocol in Appendix to guide the study. I asked each participant the same interview questions. The analysis involved coding all of the data to identify similarities and differences. I imported the responses from all the semistructured interviews into qualitative software to code.

The primary source of data collection for this study was the open-ended face-to-face interviews. The interview questions were to establish credentials and background of each of the participants and uncover information about the communication strategies employed by the participants to facilitate team collaboration in software development. Coupled with the face-to-face interviews, I used the methodology triangulation of secondary data sources gathered from the documents provided by the company. The data

collected from the secondary source provided relevant data sets that complemented and gave more insight into my data.

Additionally, the data analysis involved examining the data collected to answer the primary research question for the study. I discovered themes in the data gathered in interview transcripts. It was critical that I verified, confirmed, and qualified data by searching through the data and repeating the process to identify categories further, which was activity acknowledged by Wilson (2016). For example, I organized the data collected in a group and related to the PM communication strategies. I used categories such as use collaboration tools, meet regularly, be inclusive, be transparent and concise, show respect and accountability, balance teamwork, ensure team dynamics, explore team culture, emotions, etc. While these groups were the idea of what categories surfaced, the data gathered was the real dictator of the categories. Upon encountering new information, which does not fit existing types, I established additional categories and reviewed previous information to ensure that I had an accurate representation.

Also, I used the five-step of Yin data analysis approach. These steps were; (a) compiling data, (b) disassembling data, (c) reassembling data (d) interpreting the data, and (e) concluding the data. Following is the explanation of each step:

- A researcher must organize the data. According to Yin (2015), the first step of the data analysis started with compiling data, which was a process of organizing. I used qualitative data analysis software – Nvivo Version 12 to store textual transcripts of data collected and arranged them in the order that helped relate to a particular category.

- Disassembling was the second step (Yin, 2015). Disassembling was an iterative process, which breaks down data in smaller fragments. I used the Nvivo software to generate coding using auto coding feature. The coding involved labeling of units of text according to themes. I created blocks of units text and linked the blocks to items they represent, thereby recognizing similarities in data among the views of participants. Furthermore, I identified the critical themes of the overall research question. In this study, the research question drove thematic analysis through the coding process. Such a classification not only helps researchers identify major themes but also enables detailed comparison as noted by Gilson, Maynard, Young, Vartiainen, and Hakonen (2015). I also recognized the critical topics based on each occurrence of the subject across the entire data set.
- The third step was reassembling data from the previous step, an iterative process, as well as noted by Yin (2015). I arranged the data sets based on the coding scheme, which made it easier to examine, compare, and contrast, things that I noticed in my data sets. I searched for the relationship between categories of the data sets to generate an understanding of the phenomena under study based on the research questions. Ultimately, the reassembling of the data led to important themes in data analysis.
- The fourth step of the analysis was interpreting the data, as noted by Yin (2015). I used the reassembled data to create a new narrative. I based the interpretation of the data on the research study to described meaningful data. Interpreting the analyzed

data from such perspective determined the significance and implications of the assessment (Lewis, 2015).

- Concluding the data was the last step in the data analysis (Yin, 2015). I noted the findings that appear to cohere, contrast, and discern with other previous findings. It was critical to perceive the results of the investigation of this study from a broader set of ideas. Also, it was essential to ensure that the results were transferable to other particular situations in the future. Duggleby and Williams (2016) supported this approach.

As mentioned earlier, I used Nvivo Version 12 software for my qualitative research study. This software allowed me to enter, save, code, and explore themes from the data collected easily. I used the software to organize and code items, including keeping data in a single location with easy access. NVivo supports qualitative research, and researchers use it to organize and analyze interview transcripts, textual sources, and other types of qualitative data (Paulus et al., 2015). During the coding, I linked paragraphs from one block to another and access with less effort. The software provided features to reshape and reorganize coding and nodes structure quickly (Castleberry, 2014). Additionally, the presence of the features such as nodes and auto-coding in NVivo software made it more compatible with thematic analysis approaches (Lewis, 2015) and provided a simple structure for creating codes and discovering themes. Castleberry (2014) emphasized that NVivo enhance research quality significantly. Therefore, using Nvivo 12 qualitative data analysis software, I worked more efficiently, saved time, quickly organized, stored and retrieved data, and backup findings rapidly.

The results of the data analysis identified themes related to the research question guided by the conceptual framework - sociotechnical model. I developed the ideas by examining the data categories through comparison between and within the groups. Also, I interpreted concepts that described aspects of the data based conceptual framework. The conceptual framework that was used as the foundation of this study provided the content for the entire investigation based on literature, methodology, and results (Wu et al., 2015). The conceptual framework underpinned the context of the research to the research questions, the method, and the outcomes. These highlighted aspects become tied by the sociotechnical frame, allowed me to interpret and make sense of the data gathered. Exploring communication strategies used by IT PMs through the lens of the sociotechnical framework provided the opportunity to analyze, contrast, and discern data collected based on founded framework applicable to the study phenomenon.

Reliability and Validity

Reliability and validity are essential concepts for assessing the extent to which convincing evidence support claims in qualitative research (Morse, 2015). Qualitative researchers take steps to ensure that their research findings are believable, consistent, applicable, and credible to be useful to readers and other researchers (Lewis, 2015). Therefore, this study demonstrated reliability and validity to confirm it has suitable rigor.

Reliability

In qualitative research, reliability relates to the reproducibility and stability of the data (Leung, 2015). Researchers explain the strategies used in the study and understanding their roles and the relationship they have with participants to achieve

reliability (Morse, 2015). Other researchers also recommended that keeping detailed notes and documentation throughout the data analysis process of research could add to the reliability of the study (Walther et al., 2017). Using data analysis software, such as NVivo, can improve reliability by applying the rules built into the software (Houghton et al., 2016). Through this association, this process will allow the results or findings of my study to be reproduced some other time, adding trustworthiness, rigor, and quality of my qualitative research.

Validity

Validity is described as the genuineness of the research findings (Kavanagh, Goldizen, Blomberg, Noad, & Dunlop, 2016). The researcher should reflect openly on their ability to be unbiased and consider the effect of the final written account of the study process; all in the effort to promote the validity of the research (Savage & McIntosh, 2016). Participants validation can also facilitate the reduction of bias through the process of member checking (Birt et al., 2016). Another method that ensured validity was methodological triangulation (Morse, 2015). For this study, the research question was answered from multiple perspectives, including member checking by participants, primarily to inform the results from different angles. A qualitative case study design supports the collection of data from multiple sources. By applying methodological triangulation method on the data collected improved the validity of the research (Yin, 2013). Methodological triangulation assured the validity of research as it captured different dimensions of the same phenomenon (Joslin & Müller, 2016). Furthermore, I

have considered dependability, credibility, transferability, and confirmability to achieve reliability and validity in this study.

Dependability. Also known as reliability, dependability refers to the consistency of which the results could be repeated and result in similar findings (Jan et al., 2016). Jan et al. (2016) also emphasized that the reliability of the results also gives legitimacy to the study method. I employed the following two approaches to ensure the research was dependable. First, dependability was critical (Constantinou et al., 2017), and was one way that provided credibility to member checks strategy. In the member checking process, I offered participants copied of the transcribed notes from audio recordings to review detailed interview responses and verify the interpretive accuracy. Member checking improved reliability (Hussein, 2015). Second, I stated clearly the rationale used to select participants and interviews, and I maintained detailed notes and documentation throughout the data analysis process. Details notes or documentation that explained further the findings. Other researchers may want to replicate the study. The more consistent I was in the process, the more dependable the results. Third, I kept audit trails for all research activities for reviewers. External evaluation of the research process through peers to ensure accurate analysis of the method and data interpretation was vital to the dependability and trustworthiness of the study (Burda, van den Akker, van der Horst, Lemmens, & Knottnerus, 2016). For this study, the specific ways of data gathering, coding, analysis, and interpretation were described. The description contained information to repeat the research, thus ensure dependability.

Credibility. Researchers described internal validity as the believability and trustworthiness of the findings (Siegmund, Siegmund, & Apel, 2015). Moreover, the creditability of the qualitative study depended more on the richness of the data gathered (Yin, 2015). I used the following strategies to achieve internal validity. I used the member checking process, where I shared the preliminary findings and interpretations with study participants. The participants checked for accuracy and ensured that I captured the meaning of what they said. Member checking was the most valuable way to confirm the credibility of the study because the participants decided if the results reflect the phenomena studied (Birt et al., 2016). Also, I used triangulation, a commonly used method for verifying accuracy that involves crosschecking information from multiple perspectives (Hussein, 2015). The case study design supported the collection of data from various sources. I used methodological triangulation of data sources to improve the credibility of the research study.

Transferability. Transferability also termed external validity (Leung, 2015). Transferability means the findings of the study that can be shared in other contexts by the readers. As a researcher, I thoroughly documented the case study and ensured that the conclusions of the study could apply to similar settings, situations, or individuals. It was crucial to describe the phenomenon under investigation and documented to allow the audience to have a proper understanding of the research (Ang, Embi, & Yunus, 2016). Transferability enables others to compare the instances of the phenomenon explained with those that they have in their situations (El Hussein, Jakubec, & Osuji, 2015). This research was a case study of an IT company, and I intended to provide readers with

evidence that the finding of the study could apply to other contexts, situations, times, and populations. In other words, readers to note the specifics of the research and compare them to the details of their situation with which they are familiar. If there were enough similarities between the two cases, readers could infer that the results of this study would be the same or similar in their situation.

Conformability. Conformability related to the objectivity of the research (Munn, Porritt, Lockwood, Aromataris, & Pearson, 2014). It was the degree to which other people could confirm the outcomes and provide a unique perspective to the study (Noble & Smith, 2015). I used the following techniques for improving conformability. First, I documented the procedures for checking and rechecking the data during the entire research. Intensive engagement with the data, moving backward and forwards between the data and the interpretation of it and making firm links among the data collected increased reliability (Cope, 2014). In the data analysis process, I used NVivo to create codes to describe the data. The codes represented statements from interview transcripts, and I confirmed by revisiting previously coded data. Second, I used peer reviews to help establish the research approach and findings and to ensure no inappropriate biases impacted the data analysis. Third, I used methodological triangulation of data sources. Qualitative researchers suggested that the triangulation of multiple sources allows the researcher to gather more extensive data with greater insight into the topic and therefore adds to confirmation (Hussein, 2015). As applied to this study, I documented the procedures for rechecking data to ensure conformability. Methodological triangulation is a widely used method to provide conformability of qualitative studies.

Data saturation. Researchers should use methods to ensure data saturation that will not hamper the validity and transferability of the findings (Nelson, 2016). The work of researchers reach data saturation when no new themes emerge, and enough information is available to replicate the study (Fusch & Ness, 2015). More importantly, a researcher makes sense of the data to readers and demonstrate the richness of the information gleaned from the data. Second party can conduct coding of transcripts to make sure data saturation has been achieved (Ando, Cousins, & Young, 2014). To ensure data saturation, I collected data until no more patterns or themes are emerging for the data. Also, I used data triangulation to ensure data saturation. There is a direct link between data triangulation and data saturation. Data triangulation can ensure that data is rich in depth (Morse, 2015). In this study, the interview was the method I used to get results to reach data saturation. The number of interviews needed for qualitative research to achieve data saturation was thirteen. Additionally, I structured the interview questions to facilitate asking multiple participants the same questions to achieve data saturation.

Transition and Summary

The goal of this qualitative case study explored the communication strategies uses by IT PMs to facilitate team collaboration in software development. I used Yin's (2015) five steps data analysis process to understand and describe the data collected from semistructured interviews. I investigated the communication strategies and individual perceptions of the study participants. Also, I triangulated the data I collected from archive records provided by the IT company. I used the census sampling method to pick IT PMs serving in leadership positions in a midsize IT firm in metropolitan Alberta, Canada. It

was imperative that before I commence the study, I obtain permission from Walden University. I also needed to get approval from the research site, where I conducted interviews and collected data. I performed face-to-face meetings with each of the 13 participants, recorded and transcribed the data. I imported the transcribed data into NVivo 12 qualitative software to identify emerging themes. Therefore, section 2 discussed the purpose statement, the role of the researcher, participants, research method and design, population and sampling, research ethics, data collection, organization and analysis techniques, and reliability and validity. The presentation of findings, applications to professional practice, implications for social change, recommendations for action and future study, and finally, conclusions are discussed in section 3.

Section 3: Application to Professional Practice and Implications for Change

Overview of Study

The purpose of this qualitative case study was to explore communication strategies IT PMs use for team collaboration in software development in midsize companies in Alberta, Canada. In this section, I present the findings of the research study. I gathered the data for this study by conducting semistructured interviews with senior PMs in a mid-sized IT company in Alberta. I also reviewed company documents correlated with data obtained from interviews. As described in Section 2, Yin's (2015) five-step approach formed the basis for data analysis for this study. Section 3 included the presentation of findings, applications to professional practice, implications for social change, recommendations for action, suggestions for further research, reflections, and the conclusion of the study.

Presentation of the Findings

The research question I developed to guide this qualitative case study was: What communication strategies do IT PMs use for successful collaboration in software development teams of mid-sized companies? Following the collection and analysis of data through semistructured interviews and review of company documents, the following four main themes emerged: (a) effective communication, (b) attributes of communication, (c) significance of social and emotional intelligence, and (d) impact of post-work activities for team collaboration. Following the discussion of each theme was a frequency table that explains the findings — each of the tables composed of subjective columns. The columns characterized the number of the participants in the study who made substantial

contributions to the theme and the number of company documents correlated with data obtained from the interview.

The participants in the study were experienced IT PMs with supervisory responsibilities that had employed successful communication strategies that facilitated team collaboration in software development projects. The midsized IT company in the study consisted of various accounts or roles managed by these senior PMs. Thirteen participants consented to take part in this study. I interviewed each of them. Three of the participants had over 20 years of IT project management experience. Four participants had between 13 and 18 years experience, two had 11 years, and 4 participants had 10 years of IT project management experience. There were five female and eight male participants. The difference in the numbers of females to males caused no bias since the research interview questions were not gendered sensitive.

To ensure data saturation, I went beyond the data saturation point until no new information arose anymore. Attainment of data saturation occurred when I interviewed the 13th participant and realized that adding more participants to the study would not have resulted in new perspectives or information. The organization provided 11 documents for this study, including communication plans used throughout project management life cycles, project management plan records, and project status reports used by PMs. Additionally, the company allowed me access to project wikis, which were used by PMs to facilitate team collaboration. I was provided with project meetings (i.e., kickoff and delivery meeting notes, agendas, etc.); and project management office framework focused on PMs' communication and interaction within teams. The company

also provided project logs, such as a lesson learned, scrapbooks, and incidents/issues for the study. The documents mostly illuminated ongoing records of project communication activities in the company. Other materials included were my field notes and reflective journal that contained some critical issues raised during the interviews. To seek convergence and corroboration, I employed methodological triangulation to analyze the data I collected from the semistructured interviews and review of company documents. The purpose of triangulating was to provide a confluence of evidence to breed credibility. Corroborating my findings across data set reduced the impact of potential bias because I examined information that I collected through interviews and the organizational records. Also, I used member checking to improve the analysis and the interpretation of my findings.

Theme 1: Effective Communication

Effective communication for team collaboration was the first theme that emerged from the data analysis for this study. The idea was highlighted by nearly all the interviewed participants, my review of 9 out of the 11 documents provided by the company, and confirmed by previous and current research. Within this first theme, there were several subthemes mentioned by the participants, in the company documents, and established in earlier literature that contributed to effective communication. I found that proper project management and leadership skills, well-defined communication plans, real-time communication, and the right communication tools are among the essential factors for effective communication.

The findings of this study indicated that effective communication was significant to the success of projects. To accomplish effective communication for team collaboration, PMs needed to have strong management and interpersonal skills to work effectively with people in a variety of roles (Muller & Martinsuo, 2015). PMs considered definite communication plans that clearly and succinctly express the most appropriate communications team members should engage in (Varajão et al., 2017). Also, PMs needed to ensure real-time communication among team members for effective communication (Niazi et al., 2015). The findings of this study indicated that PMs should use the best tools for effective communication. Using suitable tools helped facilitate team collaboration and ensured team members were on the same page (Mitchell, 2018).

My analysis of company documents and participant responses showed that effective communication was critical to team collaboration, which, in turn, influenced project success in software development. Based on the conceptual framework of this study, which was the STS theory, the findings demonstrated useful PM practices. The STS model undergirded the need for effective communication to promote team collaboration. The results of this study suggested that one factor alone is not sufficient for team collaboration efforts. This reality aligned with the STS theory because it required multiple social and technical aspects, working together as a whole to ensure success (see Carayon et al., 2015). Data in Table 2 lists the factors or subthemes for effective communication. The study participants identified these factors or subthemes as results of their experiences in various projects in the company. The table also indicated the frequency of participants who stated that these factors were useful for team collaboration.

Furthermore, Table 2 showed the frequency of supporting documents that contained information about these components. These numbers were not mutually exclusive, meaning that two or more of these components may have appeared in one document.

Table 2

Frequency of Theme 1

Data source	Well-defined communication plan (<i>f</i>)	Real-time communication(<i>f</i>)	Right tool for communication(<i>f</i>)	Management and leadership skills (<i>f</i>)
Participants	13	11	9	10
Documents	7	5	4	6

Well-defined communication plan. Overall, 100% of the participants showed that effective communication was critical to team collaboration in software development projects. The responses from all the 13 participants indicated that they developed communication plans as the first step to ensure effective communication for team coordination and collaboration. Their views were consistent with the findings of Meng and Boyd (2017). The viewpoints of Participants #2 and #5 of a well-developed project communication plan adequately informed team members of the scope, components, and individual and collective roles. Seven participants indicated that a clear communication plan set the tone for correspondences within the projects, which allowed team members to collaborate effectively among themselves and aligned with this theme.

In reviewing 9 out of the 11 documents provided by the company, I found successful projects in the company used effective communications strategies due to reliable project communication plans. This information was consistent with the views of

the seven participants mentioned earlier. The project management documents provided by the company outlined communication strategies that helped smooth the interaction among team members, including clearly defining the roles of individuals in the team. In their experiences, Participants #4, #7, #11, and #12 indicated that their team members followed a solid project plan. The plan outlined follow-up procedures to advanced interactions and, in turn, improved team dynamics dramatically. Participants #1, #2, #5, and #8 shared a similar view and added that a thought-out communication plan ensures all stakeholders receive consistent information throughout the projects. These findings also supported the first theme of this study.

Papke-Shields and Boyer-Wright (2017) also supported the findings of this study. Papke-Shields and Boyer-Wright emphasized that communication plans guide the information flow in projects consistently and reliably. Mishra et al. (2015) recognized the importance of a solid communication plan for effective communication among the team members. They maintained that the primary responsibility of project management was to ensure effective communication and collaboration was established with all the stakeholders, which confirmed the findings in this study. Previous researchers viewed IT projects as challenging to manage successfully because of their complexity (Marsilio et al., 2017). Marsilio et al. (2017) emphasized the significance of a well-developed communication plan as critical to effective communication for team collaboration in software development, which also supported the findings. In the experiences of Participants #2, #7, and #10, ineffective communication isolated team members and disconnected them from the purpose of the project, their roles, and the value of their

contributions. Šmite et al. (2017) supported the participants' statements, acknowledging that poor communication lacks interactive feedback and creates frustrations among team members.

The first theme of this study was also consistent with Walker et al. (2017) findings. Walker et al. (2017) highlighted that a well-defined plan provided relevant, accurate, and regular project information to all project stakeholders. More importantly, a solid plan enhanced interaction among teams, leading to project goals (CITE), which was also in agreement with the responses from Participants #3 and #9. These participants expressed that a proper communication plan ensured project goals and objectives and fostered collaboration among teams, increasing the success of the project, particularly in Agile software development.

Previous research by Kopmann et al. (2017) corroborated the findings for the first theme. Kopmann et al. stated that most PMs develop appropriate communication plans to ensure team members are informed and always on the same page. The finding of these researchers was consistent with the responses from Participants #7, #8, and #11 of the study. These participants indicated that the communication plan they used in their project ensured every team member was kept in the loop. They also mentioned that the communication plan defined the types of information delivered, received, and the format for communicating. With software development projects now often on a global scale, a recent study showed that software-developing practice shifted towards more open and collaborative environments (Knauss, Yussuf, Blincoe, Damian, & Knauss, 2018). Communication and collaboration among teams are more critical to the success of the

project. Knauss et al. (2018) stated that team interactions in a globally distributed software development environment could get complicated. Therefore, effective communication based on a well-thought plan is required to deal with the challenge of such a complex software development environment.

The conceptual frameworks that guided this study, the STS theory (Trist, 1981), supported the findings of this study. As related to the STS model, the findings of this study suggested useful communication practices for the PMs that can benefit team collaboration in the software development environment. The results of the study also showed that with a reliable communication plan, team interactions improve, which was a critical aspect of the STS model, as cited by Hinkelmann et al. (2016). Tsvetkova et al. (2017) explained that the STS structure constituted many parts, including identifiable people, groups, actors, communications, information flows, and tools. The first theme of this study exploited the social aspect of the STS model (see Alzoubi et al., 2015). Furthermore, a solid communication plan provides interactions, which characterized the sociotechnical context (Kim et al., 2016). Based on the findings and the first theme, what defined the social elements were reasonably harmonious with what established the sociotechnical framework.

Real-time communication. Participants spoke to the significance of real-time communication for effective communication in software development. The responses from 11 participants and my analysis of 7 out of the 11 documents provided by the company indicated that real-time communication promotes team collaboration, which was supported by existing literature (Niazi et al., 2015). Nearly all the participants

avored face-to-face or in-person conversation. The responses from most of the participants indicated that team members interact effectively with each other through network connections, just as if they were face-to-face. This finding was consistent with the contributions by Krumm et al. (2016), as cited in the professional and academic literature. Krumm et al. emphasized that agile software development methods stimulate intrateam knowledge sharing through face-to-face interactions, which positively influence collaboration and cooperation across teams.

Also, the findings signified that project teams continuously improved communication using real-time tools like email, webcasts, collaboration websites, video conferences. These findings were supported by Mitchell (2018), as cited in the professional and academic review of this study. Mitchell stressed that some real-time management tools such as web-based dashboards help project managers established effective communication with team members. Participants #6, #7, #9 and #11 responses were consistent with the study of Mitchell, and that using real-time communication tools drove team productivity, kept team members up to date on project progress. Participants #2 and #3 worked with distributed teams. They used real-time communication tools such as group instant messaging, allowing team members to respond and decide instantly in a collaborative fashion. Likewise, Participants #5, #8, #12, and #13 used video conferencing and strengthen team relations, improved team workflow, and increased team productivity. However, nearly all 11 participants highly preferred face-to-face communication, as it nurtured collaboration. The participants' responses and experiences were consistent with existing literature; Niazi et al. (2015). Niazi et al. noted that

emailing back and forth was unproductivity in an agile software development environment. These researchers emphasized that to hash-out all of the details of a project, the face-to-face conversation was efficient and effective, which supported the first theme of this study.

Five out of the 11 participants indicated that real-time communication was necessary, and that phone conversations were the second alternative to face-to-face communication. But these five participants all agreed that in a phone conversation, there was a high chance to miss the full attention and visual feedback. This was consistent with the information I found in the project guide documents provided by the company. The materials highlighted that instead of the phone; video conferencing was effective in communication. Another participant indicated that real-time communication empowered and provided a better medium for information sharing across the distributed software development teams. I further reviewed the company documents, including the lesson-learned reports, and found that real-time communication contributed to effective communication among team members. Three out of the 11 participants mentioned at the beginning of the paragraph indicated that regular team meetings, such as daily/standup scrums or weekly meetings, were productive. Provided as long as these meetings, were not used to overlooking teammates' work or micromanage, but foster discussion and collaboration among team members.

A recent study by Buffardi, Robb, and Rahn (2017) found face-to-face communication among team members led to improved team collaboration. While it was easier to communicate via an email, instant message, or use the phone to speak with a

team member within physical proximity, face-to-face was generally more effective. Face-to-face interaction allowed team members in projects to build trust, understanding, and a real sense of a shared mission (Rauniar, Rawski, Morgan, & Mishra, 2019). Another study showed that body language could only be sensed in person, and the nonverbal cues determine most of the communication effectiveness (Hall, Horgan, & Murphy, 2019). A similar study showed that face-to-face interactions boosted creativity as the overall energy was higher to brainstorm and solve several problems at one time (Polat, Lynn, Akgün, & Onat, 2018).

In contrast, some of the study participants indicated that the value of face-to-face communication is fading in today's digital era. Team members rely heavily on the convenience of emails and text messages. But three participants maintained that digital communications if personalized, runs the risk of being misinterpreted or viewed as unprofessional. This statement contradicts the contribution by Niazi et al. (2015) cited in the professional and academic review for this study. In support of the theme of this study and the contribution made by Niazi et al., researchers in a recent study found that face-to-face conversations build better relationships than those who use computer-mediated communication (Schulze, Schultze, West, & Krumm, 2017). Furthermore, the first theme was supported with previous researchers, Soomro et al. (2016), García et al. (2015), and Alzoubi et al. (2016), cited in the review of professional and academic literature, and also aligned with the conceptual framework for this study, which was the sociotechnical theory (Carayon et al., 2015). Davis et al. (2014) envisioned sociotechnical framework

systems as a set of goals involving people who used a range of tools within the infrastructure to achieve a goal. Therefore, the framework supported the theme.

Right tool for communication. Using the right tool to communicate increases team collaboration. Nine of the participants' responses indicated that using the right tool for communication was significant. My review of 7 out of the 11 documents provided by the company confirmed the findings from the participants. Previous researchers also supported these findings (Dwivedi et al., 2015). Dwivedi et al. (2015) found that using the right tools influenced communication effectiveness. Their statement was consistent with the responses from Participants #3, #4, #7 and #11. The participants stated that in their previous project, they used tools like skype, which was suitable and sufficient for their team communication. Participants #3 and #7 indicated that it was crucial to ensure adequate collaboration tools to enabled sharing information and knowledge among the team members in a software development environment. Furthermore, these participants disclosed that they used a collaboration software called Proaction, which was made available to them by the company. This tool allowed all teams to communicate effectively and worked together to complete project tasks successfully. Participants #1, #4 #6, and #10 echoed the statements of the previous participants, but stated that introducing this tool ameliorated team workflow and strengthened the team engagement and collaboration.

My analysis of the seven out of eleven company documents confirmed the usage of suitable communication tools such as ProAction in previous projects. The information in these documents was consistent with the responses from Participants #4, #5, and #8,

and that the tool featured for effective communication, exchange of documents, conferencing, and real-time assistance for remote teams. With this tool, the project managers were able to complete the tasks successfully, especially with the increasing number of development teams working remotely in the company. Nearly all the participants of this study used Microsoft Project Server software, which was a project management platform offering tools to tie all project tasks. According to the participants, this tool provided collaboration and communication functionalities and ensured everyone on the team is on the same page. Therefore, the documents, responses, and experiences of the participants supported the theme of this study and aligned with the conceptual framework that guided this study, which was the sociotechnical conceptual framework (Wu et al., 2015). Contributions by Carayon et al. (2015), which was cited in the professional and academic literature of this study also supported the findings above. Carayon et al. stressed that the sociotechnical model represented the people (social subsystem) using tools, techniques, and knowledge to produce a product or service. Therefore, project managers used the right tools to interact effectively with team members in IT projects, as effective communication and collaboration are critical to the success of the project. Participants #7, #8, and #9 indicated that a positive collaborative culture influenced tool usage. The previous study cited in the professional and academic literature supported the findings from these participants, and that with better communication tools; team collaborations transcend functional and organizational boundaries (García et al., 2015).

Dwivedi et al. (2015) suggested that the lack of appropriate tools inhibit sharing information and knowledge among the team members in the distributed software development environment. It was a sign that team members were not coordinating and working together or using the tools effectively to achieve the tasks, which ultimately endangered project goals (Li et al., 2018). Zahedi et al. (2016) found that mobile collaboration tools were useful for team members in different locations and increase trust among team members. The studies of the above researchers supported the theme and findings of this study. They were also consistent with the responses from four of the participants. The participants indicated that they used mobile collaborative tools to document project issues and provide updates efficiently. The conceptual framework that guided this study also aligned with the first theme and findings of this study. The sociotechnical structure (Trist, 1981) serves as a set of functional tasks performed by people and set of technical aspects, including tools required to acquire the system's goal (Bolton & Foxon, 2015). Similarly, the study by Righi and Saurin (2015) also supported the theme and findings of this study. These researchers noted that STSs application encompassed the interaction of people using tools to communicate effectively.

A recent study by Sarka and Ipsen (2017) found that software development teams using group messaging and file sharing integrated with project management tools benefited considerably in communication. The utilization of such tools led to better project outcomes, according to the researchers. This was another evidence that recent studies supported the findings of this study, and consistent with the views of Participant #9, #11 and #13. These participants indicated that the communication tools they used in

their projects increased collaboration among team members. These participants explained that they coordinated software development activities effectively, which led to the project's success. García et al. (2015) also supported the theme of this study. They stated the importance of using the right tools for effective communication to promote team collaboration in Agile software development. They also stressed that effective communication and collaboration are the primary contributing factors in attaining success in Agile software development. This aligned with the sociotechnical model, the conceptual framework for this study (Alzoubi et al., 2015). Alzoubi et al. (2015) observed that the principal reason for the low rate of success in agile distributed software development is communication-related issues among team members. Moreover, the components of the sociotechnical system – people, technology (tools), and environment needed to work together so that an organization function optimally (Weichhart et al., 2016). Software development projects involved individuals from various experience working collaboratively and using multiple tools and technologies to achieve project objectives; all required to communicate effectively (Muszyńska, 2018). This concept of communicating effectively and working altogether for the common goal was the fundamental base of the conceptual framework for this study.

Management and leadership skills. For the IT company, project management, and leadership skills were critical characteristics that IT PM should have to ensure effective communication for team collaboration. The responses from ten participants and my analysis of 8 documents out of the 11 documents provided by the company confirmed the findings of previous research. Aga et al. (2016) indicated that the project management

and leadership styles influenced effective communication among team members in IT projects. The findings from Participants #1, #3, and #8 indicated that PMs provided valuable management and leadership support to their teams. These included clearing obstacles, looking ahead, taking care of the team's morale, upskilling team members, which are significant in ensuring effective communication among team members.

Participants #2 and #5 noted that project managers in the company did not adhere to one specific management style for effective communications, unlike many PMs in other companies. Participants #3, #4, and #8 emphasized that they were supportive and participative from a management and leadership perspective and ensured adequate communication within the team. The findings were supported by Walker et al. (2017), who was cited in the professional and academic review. Walker et al. noted that project management and leadership used appropriate communication to advance the interactions among team members. The findings supported the theme, which aligned with the conceptual framework for this study; the sociotechnical model (Trist, 1981). Founded on the STS, the structure allowed PMs to conceive management and leadership strategies, which belongs to the domain of the social and technical system with an understanding of promoting team collaboration in the project. Furthermore, the sociotechnical model referred to the interrelatedness of social (people) and functional (activities) aspects of an entity as a whole (Niazi et al., 2015). This involved management strategies built on effective communication for collaboration, which was consistent with the theme of this study.

Reviewing the documents provided by the company regarding project management activities, I found the focus was on improving the team culture. Effective communication and teamwork were at the center of managing the software development projects in the company to influence the project outcome. Consistent with the findings from Participants #2 and #5, teamwork among team members build a culture that facilitates team collaboration. This finding was supported by Lee, Park, et al. (2015), cited in the literature review for this study. Lee, Park, et al. highlighted that project teams that maintained positive dynamics have a higher chance of delivering successful projects. Also, consistent with the theme was the study by Zahedi et al. (2016). Zahedi et al. (2016) indicated that unnourished team culture results in poor communication and collaboration, one of the leading causes of project failures in software development. The findings also aligned with the sociotechnical framework for this study. Based on the sociotechnical model, relations between the social and technical aspects of an organization make up to the dynamics of the framework resulting in a whole functional system (Chen & Qi, 2015). Previous research confirmed the study's finding and ensured that fundamental to the STS performance is interdependency and interaction of the social and technological aspects (Kim et al., 2016).

Also, the findings from Participants #3 and #4 indicated project objectives should include communicating clearly and consistently to ensure project success. The work of Bathallath et al. (2016) supported the participants' views but also added that PMs should manage the timelines and expectations appropriately within the team through effective communication. The views of these participants were supported by Muller and Martinsuo

(2015) cited in the professional and academic literature, stressing that leadership and communication were the attributes most lacking in project managers. Contributions by Ramazani and Jergeas (2015) showed that there could be different types of project management leadership styles. PMs have different methods to address project complexity, including team communication, and to ensure the role of leadership in the successful delivery and management of projects. The researchers furthered that project management, and leadership style covered a broad range of experience and knowledge to ensure effective communication for team collaboration. These findings supported the theme of the study and aligned with the conceptual framework. PMs management and leadership skills were critical factors for effective communication and played a part in the overall success of the project. As noted previously, the sociotechnical framework required various elements of social and technical aspects, working collectively as a whole to achieve project goals (Kim et al., 2016). Findings from the participants and the information analysis obtain from the company documents were aligned with the sociotechnical framework.

The findings of this study also indicated that software projects were increasingly operating in an unstructured environment, and therefore, effective communication was required to manage the interrelationships between stakeholders. PMs engaged in identifying, talking about, and resolving issues within the project, according to Participant #6. Previous literature (Mishra et al., 2015) emphasized that the primary responsibility of project management was to ensure effective communication and collaboration for healthy relationships with the parties involved. In support of the theme,

the findings showed that practicing participative leadership was an effective communication strategy that empowered the team and increased project success. Current studies supported the results; the more the PM was conversant with the strengths, weaknesses, and motivations of the group, the more was the chance the team may finish the project successfully (Knauss et al., 2018).

A recent study by researchers Dönmez and Grote (2018) indicated that the PMs who were approachable to the team members set up a feedback system where the team could communicate their opinions and suggestions effectively. The research reinforced the responses from the interviewed participants when asked what effective communication strategies they used to promote team collaboration in software development. Seven participants strongly believed that encouraging team involvement by allowing decision-making from the team's end, allowed a sense of freedom in contrast to the otherwise suffocating atmosphere of following strict guidelines. Not only this gave birth to a cordial bond between the team and the PM but also motivated the team to communicate and collaborate effectively, improving project success.

Theme 2: Attributes of Communication

The second theme for this study that emerged from the data analysis was about the attributes of communication for team collaboration in software development. The theme emerged from the responses of participants, the data analyzed from the records provided by the company, and the findings of previous research. The literature supported the theme. I found the following subthemes; encourage collaboration, inspire trust, and useful feedback are attributes central to communication for successful team collaboration.

The findings of the study indicated that project managers who helped collaboration built capable project team members thrived in an environment in which they communicate freely and work together (Körner et al., 2015). Also, it was vital that all members of the projects, whatever their skill and technically competent or cultural background, worked within an atmosphere of mutual trust and respect. A capable project team has a clear understanding of individual roles (Evers et al., 2016). Also, the findings from this study indicated that providing feedback regularly during the project cycle keeps team members on track and benefits everyone involved in the project as this increased team collaboration (Bathallath et al., 2016). Methodological triangulation was accomplished with 7 out of the 11 documents provided by the company. My analysis of company documents and participants' answers showed that communication attributes mattered to team collaboration, which in turn impacted project outcome in software development.

As fundamental to the sociotechnical framework for this study, the research findings of the second theme showed that the attributes of communication were essential elements of the social aspect of the conceptual framework. The theory implied that one factor was not sufficient for team collaboration efforts. The sociotechnical model requires multiple social elements working together as a whole to ensure success (Carayon et al., 2015). Therefore, when project management employed various attributes of communication for team collaboration, team members naturally felt a part of something bigger than themselves. Table 3 listed the characteristics of communication that were identified by the participants for the second theme. It showed the frequency of participants who expressed that the attribute was valuable to the project for team

collaboration. Also, the data in the table presented the frequency of documents provided by the company that contained information related to these attributes. These numbers were not mutually exclusive, meaning that two or more of these attributes may appear in one document.

Table 3

Frequency of Theme 2

Data source	Encourage collaboration (<i>f</i>)	Inspire trust(<i>f</i>)	Effective feedback (<i>f</i>)
Participants	12	10	13
Documents	5	4	5

Encourage collaboration. Nearly all the participants of this study indicated that project managers encouraged and ensured team members to collaborate effectively during the project's lifetime. According to Participants #2, #3, #5, and #7, encouraging collaboration fostered communication and created a productive team environment. Supporting the participant's views was the study by Sempolinski et al. (2015) noted in professional and academic reviews for this study. Sempolinski et al. stressed that developing software involves activities that require active collaboration among team members. Also, supporting the second theme was a study by Körner et al. (2015), cited in the professional and academic literature of this study. Körner et al. stated that software development activities require the project manager to employ attributes of communication that influence team collaborations. The researchers' views were consistent with the opinions of the participants, who indicated that encouraging collaboration among team members smooth delegation of project tasks while keeping in

mind everyone's strength. PMs who designated tasks and leverage every team member's unique abilities result in projects completed on-time, under-budget, and according to the requirements.

In reviewing the documents provided by the company, I found that the company offered tools for PMs to encourage team collaboration. The information from the records of the company was consistent with the existing literature (Dwivedi et al., 2015).

Dwivedi et al. stated that open communication and collaboration were vital for brainstorming innovative ideas and finding solutions. Further reviewing the project manager's guides and project status reports provided by the company corroborated the participant's responses. Fostering collaboration among team members was a critical attribute of communication. The participants indicated that as project managers, they used a collaboration platform or tool to enhance team engagement. This tool was beneficial to project success within the company because it improved interaction among teams, which, in turn, promoted collaboration.

Also, Evers et al. (2016), and Ghobadi (2015) supported the findings of the second theme. These researchers maintained that those project managers who have strong communication skills create a collaborative climate for team members that can influence project outcomes positively. Other researchers understood the phenomena of team collaboration in agile development projects and noted that effective collaboration could mobilize the team members to achieve project goals (Magdaleno et al., 2015). Furthermore, fostering collaboration within the project team supported an innovative

culture that strived to achieve project objectives, which also implied accomplishing successful projects. Nearly all the participants admitted to looking for strategies to improve team collaboration, which was consistent with previous literature (Evers et al., 2016; Ghobadi, 2015). Four participants indicated that in their experience, understanding the various personalities of team members helped them to determine the best way for them to work collaboratively. Two participants with the most extensive project management experience perceived that collaboration was of the utmost importance in a software development project. As part of the communication role of the project managers, they made sure they encouraged meaningful interactions among team members that have a positive influence on the project outcome.

A recent study found IT PMs can manage the inevitable conflicts among team members in their projects to ensure better collaboration in future projects (Rezvani & Khosravi, 2019). The researchers noted that negotiation and mediation were useful in a situation where there are interdependences. In the classic application development project, team members all too often end up working against each other. The tester and the programmer are at odds with each other, even though the two roles aligned in project management. One participant indicated that in complex IT projects, encouraging team collaboration could be challenging in times of conflict. Participant #9 echoed a similar statement and added that project managers act as psychologists to advance team collaboration by listening to determine the key factors that motivate team members in times of conflict. These are efforts by project managers to ensure stronger relationships to facilitate project activities. Also, in another recent study, advancements in the 21st

century and globally distributed software development continued to shape the nature of team collaboration in software development projects (Jain & Suman, 2015). The increasingly remote and interdependent software development engagements have forced PMs to place greater emphasis on communication and collaboration. The findings of the researchers supported the second theme and also aligned with the sociotechnical framework that guided this study (Trist, 1981). Previous studies by Bentley et al. (2016), cited in the professional and academic literature, supported the second theme. Bentley established that the social aspect of a sociotechnical system constituted the human component, and at the center of this model were communication and collaboration. The sociotechnical concept continued to offer intriguing and potentially valuable insights into communication strategies to sustain productive working environments. Also, supporting the theme was Lee et al. (2016) cited in the existing literature. Lee et al. pointed out that those PMs who communicate and work together with all teams always encourage team collaboration, which is a fundamental principle of the STS theory. The STS theory has been used in other systems to facilitate collaborative dementia care activities by matching individual patient characteristics to a knowledge base (Wilcock et al., 2016). The findings of the study aligned with the framework as conceived in the framework.

Inspire trust. Ten participants indicated the importance of inspiring project team members for project success. My analysis of the documents provided by the company also showed that trust among team members was the reason team members collaborate effectively, influencing the project outcome. Project status notes and minutes of July 2018 indicated that the project rate of success increased because team members were

confidence and trust each other to accomplish project tasks. The lesson-learned records and meeting minutes for Oct 27, 2018, further revealed the consistent emphasis on open communication to build trust among team members. I found that the project management in the company conducts team development through regular review sessions using a standard format, as explained in the project management guide provided by the company. The findings from the documents were consistent with the responses from the study participants. Nearly all participants indicated that trust enabled effective collaboration, which in turn increases the chances for project success. The viewpoints of these participants supported by Tang (2015) cited in the professional and academic literature. Tang studied the communication quality in 86 software development teams in China and found that trust mediates collaboration within development teams. Also, supporting the findings was the research of Bolici et al. (2016), who noted that PM communication skills influence the level of trust within the project team. Bolici et al. findings were consistent with Participants #8, #10, and #11 perspectives. These participants stressed those team members who shared information, engaged one another, and completed tasks feel they could trust the project manager and others in the team. Researchers in previous literature intimated trust as a critical communication attribute for teamwork and required in software development activities because of the need to depend on others in carrying out interdependent tasks (Kim et al., 2016). The second theme aligned with the framework, which is the sociotechnical framework. Trusting of trusting members was the social element of the conceptual framework, which, in turn, contributes to effective communications. Also, previous research supported the theme; trust enables team

members to carry out tasks together and effectively to accomplish project goals (Murphy, 2015).

Seven participants indicated that when there was no trust between the project manager and team members, the focus was on differences rather than areas where they may agree. Contributions by Lee et al. (2016), as cited in the professional and academic literature, indicated that a team without trust often make disappointing progress. The statement was consistent with Participants #4 and #9 views. These participants stated that it didn't matter how capable or talented the team members were; they never attained their full potential in the absence of trust. Researchers like Walker et al. (2017), on the other hand, confirmed that when team members trust one another, the team achieved significant goals. Also, the findings from the participants indicated that for a globally distributed team, the communication attribute such as trust was critical, given the challenges with managing virtual teams. According to Participant #6, simple things like project managers kept promises and conducted video conferences on time promoted trust. Buvik and Rolfsen (2015) supported this finding, as noted in the professional and academic literature for the study. These researchers emphasized that video conferencing with virtual teams ensured trust and improved collaboration for the success of a project. Similar viewpoints were noted by Participants #2, #5 and #9. In their experience, the distance may affect trust and cooperation, especially in the virtual team settings - but video conferences improved team cooperation. Seabra and Almeida (2015) stated that managing IT projects in a virtual team can be challenging. The communication model needed to establish a trust that fostered interactions and ensured project success. From the

sociotechnical domain (Kim et al., 2015) and in particular the social aspects, the findings of this study explored the notion of trust within the software development. The sociotechnical model is a complex, interconnected, relational, entangled state that encompassed human and non-human actors (Wang et al., 2015). Also, supporting the theme of the study was the previous researcher, like Hinkelmann et al. (2016), who pointed out that central to the sociotechnical system was interactions.

In the review of the documents provided by the company, the Project Management Plan, and the Governance Structure Role and Responsibilities records supported the participants' responses. The documents outlined the significance of the PMs maintaining trust and confidence with team members through regular communications and interactions during the project lifetime, which was also consistent with existing literature (Wu, Liu, Zhao, & Zuo, 2017). These researchers noticed that speaking openly and honestly on issues related to the project with team members inspire trust in team members, which Participants #1, #3, #8 also noted. The participants furthered that open communication allowed them to instill loyalty in their team members. A recent study by Anwar, Rehman, Wang, and Hashmani (2019) found that the role of communication of the project manager to inspire trust was crucial in the team's knowledge acquisition. They furthered that the project managers who promote trust increase knowledge sharing among team members, which benefits the project. Anwar et al. suggested that effective teamwork was more likely to happen between team members who trust each other. Anwar et al. views were consistent with ten participants of the

study. The participants expressed they used opened communication strategy to fundamental build trust in their various projects.

Furthermore, Zaman, Jabbar, Nawaz, and Abbas (2019) gathered that PMs who open up to team members were more likely to set a positive collaboration environment in projects. Also, the theme of this study was consistent with the sociotechnical model that guided this study. Existing literature referred to trust as a mental factor for the actors in the modern approach of the sociotechnical system — the trust of the actor of a technical artifact such as the tools used for collaboration (Evers et al., 2016). Therefore, the sociotechnical theory that guided this study supported the second theme as the dependencies among actors were fundamental social relations. In other words, the findings of this study indicated that dependency existed as a result of trust. The work from previous literature (e Costa et al., 2014) aligned with the findings of this study. For instance, e Costa et al. (2014) mentioned that the State Department of Social Development and Human Rights in Brazil in 2007 used the sociotechnical model for group decision support. Actors in the system ensured trust and participated in building public strategic planning processes. In this study, I took a more expansive view of confidence from the sociotechnical conceptual framework. In addition to the exploring trust as one of the critical communication attribute for a capable team, I considered trust in the actor's role sense, as a broad element of the sociotechnical model.

Effective feedback. All 13 participants noted that providing useful feedback was critical for team collaboration in software development. The findings from the participants indicated that helpful feedback was two-way communication given

effectively and received constructively during the life cycle of the project. This understanding was consistent with the emerged theme, which was attributes of communication. Yagüe et al., (2016) confirmed that two-way feedback was more beneficial to the project as it advanced team communication and collaboration. Also, Bathallath et al. (2016) cited in the professional and academic literature for the study supported the findings and the theme. Bathallath et al. accented that project managers must communicate effectively and encourage feedback from the team members to improve the outcome of the project. Ghobadi (2015) recognized that useful feedback encouraged the motivation and creativity of the team in software development projects. Ghobadi (2015) findings were consistent with the responses from Participants #11 and #12. The participants indicated that they were comfortable using useful feedback as a means of communicating to ensure a productive and harmonious team environment. Valuable feedback improved team dynamics, as noted by Medina and Francis (2015) and Seabra and Almeida (2015). Participant #5 expressed that PMs must communicate feedback in the right way, with a focus on improving team collaboration and project performance. While Participants #10 and #13 recognized that feedback was a powerful practice that constituted a visible positive outcome, it could also hurt team members. Ineffective feedback can lower their self-esteem, or make members feel, underappreciated. Rezvani et al. (2016) acknowledged that feedback without action was criticism. Other participants stated if team members were to improve based on feedback, there needed to be the support to make the feedback useful. The second theme also subscribed to the conceptual framework for this study, the sociotechnical framework. The

STS, as conceived by Trist (1981), was intended to improve the performance of work systems by recognizing how the behaviors of human actors affected the operation of technology. As related to this study, the participants encouraged opportunities for constructive feedback in ways that facilitated the development of more sustainable projects, which was also consistent with the concept of the sociotechnical theory. Bolton and Foxon (2015) perceived the sociotechnical framework to be a set of inputs and outputs of information from one component of the system to another. Similarly, as related to this study, useful feedback was a critical attribute of communication and a causal loop in which the contributions affected other parts of the system.

The finding from the participants also indicated that some team members in the project viewed giving feedback as potentially creating conflict with managers. Participant #7 thinks project managers should resolve disputes, not make them, and not providing any input could signal the beginning of a breakdown in communication. Existing literature supported the findings; the project manager should communicate and ensures the entire team can provide feedback to project activities to improve project success (Cruzes, Moe, & Dybå, 2016). Bathallath et al. (2016) also agreed with the findings and stressed that feedback was a vital part of any PM skill set. Bathallath et al. further recognized that to build a capable team, largely depended on the PM's ability to relay and receive constructive feedback openly. The views of the researchers were consistent with the findings of the study regarding encouraging feedback.

Most of the study participants had extensive experience with the agile development methodology. Existing literature suggested that the agile process features

short and frequent feedback loops that keep the development team focused on delivering high-value features (Dingsøy et al., 2018). The Agile method has built-in checkpoints to facilitate feedback and collaboration, such as the daily standup, the sprint review meeting, and project retrospectives (Liu, Ho, Chang, & Tsai, 2019). The viewpoints stated in these works of literature were consistent with six of the participants, who indicated that their projects were a tremendous success because they benefited from the short feedbacks. Also, the findings were consistent with notes from the retrospective meetings obtained from the documents provided by the company. The records contained information that demonstrated projects that completed successfully and used the agile development short feedback loops. Notes aligned response of the participants regarding the importance of feedback as an attribute of communication. The PM guide and the project management plan documents provided by the company also outlined strategies for project managers on feedback that could improve the chances of project success. The information in these documents was consistent and supported by findings in recent research (Alahyari, Gorschek, & Berntsson Svensson, 2019). Alahyari et al. (2019) findings indicated that project managers ensure frequent feedback during the project life cycle to achieve expected goals.

The conceptual framework for this study, the sociotechnical theory, supported the findings. The understanding of the social structures as related to the roles to inform the system that involves a group of people (Hoda & Murugesan, 2016). Hoda and Murugesan (2016) added that the sociotechnical model was the most extensive body of conceptual work underlying human involvement and systems. The framework also supported the

theme as PM competence in communication directly impacted team member satisfaction and productivity (Aga et al., 2016). According to Blaskovics (2016), feedback promotes collaboration. Henderson et al. (2016) suggested that feedback was an essential social aspect of communication, which aligned with the sociotechnical conceptual framework. Previous studies by Bentley et al. (2016), cited in the professional and academic literature of this study, showed that the social aspect of a sociotechnical system constituted human engagement. Similarly, Lindsjörn et al. (2016) shared the same perspective. The second theme was consistent with the conceptual framework that guided this study. Multiple attributes of communication, including feedback, encourage team members to work collaboratively to ensure project success. Furthermore, the sociotechnical system model concept continued to offer valuable insights into interaction attributes to maintain productive working environments as related to the findings. Other researchers associated the sociotechnical theory to the quality of human communication activities more than the technical aspects and how this impacted the overall performance of the system (Deak et al., 2016). Kim, Chan, et al. (2016) also noted the quality of communication in the sociotechnical system. Therefore, the sociotechnical conceptual framework that guided this study supported the theme of this study.

Theme 3: Significance of Social and Emotional Intelligence

The third theme to emerge from the findings of this study was the significance of social and emotional intelligence for team collaboration. Bar-On (2006) described social and emotional intelligence as to how effectively people are aware, express themselves, understand others, and relate with them. The findings of this study emerged from

responses of 13 participants and the data analyzed from 7 out of the 11 documents provided by the company. Previous and recent studies also supported the findings. The findings from the participants indicated that social and emotional intelligence matters for team collaboration have positive effects on project outcomes. Based upon the textual data set and emergent themes, IT PM actively facilitates group awareness of each team member's level of comfort with group activities and tasks within the project. PM awareness of, and consideration for, the opinions and feelings of members of the team can positively influence project outcomes. Psychological safety matters for team collaboration and was also a contributing factor in project success or failure, both at the individual and team behavioral levels. Lastly, the finding of this study suggested that ensuring a balanced project team has a positive effect on project outcomes. The conceptual frameworks guiding this study supports the third theme. Social and emotional intelligence was considered social aspects of the sociotechnical system (Deak et al., 2016), and when team members interfaced with the system, they engaged in a flow of emotions. Table 4 listed the findings and represented the frequency of participants who stated that interpersonal awareness, psychological safety, and balance team influenced project outcomes. Also, the table presented the frequency of company documents that contained information related to these factors. These numbers in the table were not mutually exclusive, meaning that two or more of these factors appeared in one document.

Table 4

Frequency of Theme 3

Data source	Interpersonal awareness (<i>f</i>)	Psychological safety (<i>f</i>)	Balance teamwork (<i>f</i>)
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Participants	13	7	11
Documents	4	3	4

Interpersonal awarenests. Using the STS (Trist, 1981), the findings of the study indicated that the exploration of the PM interpersonal awareness as relating to communication for team collaboration contributed to increased success in the projects. Thirteen participants stated that it was essential for IT PMs ensured interpersonal understanding within the team as the result of a project depended on it. Contributions by Rezvani et al. (2016), as cited in the professional and academic literature, showed that the ability PM to understand the emotions of the team was critical for project success. As suggested by Wick et al. (2015) and Monaghan et al. (2015), emotionally team members were valuable within a project, and they communicated and worked collaboratively. This study was consistent with the information found in the company documents for project management plans outlining interpersonal understanding benefit transparency. Thus, the exploration of interpersonal awareness and emotional intelligence of PM within the context of the project identified critical factors affecting project outcomes.

The social aspects of the sociotechnical framework constituted team motivation, performance, etc. (Deak et al., 2016). Study participants indicated project teams with high emotional intelligence tended to have healthy relationships among the members, improved collaboration, and performance. Dabke (2016) attributed the power of emotions as the PM's most significant source of energy, motivation, and influence within the project team, which was also noted by Participants #4 and #9. Recent literature by Boyatzis, Rochford, and Cavanagh (2017) found PM emotional intelligence critical to the

success of a project, which supported the views of the participants. The PM, who displayed a high level of emotional intelligence, increased open communication for team collaboration, which also influenced the project outcome.

When facing project challenges in the team, study participants indicated they become aware of their emotions and addressed issues in a calm manner, which helped build trust and respect. The emotional self-awareness ability to identify and focus upon their negative feelings, and self-regulate, was enlightening. The study findings suggested interpersonal awareness has a positive effect on team collaboration and, ultimately, upon project outcome. As one participant reported, the ability of PMs to be attentive to team issues generated positive energy and contributed to the project's success. Another participant credited project success to positive emotions and behavior. She indicated transparency improved collaboration among team members, and ultimately accomplished project goals. Lee, Park, et al. (2015) identified the need to maintain positive team dynamics to achieve project goals. As indicated by Medina and Francis (2015), given the complexity and challenges of managing IT projects, an emotionally skilled PM improved team morale and added value. The findings of this study suggested that PM interpersonal awareness made a positive contribution to project outcomes, which was supported the theme of this study.

Psychological safety. Based on STS (Trist, 1981), psychological safety was a critical social factor, which contributed to successful projects. A contributing factor to social and emotional intelligence was psychological safety, where team members of the project felt accepted and respected (Buvik & Rolfsen, 2015). Edmondson and Lei (2014)

described psychological safety as people's understandings of taking interpersonal risks in the work environment. Seven participants reported the critical need for positive emotions like trust, curiosity, and confidence to broaden the mind and help build psychological safety in the team. Tang (2015) noted that perceived trustworthiness enables team engagement and collaboration. Wu, Zhao, and Zuo (2017) emphasized that when team members trust one another, they looked forward to working collaboratively. Thus, psychological safety as a critical factor to emotional intelligence was vital to project success because it built the type of trust that defines the team. Also, as indicated by Lee et al. (2016), PMs should facilitate open communications. This was consistent with the company documents I reviewed. PM's responded to team mood at various stages in the project and explored ways to open up group conversations instead of suppressing emotions. PMs displayed the can-do attitude, which can be viewed to increase team collaboration, and ultimately improve the chance of project success (Weiss, Kolbe, Grote, Spahn, & Grande, 2018).

Participants #5, #8 and #11 indicated that psychological safety builds emotional intelligence because the more team members question, the more they learn, the more they became aware and working collaboratively. Bentley et al. (2016) perceived collaboration in an organization improved psychological stress and influenced job satisfaction. Several participants identified that PMs must approach conflicts as collaborators and not an adversary, which contributed to positive project outcomes. A perceived loss triggers attempts to reestablish fairness through criticism or disengagement, which impacted team morale as well as project success negatively. Another participant indicated that team

members worked in silos allowed conflicts to quickly arise as individuals loss track of completed and upcoming tasks. Medina and Francis (2015) noted that the ability of PM to understand team personalities and manage conflicts were critical factors for emotional intelligence that influence projects outcome.

Additionally, Vick et al. (2015) noted that projects have distinct social conventions that affected team member's behavior and performance. Two participants reported that the ability of the PM to recognize the underlying team needs like respect, etc. promotes positive behavior and safety even in the most contentious discussions. Participant #9 suggested that to achieve project success; the PM has the ability to compromise, thus leading the team with a focus upon the project goal. Another participant recognized the strength of PM to be humble and aware, which leads to positive project outcomes. A common theme throughout the study was the ability of the PM to ensure a psychologically safe team environment where team collaboration thrived, resulting in successful projects. Buvik and Rolfsen (2015) supported these findings, where safety within the team awareness context may result in the increased ability to build trust due to a high level of social and emotional intelligence.

Balance teamwork. Findings from this study revealed that project managers judged success by the accomplishments of the team. Eleven participants indicated that effective teams were emotionally intelligent. As cited in the professional and academic literature, Seabra and Almeida (2015) noted that effective team dynamics shaped project outcomes. Medina and Francis stressed that among the essential skills for project managers was team-building. Participants #2 and #6 indicated that the project manager's

awareness of and the ability to focus on the emotional behavior of the team was a contributory factor in successful projects. Another participant suggested that the nature of IT projects today demanded successful collaboration, which rested on the team member's ability to navigate team dynamics. In reviewing the company documents, including the project retrospective notes from July 2018, September 2018, and October 2018, the information provided was consistent with participants' comments about the ability of the PM to create a positive and supportive team. Thus, groups whose members built upon each other differences contributed to positive project outcomes. As noted by Seabra and Almeida (2015) in the professional and academic literature, the support model within projects helped to promote interactions and teamwork that ensured project success.

Matthews and McLees (2015); Romans et al. (2016) suggested that building a team culture that provided the atmosphere for members to work towards the project goals was significant. One participant intimated that project managers who have emotional awareness, sensitivity, and ability create teams that emerge into a well-balanced cohesive team. In the existing literature by Boughzala and de Vreede (2015), effective collaboration among team members of a diverse culture can be challenging due to structure and composition. However, creating awareness on issues around the team's capacity to collaborate minimized the obstacles and ensured positive project outcomes. Emotional Intelligent and skilled PM contributed to the successful outcome of the project through practices and knowledge shared with a balanced and diverse team (Vick et al., 2015). In the current global distribution software development environment, the ability to build and lead a balanced team, but diverse contributed to project success. As one

participant noted, the teamwork knowledge developed by one team contributed to the development of future project teams. It turns out emotional intelligence in a team accelerated the team's progress. A recent study indicated collaboration among team members with high emotional intelligence created outcomes that exceed project goals (Cole, Cox, & Stavros, 2019). Thus shared emotional intelligence not only improved teamwork in software development, but it also produced a better software product.

Based on the STS (Trist, 1981), effective teamwork was a critical social factor, which contributed to successful projects. The conceptual framework supported the theme of this study and aligned with the view of Participant #7. Even teams that perform on a satisfactory level heighten their capabilities by working on their emotional intelligence, consistent with Lima et al. (2016) study. Managing software projects was a sociotechnical practice where team members contributed to improving collaboration (Niazi et al., 2015). Furthermore, the sociotechnical framework allowed sustaining a productive working environment (Carayon et al., 2015). The findings from this research study supported addressing the research question regarding the importance of social and emotional intelligence for team collaboration to affect project outcomes. Project managers focused on interpersonal awareness influenced project outcomes, including ensured psychological safety, where team members of the project felt accepted and respected. The findings of this study implied emotional intelligence was critical to balanced teamwork because it enhanced development practices that increased project success.

Theme 4: Impact of Post-Work Activities

The fourth theme to emerge from the findings of this study was about the significance of post-work activities for team collaboration. The theme emerged from the responses of 11 participants, and my analysis of 5 out of 11 documents provided by the company. Methodological triangulation was achieved with five out of the eleven company documents. Previous and recent studies also supported the findings. The findings indicated that post-work activities helped team members see each other in a different light and allowed them to connect in a different setting. This had a positive effect on project outcomes. Based on the textual data set and emergent themes, the project managers in the company supported post-work activities for teams to boost morale and motivation. Project managers encouraged post-work team building activities to improve communication, which impacted team morale positively and influenced project outcomes. Also, conflicts between team members was a productivity killer, and project managers were to maintain team harmony as it was critical for the team working collaboratively. Also, the finding of this study suggests that team building matters not only draw people closer together but also contribute to a creative environment, which influences the project outcome. Team members tend to have more considerable creativity when they are around people they know. The sociotechnical framework, which led this study, supported the fourth theme. STS, as conceived by Trist (1981) and others, was intended to enhance the performance of work systems by recognizing how the behaviors of human actors affected the system. Post-work activities in software development were considered the social aspects of the sociotechnical system (Lima et al., 2016; Sedano et

al., 2017). Table 5 represented the frequency of participants who stated that morale and motivation, conflict management, and creativity were essential factors of the post-work activities that influence project outcomes. Also, the table presented the frequency of company documents that contained information related to these factors. These numbers in the table were not mutually exclusive, meaning that two or more of these factors appeared in one document.

Table 5

Frequency of Theme 4

Data source	Communication and team morale (<i>f</i>)	Effective collaboration and conflict management (<i>f</i>)	Creative team and innovation (<i>f</i>)
Participants	11	7	8
Documents	3	4	3

Communication and team morale. As relates to team morale, the findings from participants and the documents provided by the Company confirmed the results of previous research. Medina and Francis (2015) found that team morale mattered to collaboration and influenced team collaboration. The findings of this research study confirmed Medina and Francis, as 11 participants revealed that socializing after work hours was a great way to boost team morale. One participant indicated that post-work activities allowed team members to know each other, communicate better, and work collaboratively. As cited in the professional and academic literature for this study, Bentley et al. (2016) noted that social collaboration in organizations influenced job satisfaction. In the same manner, researchers like Körner et al. (2015) shared the same

perspective. Participant #8 indicated that post-work activities improved team morale and could take different forms, such as off-site retreats, an on-site lunch discussion, etc. Reviewing the company documents, I found that project managers conducted kickoff meetings or alignment sessions to begin the project team building required to operate efficiently during the project. This information was consistent with the answers of the participants and confirmed by Matthews and McLees (2015) in the professional and academic literature of this study. Another participant suggested that post-work activities that required team effort increase confidence and motivation, which translated into team culture and job satisfaction. Lee et al. (2016) supported this viewpoint. Lee et al. noted that team members who felt they were part of something more significant tended to engage and were more satisfied. Indirectly, Tong et al. (2015) view aligned with the findings from participants, where an influential team culture has high moral.

Three participants emphasized that engaging in fun activities enabled team members to open up to each other and their seniors. Previous literature confirmed the findings from the participants; Tang (2015) noted that open and transparent communication built rapport among team members. One way for project managers to maintain proper levels of team morale was to encourage open communication with team members. Meng and Boyd (2017) research study showed that when managers were transparent, and they listened to team members with respect - a higher level of trust was developed, and this improved morale. Wickramasinghe and Nandula (2015) also confirmed that project managers who ensured efficient communication flow with the team elicited the right kind of information from their team members. Vick et al. (2015)

stressed project managers who created a culture of open communication supported positive relations with team members.

The STS (Trist, 1981), which guided this study, supported the findings from participants and the fourth theme. Based on the sociotechnical framework, the results demonstrated that the exploration of post-work activities improved the relationship of team members in projects. Thus, enhanced communications and team collaboration positively influenced project outcomes. Kim et al. (2015) noted that software activities characterized as STSs affecting social, organizational, psychological, cultural, and collaboration perspectives in an organization. Deak et al. (2016) research study linked sociotechnical theories to other attributes that contributed to human aspects such as motivation, group performance, commitment, and satisfaction. Other researchers observed that the sociotechnical model encouraged team collaboration, which impacted team morale and job satisfaction (Körner et al., 2015). Thus, such a model characterized by supporting post-work activities for teams led to higher morale, productivity, and employee job satisfaction.

Effective collaboration and conflict management. The response from 7 participants and analysis from 4 company documents showed the project managers in the company encouraged after-work activities as a strategy to improve teamwork and manage team conflict. Bentley et al. (2016) noted that supporting outdoor activities between teams outside of hours was as advantageous as it was fun. Tang (2015) confirmed that effective collaboration and conflict management enables team members to have healthy debates and maintain trust. The findings were consistent with the participants' answers

that inevitably, conflict occurs, but teams needed to collaborate successfully to complete projects. One participant indicated that managing personalities, deadlines, and emotions could be a challenge, and that collaboration and cooperation lessens. The cause of conflicts in team projects were related to differences in attitudes, needs, expectations, perceptions, resources, and personalities (Hsu, Li, & Sun, 2017; Medina & Francis, 2015). One participant indicated that going to the bar after working hours enabled team members to know each a little better. They felt more open to talking about non-work related issues. The project retrospect meetings from April 2018, June 2018, and notes from lesson-learned from the documents provided by the company confirmed the participant's response. I reviewed the project guide and the project management plan documents. I found that project managers in the company managed conflicts by supporting after-work activities such as signing the team up for sports and cooperate challenges. Previous research (Rezvani & Khosravi, 2019) study showed that competition against other teams diffused anxieties among employees and helped team members change perceptions of each other.

Additionally, researchers like Bentley et al. (2016) discovered that social collaboration in organizations improved psychological stress and influenced job satisfaction. Research (Knight, Patterson, & Dawson, 2017) indicated that when project teams were trained in team-building skills, effective collaboration was accomplished, and project outcome quality increased. One participant noted that excellent team bonding exercise helped break up office cliques and encouraged individuals to work with colleagues from other teams in the departments. Based on the sociotechnical framework

(Chen & Qi, 2015; Kim, Shin, et al., 2015; Trist, 1981) that guided this study, the findings of the participants and the analysis obtained from the documents provided by the company were aligned with the framework. The framework supported the findings as STS promoted team collaboration (Körner et al., 2015). Previously, researchers (Kim, Chan, et al., 2016) noted that collaboration was an essential attribute of the social element and influenced team performance and organizational well-being. Therefore, team-building skills in dealing with conflicts assisted project managers in handling and effectively resolving disputes. The findings from this study showed that post-work activities improved team collaboration, and in turn, influenced project outcome positively.

Creative team and innovation. The study participants spoke about the effect of the creative team and innovation. The findings from eight participants' responses indicated project managers who pursued creative activities outside of work find that these activities boost team members' performance on the project. Analyzing the documents provided by the company found that a team of developers was 50% more creative after they had spent some hours brainstorm in the park. The findings from the participants and the documents were consistent with the research of (Açikgöz & Günsel, 2016), members energized through stimulating, quality discussions around cutting-edge issues in the right environment. After-work hours activities were great ways to foster team creativity (Harrison & Wagner, 2016). One participant noted that the company opened up and allowed the project managers to come up with creative activities, both on-site and off-site, to foster creativity. Another participant indicated PMs plan off-site team-building

activities boosted motivation and creativity. Creativity and intrinsic motivation were part of that unique experience that came with post-work team building activities. The view of the participant was consistent with that of Aga et al. (2016), an essential skill of the project manager was a great team builder. Successful project teams maintained positive dynamics and stuck together to achieve project goals (Lee, Park, et al., 2015).

Analyzing the project reports or notes provided by the company; creative pursuits away from work have a direct effect on factors such as creative problem solving and helping other team members on the project. One participant noted that some developers worked on code outside of their normal work activities, which led to innovations benefiting both team and project. The response from the participant and information in the documents were consistent and supported with previous research by Castellano et al. (2017). Polat et al. (2018) also argued that team building activities required team members to work together to solve problems and improve creativity. Thus engaging in team-building exercises created stronger and more connected teams that recognize the value of the contribution made by everyone in the group.

The findings of this study aligned with the sociotechnical framework (Cooper & Foster, 1971; Trist, 1981), which guided this study. Creativity and innovation were elements of the social component of the STS (Lee, 2018). One participant indicated that off-site team-building activities such as collaborating with and learning from others gave team member's creativity a boost. Kim, Chan, et al. (2016) contribution confirmed the findings of this study. The researchers noted that the social aspect of the sociotechnical system affected human performance and inevitably influenced the behavior of its

members and the work of the organization. The sociotechnical framework entailed the understanding of team culture, an atmosphere for the members of the team to work together effectively for project success (Matthews & McLees, 2015; Romans et al., 2016). Thus, having events that encouraged team members to have fun capitalized on the creativity and ingenuity of the team members of the project (Castellano et al., 2017). Therefore, post-work team-building activities enabled participants to learn to trust others and work as a cohesive unit, improving communication and team morale. It motivated and encouraged team members to be creative, which in turn developed the spirit of teamwork. Thus, these values of team building were imperative for project success (Harrison & Wagner, 2016). The findings of this study, therefore, indicated that post-work activities ensured productivity, project success, and most importantly, job satisfaction.

Applications to Professional Practice

This study was significant to communication practices in many ways. The primary purpose of the study was to explore participants' views on the communication strategies used to facilitate successful collaboration among team members in software development. The findings from the participants of the study indicated that effective communication was key to the success of projects in software development companies. Not only it boosted productivity, but it enhanced businesses with competitive advantages. Effective communication can result in a significant return on investment through productivity gains, and increasing the value of the company, improving the overall quality of business (Müller, Vorraber, & Slany, 2019). Successful software projects are

the catalyst for achieving profitability, and ultimately creating shareholder value in organizations. The world is becoming increasingly more reliant on technology, which increases the demand for software development services (Ebert & Shankar, 2017). Now more than ever, businesses are expecting more from various product technologies (Foroudi, Gupta, Sivarajah, & Broderick, 2018).

The findings of this study can benefit project managers. PMs can use the results of this study to adequately understand and communicate the objectives of the project to team members to ensure project success. A failure in communication negatively affects a project as team members struggle to collaborate during software development projects (Pernstal et al., 2015). The findings of this study may also be used to provide an understanding of the communication strategies project managers used in medium IT firms for those leaders seeking to improve collaboration among teams. Nearly all the study participants indicated that teamwork and collaboration were critical to project success. Promoting team collaboration increases project success, which, in turn, creates shareholder value in the organization (Bathallath et al., 2016). In software development projects, teams are in a continual state of communication via e-mail, video conferences, phone calls, texts, and face-to-face meetings. If project managers communicate project objectives clearly to team members, the chance of achieving project goals can increase.

The participants in my study were experienced project managers in a midsized IT firm, who used communication strategies for team collaboration to improve their project outcome. Improving communication, maximizes achievement, and minimizes risk. Also, if a PM develops effective communication with all team members, including

stakeholders, this may mean more projects for the team. Additionally, the findings from this study showed that encouraging collaboration, inspiring trust, and providing useful feedback were essential attributes of communication that facilitate team collaboration in software development. PMs who understand the relevance of these attributes to project outcomes can enable team members of the project to thrive in an environment in which they communicate freely and work together (Körner et al., 2015). Moreover, PMs who invest time and energy into delivering clear ways of communication build trust amongst team members, leading to an increase in productivity and team spirit. The findings of this study are meaningful to communication practice from feedback outlook. Feedback can be reinforcing if appropriately delivered, which in turn, motivates team members to improve, leading to successful projects. Additionally, constructive feedback adds to effective communication, which, in turn, influence project outcome positively, and preventing companies from paying the high cost related to project failure (Pernstal et al., 2015).

The findings shed light on communication from the perspective of social and emotional intelligence, which was critical for team collaboration and project success. PMs, who displayed a high level of social and emotional intelligence manage project team effectively because people are vital to the realization of the project (Meng & Boyd, 2017). More importantly, the ability of the PM to understand the particular wants and needs of team members motivate and increase the likelihood to succeed. As a communication strategy, emotions are the source of energy for the project team and the driving force behind significant and successful accomplishments. Also, studies have

shown that collaboration among those team members with high emotional intelligence improved work processes and products in software development (Rezvani & Khosravi, 2019). The findings are important to PMs seeking to improve team collaboration through team building activities, and especially after post-work hours. Team building activities primarily involve substantial communications, which improved team collaboration. Such activities not only improved communication but helped team members build trust and develop good relationships with one another.

Also, team building empowers individual team members to contribute to common project goals. The success of projects depends on the ability of its team members to communicate and understand each other's strengths and weaknesses to deliver the quality work desired. There was much evidence to support that team building activities have positive effects in the workplace (Shore et al., 2018). The findings of this study benefit project teams looking to bring improvement in the way they work with each other. Also, the results of this study are meaningful since they provided a platform for team members to break the ice and improve their teamwork. The conceptual framework that guided this study supported the findings, and the importance of project managers to identify effective communication strategies best suited for team collaboration. Previous and current literature, as well as the documents supplied by the company, supported the findings of this study. The participants of this study are qualified project managers of an IT firm that is expanding through acquisitions and looking for additional PMs for more projects. Other junior project managers can use the information they provided, and learn how the different aspects of communication may influence the project outcome.

Implications for Social Change

Exploring effective communication strategies IT PMs practice may be a significant step to ensure successful projects in software development. From a social change perspective, the findings of this study may be useful to organizational culture by empowering team members. An empowered culture may result in higher job satisfaction and more successful projects, which may improve morale and unemployment numbers. The study findings revealed that PMs using effective communication increase the comfort factor amongst the team members creating a healthy team culture in the organization. Supportive leadership characterized by a combination of open communication and team spirit, which, in turn, feeds back into strengthening the sense of collective efficacy. Communicating with team members effectively ensure a 100% dedication and cooperation from their end, and were more satisfied when they share a great rapport with leadership.

As cited in the professional and academic literature, poor communication accounts for more discrepancies in software projects due to the lack of collaboration among team members (Storey et al., 2017). A comparable study showed that in more than 50% of projects, ineffective communication strategies were critical contributors to project failures in software development (Alzoubi et al., 2016). Failure in software projects mainly due to lack of team interaction and collaboration (Giuffrida & Dittrich, 2015). One of the principal reasons for this may be PM incompetence to utilize effective communication strategies to foster team collaboration in software development projects. Therefore, effective communications help decrease morale problems and keep members

happy because they are in the loop and part of the team. Understanding how effective communication affects team members help build stronger job satisfaction, thereby reducing the failure rate of projects.

Moreover, the findings explained that when team members felt heard by senior leadership, it created a positive working environment. A positive working environment led to happy team members, and a content team was productive. Effective communication allowed ideas shared among team members, which, in turn, led to more significant innovation. Therefore, effective communication within a project boosts morale and helps build trust among team members. Proper communication also helps ensure that projects completed as successfully and quickly as possible. Project completed successfully leads to increase productivity, performance, and in turn, a positive impact on unemployment. More production offers more jobs and pays better. Also, the findings of this study may help increase team motivation. Motivation increases productivity and morale (Shareef & Atan, 2019). Recent literature indicated that through effective communication, team members feel more empowered, a sense of belonging, and responsibility (Potnuru, Sahoo, & Sharma, 2019). Most importantly, team motivation improves (Chen et al., 2019), which signifies team members are more committed to making the project a success.

The findings identified critical communication attributes that senior IT leaders may leverage to sustain team collaboration that can influence the project outcome. For instance, team collaboration brings meaning and adds value to the way members perceive their job. They continue working for an organization longer as they feel they are a part of

something important. Team members who feel supported by their supervisors were more likely to be satisfied with their jobs. Team members were willing to recommend their company as an excellent place to work, hence impacting unemployment numbers. Useful communication attributes such as feedback create the energizing, healthy team culture found to be the cornerstone of members' job satisfaction, which may enhance unemployment numbers.

Recent literature showed that advances in communication technology transformed the world of project management over the past years and changing even faster today (Handke, Schulte, Schneider, & Kauffeld, 2019). The findings of this study have implications for improving team members' wellness. PMs who create a team culture driven by collaboration and teamwork make team members happier and more productive (Potnuru et al., 2019). According to Tripp, Riemenschneider, and Thatcher (2016), PMs who focus on positive interactions reduce the team's stress. Also, the same researchers added that better team collaboration improves work-life balance, which leads to increased creativity, ideas, and productivity within team members. Happy team members are motivated, engaged, and more satisfied with their lives and jobs (Meneghel, Salanova, & Martínez, 2016).

The findings of this study also may be useful for senior IT leaders in the firm. Improved team collaboration may give the firm a competitive advantage of attracting top talent. According to Ilies, Liu, Liu, and Zheng (2017), highly motivated job prospects aspire to work with people they respect and feel they can learn. Additionally, enhanced team collaboration enables higher employee retention and a culture that keeps team

members loyal and committed (Hanaysha, 2016). From an organization perspective, the findings of this study implied cost savings for the organization that may affect additions to the workforce. Additionally, effective communication for team collaboration increases profitability because the entire organization's ability to create value accelerates as a result (Olaisen & Revang, 2017). Research studies revealed that effective communication for team collaboration has profound effects on engagement and project success, providing a considerable return for the business (Bai, Feng, Yue, & Feng, 2017).

Recommendations for Action

PMs need to begin exploring communication strategies to maintain team collaboration that can increase the opportunities for project success (Evers et al., 2016; Ghobadi, 2015). The desire for effective communication for team collaboration in software development projects is increasingly presenting new challenges for IT PMs looking to improve team collaboration and overall project success. Particularly at this time when communication technology is advanced with interconnected and interdependent components. The communication strategies that were identified useful in this study included:

- Effective communication,
- Attributes of communications,
- Significance of social and emotional intelligence, and
- Impact of post-work activities.

These findings were significant and supported current literature on communication and collaboration strategies, as well as documents from the study case

company. Results from this study are essential to midsize software development organizations. PMs must understand that the software development industry comprised of companies of all sizes. This can range from the midsize to large companies that employ people with different experiences and backgrounds. The findings of this study may be useful for PMs working with team members from diverse backgrounds. Especially in the case of those PMs who are looking to use effective communication strategies to enable team collaboration to ensure better projects outcome. The software development industry is evolving fast, and maintaining effective communication, and team collaboration can be challenging, especially in a distributed software development team (Sievi-Korte, Beecham, & Richardson, 2019). From the findings of this study, if the PM communication strategies within their organizations are ineffective, they could negatively impact project success. PMs should employ effective communication strategies to promote team collaboration in software development projects with that IT company. If they decide to implement communication strategies, they should consider evaluating their strategies against commonly known effective communication strategies.

PMs should consider the social and emotional intelligence aspects of management and use the tools to advance communication strategies for team collaboration in software development. They should work with project management guidelines to ensure that their communication strategies aligned with the project as well as the overall business goals. It is up to the project manager to ensure effective communication for team collaboration or risk failure as the project will likely not meet its objectives. Findings from this study are essential to senior and junior IT PMs. The application of effective communication

strategies may allow PMs to advance team collaboration, successfully increasing the chances of project success.

Moreover, all project teams or stakeholders involved in the software development project may be interested in the findings of this study. Understanding the result of this study may also be particularly benefitting to IT PMs who use ineffective communication strategies for team collaboration in software development. I will disseminate the results of the research through conferences, scholarly journals, and business journals. Furthermore, I may circulate the result of this study through training and seminars regarding communication strategies IT PMs need for team collaboration in IT projects. Besides, I will coordinate with the Canadian Information Processing Society in Alberta, Canada, to offer free learning seminars for small software development companies.

Recommendations for Further Study

The findings of this study present an additional exploration of communication strategies; senior IT leaders use for team collaboration in IT projects. Software development companies need to produce reliable software applications to maintain profitability and productivity (Haile & Altmann, 2016). The limitations of this study included that it was conducted at a single IT organization. I recommend exploring communication strategies IT PMs used for team collaboration in other geographical areas. Also, a study over more extended periods, under different software development environments and conditions, may yield a more thorough analysis. Besides, the sample came from a comparatively small number of qualified and experienced IT PMs. Future work may consider the exploration of communication strategies for team collaboration

with a larger sample size or a larger company. Finally, I conducted this study in an already experienced or mature IT company, which was almost two decades past its startup phase and had the benefit of experience. It would be useful to consider IT PMs in young startups software development companies.

This study also recommended some important issues. Based on the literature review and the collected data of this study, recommendations for future research topics were highlighted..

- Researchers should conduct a similar study where team members are asked about the best communication channel for information delivery. Both colocated and distributed software development teams should be studied to determine if there are any differences in how team members prefer information delivery.
- Further research might explore the barriers to communication within and between individual departments in software development.
- It would also be helpful to capture qualitatively the experiences of participants on how feedback from team members about communication methods are analyzed and implemented to fix problems within the project.

The data collected in this study was beneficial to further research on communication efficacy in software development companies. PMs who overlook the importance of communication put their projects at serious risk; meanwhile, improving communication maximizes success. Although communication practices can never be

perfect, time, and effort to improve communication gaps can promote team collaboration and overall project success.

Reflections

During the research process, my understanding of doctoral-level research developed considerably. I was challenged and amazed by the level of detail and alignment that this research study entailed. The data that emerged from the semistructured interviews and the company documents overwhelmed me. The interview experience humbles me. All the study participants were passionate about the topic area and communication strategies for team collaboration in the IT company. They expressed the desire to engage in the study. Our engagements and interactions resulted in mutual benefits. From the participants' feedback, nearly all welcomed the manner I conducted myself in the interviews, such as paying attention to their responses and being knowledgeable of my study area. It was motivating to see all the participants express their in-depth knowledge and experiences on the topic of the research.

I had a team lead experience, including managing a testing team. As a team lead, I was not fully aware to what extent ineffective communication strategies can negatively affect team collaboration. More importantly, the overall project progress and, ultimately, the project outcome. I tried to remain mindful of my personal bias during the study, as it could influence the interactions with the participants and how I examine the existing literature. The open-ended questions I established for the interviews allowed me to avoid asking leading questions. I asked questions during the exchange that generated honest conversations to obtain the participants' perspectives on the study topic. The finding of

this study interests me personally as a senior team lead. The results of the study were similar to what I have experienced promoting collaboration among the team members in a software test project. Although there were differences from each participant's perspective, I recognized many similarities. The difficulties that all face as senior IT leaders looking to advance team collaboration. The findings from this study identified further communication strategies and practices that I can utilize in my efforts to improve team collaboration within a software development/testing environment.

Summary and Study Conclusions

Communication strategies to advance team collaboration are critical to software development and can influence the overall project outcome. The specific IT problem for this research study was that some PMs lack communication strategies for successful team collaboration in software development in a mid-sized company in Alberta, Canada. This qualitative case study investigated communication strategies IT PMs used for team collaboration. The study answers the following research question: What communication strategies do IT PMs use for successful collaboration in software development teams of mid-sized companies? Thirteen senior IT PMs from a mid-sized IT company in Alberta, Canada, participated in semistructured interviews. The review of company documents augmented the interview data. I used methodological triangulation for data collected through the semistructured interviews and company documents with both previous and current literature to support the findings. After collecting and analyzing data, the following themes emerged; (a) Effective communication strategies for team collaboration, (b) attributes of communication strategies for team collaboration, (c)

significance of social and emotional intelligence, and (d) impact of post-work activities. There are several conclusions to this study. It is important to note that participants of this study answered all the questions asked in semistructured interviews. In this study, I used Nvivo software. This software supports qualitative research. I imported all the data collected (transcribe interviews and review company documents) into Nvivo to identify emerging themes. The software has features that enable thematic analysis and provides a simple structure for discovering ideas. Using Nvivo, I organized the research data into themes and ensured the retrieval of these data efficiently.

The main findings of this study showed that there are effective communication strategies that all IT PMs need to use to promote team collaboration in software development. Besides, not all communication strategies are similar; some communication strategies can be useful in promoting team collaboration in software development. Furthermore, there are attributes or factors of communication that influences team collaboration, such as encouraging collaboration, inspire trust, and foster useful feedback within the team. Also, PMs must have high social and emotional intelligence. Social and emotional intelligence was imperative when determining the need for and employing effective communication strategies. IT PMs should be able to demonstrate emotions, empathize with others, and make decisions using multilevel awareness to be successful in software development projects.

Despite the limitation on this study, such as engaging relatively small experienced and senior IT PMs from one organization; findings from this study were notable and supported by company documents and literature on project communication strategies, and

consistent with the sociotechnical conceptual framework of this study. As noted in the constructs of the STS, improving team collaboration requires a scheme of effective communication strategies to ensure project success. The findings of this study can benefit and be useful to IT PMs looking to use effective communication strategies to advance team collaboration in software development.

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Appendix: Interview Protocol

Action One	Script
Introduce and set stage	<p>Hello, my name is John Wani, I am currently a student at Walden University, pursuing a doctoral degree in Information Technology (DIT). I thank you for participating in my study on communication strategies IT Project Managers use to facilitate collaboration between team members in software development entitled: Exploring Communication Strategies IT Project Managers used to promote team collaboration in Software Development. Each interview should take 60 minutes; this interview is recorded to assure your responses correctly captured. After the meeting, to begin member-checking, I will send you a copy of the transcript. There is no wrong or right answer, so please just answer each question with your response. Do you have any questions about the informed consent form, or is there anything you would like to ask me before we get started? All right then let us get started with the first question.</p>
Action Two	Interview Questions
Paraphrase if necessary, and ask questions	<ol style="list-style-type: none"> <li data-bbox="630 1650 1382 1751">1. What communication strategies do you use to facilitate team collaboration in software development?

	<ol style="list-style-type: none">2. What is the most important process you use for successful communication between team members in software projects teams?3. What are the critical factors you use to establish communication strategies to promote team collaboration?4. What communication strategies do you use that are least useful in group collaborations in software development?5. What communication strategies do you use that are most useful in team collaboration in software development?6. What obstacles have prohibited your communication strategies from being successful in your software development projects?7. What other information would you like to provide that we have not addressed already?8. What communication strategy or strategies do you now use to facilitate team collaboration?9. Why do you decide to use this communication strategy or strategies to promote team collaborations?10. What advice would you give to some of the project managers who lack communication strategies in software development industry?
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7/10/2015

Protecting Human Subject Research Participants

