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A Case Study: Exploring Covid-19 Pandemic Influence on Videoconferencing Groupware Implementation in U.S. Signal Brigades.

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ABSTRACT

In March of 2020, the President of the United States announced that the coronavirus disease 2019 (COVID-19) constituted a national emergency. The Office of Management and Budget (OMB) issued an order to federal agencies instructing them to "maximize telework across the nation ... while maintaining mission-critical workforce needs." This imperative was issued to slow the spread of COVID-19. The same actions were taken by other public sectors. The conventional means through which military leaders provide leadership and direction to their units were replaced with new practices due to the pandemic. Before the pandemic, there was a correlation between organizational adoption of recent technology and user approval in only some cases. Because of workplace limitations imposed during the pandemic, companies needed to devise a method to facilitate the efficient sharing of information. The purpose of this qualitative case study was to identify and investigate the elements contributing to the adoption and acceptability of groupware in public sectors, such as the military. The literature identifies various applications for groupware utilized in the educational, financial, and medical fields during the pandemic; however, no such studies were found on the military's adoption of groupware. The technology acceptance model (TAM) and the technology organization environment (TOE) framework were used to investigate the aspects that were present in the military sector and contributed to the adoption and acceptance of MS Teams during the pandemic. Theories that focus solely on adoption or acceptance do not fully account for factors that contribute to successful technology implementation. This study was conducted because there was minimal research on adopting and accepting groupware in the military during a global pandemic.

Keywords: technology acceptance model; technology organization environment framework; groupware; information sharing; telework; collaboration; COVID-19 pandemic.

A CASE STUDY: EXPLORING COVID-19 PANDEMIC INFLUENCE ON VIDEOCONFERENCING GROUPWARE IMPLEMENTATION IN U.S. SIGNAL BRIGADES

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CHAPTER 1: INTRODUCTION

This case study was conducted to investigate the elements that influence the adoption of groupware to aid with operations and mission preparedness in the military. Within three U.S. Army Signal Brigades, the researcher employed a qualitative case study research method. Groupware is a category of technologies, such as processes and systems, which enable unified collaboration and information sharing throughout an organization (Grudin, 1994). Due to nonexistent literature, the researcher acknowledged a gap analyzing the implementation and acceptability of groupware inside Army Signal Brigades. According to Golia (2020), virtual platforms have been an ordinary form of collaborative work arrangement for many years, erasing geographic restrictions. As groupware technology advances, diverse organizations adopt several platforms (Ferrara et al., 2016; Jimenez et al., 2017; Muraleedharan et al., 2017). Because of the employee limits that had to be managed in the workplace during the pandemic, leaders of military organizations explored several ways to keep operations going while still ensuring readiness for the mission and soldiers. For leaders to make decisions effectively, it was necessary to develop and implement standardized protocols for sharing relevant information and working together.

In this chapter, the background information, problem, purpose, and the research question are presented. The research design and key definitions are provided for additional insight into the study. An overview of the case study will be provided in the following sections.

Topic Background

The military has always been steeped in tradition. The military's standards, operations, and processes are guided by tradition, a thread that runs through the fabric of military formations. The organization's daily tasks and procedures are frequently influenced by

standardization and policies. Formal briefings are used to disseminate information to organizational leaders or employees. Briefings are the most effective and widely used method of communicating information to commanders, staff, soldiers, and other specific audiences. Organizations hold briefings when their personnel require information quickly and promptly, when gathering information is convenient, and when critical decisions must be made to determine how to act on that information.

Briefings are preferable to hard-copy paper or computer-generated communication for sharing information because they are direct, immediate, and interpersonal. When military staff plan a briefing, the sessions are typically held around a large conference table, with designated seats sometimes marked with placards indicating rank or position. The briefing slides, also known as *read-ahead slides*, are delivered to the senior leader presiding over the meeting 1–2 days in advance of the briefing. On the day of the meeting, hard copies of the slides are produced and distributed around the conference table. A person is assigned as the individual in charge of advancing the PowerPoint slides presented on the massive television screens located throughout the conference room. The top leader frequently sits at the head of the table, allowing them to observe everyone clearly. During the global pandemic, this daily military ritual shifted from in-person briefings to a virtual groupware platform. As a result, it was not readily apparent who the senior official was in the virtual meeting; all participants held equivalent roles and statuses. This aspect may seem minor but affected user, specifically senior leader, acceptance of the videoconferencing technology. Another common experience in military organizations is the difficulty information technology (IT) and cybersecurity personnel face in achieving technological acceptance and adoption while attempting to enhance the efficiency and efficacy of the organization's collaboration and information-sharing operations. Some of the obstacles are a

lack of familiarity with recent technologies, a level of comfort with present processes, available resources, and commitment to new initiatives.

Problem Statement

The issue this study attempted to address was the difficulties experienced by IT, organizations, and individuals while putting new technological initiatives into practice. According to participants in Robinson's (2015) study, user acceptance of innovative technology was hampered by a lack of communication in 58% of cases, a lack of collaboration in 42% of cases, and a lack of involvement in 29% of cases. U.S. Army organizations were obliged to start using new methods of coordination and collaboration in 2020 to sustain operations because of the COVID-19 pandemic restriction on personnel in the workplace. These organizations experienced cultural and financial expenses due to implementing the new initiatives. Leaders were charged with investing the time and money necessary to guarantee their staff members were properly taught about the newest technology before introducing new groupware systems. This study's aim was to determine the elements that existed and ultimately contributed to developing and accepting groupware for virtual meetings as the COVID-19 pandemic posed operational issues for U.S. Army organizations.

Purpose Statement

The objective of this case study was to investigate diverse perspectives on groupware implementation but also to identify and analyze key factors that can help improve the adoption and acceptance of innovative technologies. Because of the limitations imposed by individuals in the workplace during the pandemic, organizations needed to devise a method to facilitate the efficient sharing of information. The literature identified various applications for groupware that were utilized in the educational, financial, and medical fields during the COVID-19 pandemic.

The researcher considered that it would be advantageous to uncover and study aspects that contributed to adoption and acceptability in other public sectors because there was a lack of literature on the adoption and acceptance of groupware in the military during the worldwide pandemic. To accomplish this goal, the researcher employed an approach known as a qualitative case study. Interviews were conducted with participants through an electronic survey to establish what specific variables or conditions contributed to the adoption of the groupware implemented by participants' companies. The representative sample of the population comprised 27 people drawn from three distinct U.S. Army Signal Brigades located in different parts of the United States. Approximately 3,000 people make up each signal brigade. To conduct the case study, the researcher made use of a nonprobability sample that was also random. To qualify for participation in the study, each brigade was required to have a minimum of nine participants.

In early 2020, the World Health Organization (WHO) declared that the COVID-19 outbreak was a severe pandemic. Multiple virus variants have become dominant in many countries since 2021, with the Alpha, Beta, Gamma, and Delta variants being the most virulent. As of November 10, 2021, more than 251 million cases and 5.06 million deaths were confirmed worldwide, making COVID-19 one of the deadliest pandemics in history. The pandemic resulted in severe social and economic disruption worldwide, including the most significant global recession since the Great Depression in the 1930s (WHO, 2020).

The COVID-19 pandemic had a widespread impact on every aspect of our lives: how we gained medical assistance, how our children attended school, how businesses provided services and products, and specifically relevant to this research, how the military continued operations. During the pandemic, most organizations chose to transition to virtual platforms to continue productivity. Similarly, the army had to relook at how daily tasks and functions were conducted.

Many military training and exercises were postponed or canceled due to in-person restrictions. Traditionally, military organizations would gather around a large conference table and conduct meetings. After the number of affected cases increased, military bases started using the Department of Defense Public Health Emergency Management policy that established Health Protection Condition (HPCON) levels (see Figure 1) for disease outbreaks based on the severity of the disease and the level of transmission occurring in the local community. HPCON levels outline specific actions senior leaders can leverage to minimize the spread of the virus. The various HPCON levels dictated the personnel numbers in workplaces. Workplace occupancy limitations prevented the military or organizations from continuing in-person operations (Secretary of Defense, 2020). Due to the potential for a long-term workplace restriction, military leaders authorized teleworking in March 2020, allowing personnel to work from home.

Figure 1

HPCON Levels

Note. From "*Guidance for commanders on risk-based changing of health protection condition levels during the Coronavirus disease 2019 Pandemic*" (Memorandum). Secretary of Defense. (2021, April 29). Department of Defense, United States of America

Research Question

This research was focused on groupware adoption and acceptance. Army signal brigades utilize groupware to collaborate, process, store, and share information to enable continuous operations. The examination of this process' complexity constituted the reason for the researcher's question: *what acceptance factors influenced the degree to which U.S. Army Signal Brigades adopted videoconferencing groupware technologies during the COVID-19 lockdown?*

This case study aimed to explore the factors that contributed to the successful adoption and acceptance of groupware in the military during the COVID-19 pandemic. The study was conducted using qualitative methodology with a case study design within multiple Army Signal Brigades. Throughout the pandemic, groupware technology allowed continued information sharing across each of the signal brigades. As a result of this study's findings, IT teams can leverage the factors that influence the adoption and acceptance of groupware as reference points to increase the probability of successful IT initiative adoption and acceptance.

Conceptual Framework

In this study, the researcher examined the implementation and introduction of groupware acceptance and adoption within each brigade. The innovation process begins with a requirement that leads to a design and concludes with organizational adoption and user acceptance. From a holistic organizational level, the technology organization environment (TOE; Tornatzky & Fleischer,1990) framework describes the elements leaders require to make adoption decisions (Baker, 2012). In large organizations, such as the Army, decisions to adopt and implement innovative technology are decided at the top level. A thorough roll-out and adoption process is developed and executed across the entire organization, but user acceptance is not always achieved. Some of the reasons can be the time it takes to implement

the innovative technology, the ease of use, the knowledge of how to incorporate the new initiatives into daily operations effectively, and the willingness of users to change (Tornatzky & Fleischer,1990). Acceptance is often pointed out as a critical factor for the successful introduction and intended use of innovative technology. A review of the technology acceptance model (TAM; Davis, 1985) led to a belief that most military organizations would benefit from leveraging TAM concepts. Most project implementations are not solely focused on the user experience; therefore, technology will enhance existing processes and operations, which is an essential component of the technology acceptance process.

Assumptions/Biases

In the context of this study, one of the most fundamental assumptions of top-level decision-makers is that end-users will automatically accept and make use of a technology after an organization has decided to implement it in its operations. Often, decision-makers see the implementation from a holistic level view and do not always consider the users who will actually implement the technology daily. The researcher did a number of different things to reduce the number of assumptions in this study. Instead of presuming that users would instantly notice the benefits of groupware technology, leading to its acceptance, the researcher created survey questions to measure the users' perceived utility of the groupware that was ultimately adopted.

When drafting survey questions or conducting research on existing literature, researchers should avoid restricting or removing any potential for bias, as suggested by Sudman and Bradburn (1982). The researcher took deliberate actions to reduce the possibility of bias affecting the findings of the study. For instance, the researcher used targeted questions that focused on the individual's personal views and allowed the

population to have their say on the perceived benefits or degradation to operations after adopting groupware. In this way, the researcher was able to collect data on both the perceived benefits and the perceived degradation of adoption. The respondents to the survey may have revealed responses that were not anticipated, but an objective researcher should nevertheless make room for and be receptive to a variety of perspectives. Case study research can go in a number of different directions, so it was vital that the research be allowed to go in various directions to reduce bias (Yin, 2018).

Significance of the Study

This case study is significant because it investigated the factors, disruptive or nondisruptive, that influence user acceptance and organizational adoption of working arrangements and technology. Several studies have examined groupware in various public sectors, but there needs to be more research into how a global pandemic may influence an organization's adoption and user acceptance. Various professions and sectors' processes and procedures were influenced by technological evolution when faced with the rapid adoption and acceptance of videoconferencing groupware during the pandemic. This study augments the current knowledge to provide additional research information of practice that can be used in future studies on the contributing factors related to implementing recent technology and gaining user acceptance in organizations.

Delimitations

During this research project, participants from three different Army Signal Brigades were questioned. The researcher assigned one point of contact per organization to distribute the survey to at least 15 individuals, with a requirement that at least nine of those individuals answer the questionnaire. To conduct the case study, the researcher made use of a

nonprobability sample that was also random. The data collection for the study was conducted with the use of a digital survey platform and groupware metrics.

Limitations

One of the restrictions placed on the research study was the intended sample size. According to Yin (2018), the purpose of qualitative research using a case study is to investigate the most important aspects of the case. The researcher asked a variety of questions to a wide range of respondents who held a variety of titles and degrees of responsibility. The researcher posed questions to individuals with varying perspectives and levels of influence about groupware usage in their organizations. The findings of the research represent certain viewpoints on what elements contributed to user acceptability and do not necessarily exist in each of the three brigades. In addition, because of access restrictions, groupware metrics could only be collected from a single signal brigade.

Definition of Terms

The following terms appear throughout the research:

Technology Acceptance Model. TAM is a theory that focuses on modeling computer users and predicting technology adoption decisions. The TAM indicates that only two components determine the users' acceptance of a computer system: perceived usefulness and ease of use (Davis, 1985).

Technology Organization Environment Framework. The TOE framework is an organizational-level theory describing the three elements influencing adoption decisions. The three elements are technological context, organizational context, and environmental context (Baker, 2012).

Technology Adoption. Technology adoption is a term that refers to the acceptance, integration, and use of innovative technology in an organization (Ejem, 2020). Adoption of technologies is influenced by perceived costs and benefits, complexity, compatibility with the organization's existing IT infrastructure, and processes (Nambisan & Wang, 1999).

Technology Acceptance. Technology acceptance is a term that defines users' willingness to accept and use technology to accomplish their job functions and tasks. Technology acceptance is a key component of the technology adoption process. Understanding specific acceptance factors helps influence design and adoption processes to minimize resistance and rejection when users interact with innovative technology (Teo, 2011).

Groupware. The term groupware refers to early collaborative software that enabled the first experiences with sharing digital workspaces (Ens et al., 2019). Additionally, Ellis et al. (1991) stated that groupware is a class of technologies that enable, facilitate, and mediate interpersonal relationships among participants who accomplish a group task.

Virtual Teams. Virtual teams remove geographical limitations and locate team members nationally or internationally (Aten et al., 2016). To collaborate effectively, virtual teams require powerful collaboration tools.

Military Information Briefings. The purpose of the military information briefing is to inform the listener. Leaders use these in-person opportunities to present high-priority information requiring immediate attention; complex information involving complicated plans, systems, statistics, or charts; and controversial information requiring elaboration and explanation. Situation briefings that cover the tactical situation over a period of time usually fall into this category. The goal of military information briefings is to enable sound decisions

and problem-solving (DA Pam 600-67 Effective Writing for Army Leaders.pdf - Department of the Army Pamphlet 600–67 Personnel—General Effective Writing for Army | Course Hero, n.d.)

Telework. Telework refers to a type of work setting where employees work from locations other than their usual workplace. Employees perform their normal daily tasks at an alternate location or at home (Bailey & Kurland, 2002). Network infrastructure and resources must be available to ensure employees are able to access their files and applications to complete their tasks.

General Overview of Research Design

A qualitative methodology using a case study design was utilized to collect data and provide greater insight into the factors that influenced the use of online collaboration platforms in Army Signal Brigades. Groupware metrics, such as the number of individuals who attend meetings and how frequently meetings take place were collected before, during, and after workplace restrictions were implemented. Participants in the survey were contacted by email to collect the necessary data. The strategy used data received from platforms before, during, and after the implementation of workplace personnel limits. In addition, information was retrieved from an evaluation that was conducted prior to the pandemic to analyze the adoption and acceptance of innovative technologies and collaboration platforms to improve the efficacy and efficiency of meetings and the sharing of information within Army Signal Brigades.

In this study, the researcher employed the approach of structured interview surveys as the primary data collection tool. The survey asking participants about their experience with groupware took approximately 30 minutes to complete. Description-focused coding was

utilized to perform the study's data analysis. After that, a case study with a ground-up analysis was conducted (Yin, 2018). After reading the texts, the researcher looked for similar themes and took note of them. The themes discovered by the researcher were written down and summarized so they could be looked at in further depth later.

Summary of Chapter 1

Chapter 1 contained an overview and background of the study. The purpose of the study was to examine the factors that contribute to groupware adoption and acceptance in the military sector. The problem addressed the challenges organizations face when adopting new groupware technology and gaining user acceptance. The researcher aimed to determine what factors or conditions contribute to users' realization of the benefits and ease of use of groupware technology.

The research question addressed in the study was, "*What acceptance factors influenced the degree to which U.S. Army Signal Brigades adopted videoconferencing groupware technologies during the covid-19 lockdown?*" The researcher leveraged two conceptual frameworks to answer the question: the TAM and the TOE.

Chapter 2 includes a review of the existing literature on groupware adoption and acceptance. Groupware has become increasingly popular due to social distancing and workplace limitations resulting from the COVID-19 pandemic. Groupware technologies are now widely used in various public-sector organizations. To be successful, groupware requires effective organizational adoption strategies as well as user buy-in.

CHAPTER 2: LITERATURE REVIEW

Background

This research is a case study of groupware adoption in the military sector, based on the TAM introduced by Davis (1985) and the TOE framework proposed by Tornatzky and Fleischer (1990). The following literature review section focuses on groupware adoption and acceptance. The case study sought to affirm that theories focused solely on adoption or acceptance do not fully account for all the factors that contribute to a successful technology implementation. Chapter 2 begins with an examination of two different but equally relevant theories: the TAM theory and the TOE framework; the literature will be used to show how the two theories are linked. Baker (2012) suggested a potential synthesis of theories that explores the factors that influence individual behavior, i.e., TAM, with the factors that influence organizational behavior, i.e., TOE framework.

This chapter contains an explanation of the theoretical aspects of user acceptance that contributes to organizational adoption. The researcher examined literature related to groupware adoption and acceptance in the military. Groupware adoption during the COVID-19 pandemic occurred across every facet of the public sector, but limited research exists about groupware adoption and acceptance in the military.

The purpose of the case study was to explore what factors existed at the organizational and user level during the COVID-19 pandemic that influenced groupware adoption in Army Signal Brigades. The literature search approach used by the researcher was focused on topics related to groupware adoption and acceptance, the military, the Department of Defense, virtual meeting platforms, the TAM, collaboration, platform usage, and unit operational readiness. The researcher used the Syracuse University research database and Google Scholar as the primary

databases for research. Both the university's research database and Google Scholar provided full-text results contributing to the existing empirical and theoretical literature.

With a decentralized workforce during the COVID-19 pandemic, unit leaders had to figure out a method to accomplish daily tasks and objectives. Various military organizations evaluated several types of groupware to conduct meetings and share information. After several weeks of evaluating the different platforms, some platforms were discovered to be less secure or needed to offer adequate functionality to accomplish daily objectives. Zoom is off-limits for official use by the Department of Defense personnel due to security concerns, even as military officials encouraged increased telework during the coronavirus pandemic (Pawlyk, 2020). As a result, Microsoft Office offered a more secure and robust suite of software that included an upgrade to email, cloud storage, file sharing, meetings, and collaboration capabilities.

The disruptive nature of COVID-19 initiated an unexpected paradigm shift by creating an opportunity for innovation and transformation during a devasting global pandemic (Gossling et al., 2020). The use of technology within an organization does not always guarantee the existence of the acceptance climate, policies, or infrastructure for information- or knowledge-sharing needed as the main option for conducting daily operations (Meroño-Cerdán, 2008). According to Grudin (1994), groupware failures result from not meeting the challenges of design and evaluation that arise from not understanding that organizations and individuals are different. Therefore, several factors must exist to ensure technology adoption and acceptance. Adopting groupware requires employees to change their ways of performing and understanding their jobs. Consequently, groupware adoption could be challenging when employees refuse to accept those changes (Favela & Decouchant, 2003). Adoption and acceptance depend on the value placed on collaboration, available resources, and technology acceptance standards, which considers

adoption and acceptance factors (Mark & Poltrock, 2004). Contrary to other studies of groupware adoption in a non-pandemic environment (Aldenberg et al., 1999; Hogarth, 2007; Orlikowski, 1996; Orlikowski & Yates, 2006; Palos, 2012; Rogers, 1994), this case study was conducted to explore what specific factors existed during the COVID-19 pandemic to influence both the adoption and acceptance of groupware in U.S. Army Signal Brigades.

Groupware

Groupware includes e-mail, electronic conferencing, discussion forums, document handling, and additional facilities that enable database customization and help coordinate other groupware and desktop products. The term groupware refers to early collaborative software that enabled the first experiences with sharing digital workspaces (Barrett et al., 2019). Additionally, Ellis et al. (1991) stated that groupware is a class of technologies that enable, facilitate, and mediate interpersonal relationships among participants who accomplish a group task. Groupware must support two or more users involved in a joint mission and provide the users with an interface to a shared environment. Groupware platforms are systems and processes that enable group collaboration and information sharing (Grudin, 1994). Due to the adoption of groupware, users must change their previous working techniques and processes. Therefore, groupware can make organizations more efficient because decision making and problem solving are able to occur more frequently and require fewer personnel or resources to execute the meeting (Janson et al., 2014).

According to Mark and Poltrock (2011), specific factors must exist to ensure the success of both technology adoption and acceptance by all users. To further add to Mark and Poltrock's views, this case study research was conducted to demonstrate that leaders must consider both organizational adoption factors as well as user acceptance factors in order ensure successful

technology implementation and permanence. By focusing solely on adoption factors, organizations risk implementation failures, wasted resources, and ultimately, limited user usage. Organizations must not accept and introduce components into information systems without understanding how to ensure the effectiveness, feasibility, and efficiency of the individual components of their information systems (Barrier, 2002). Effective groupware acceptance depends on knowledge of personnel, job functions, and objectives to enable collaboration awareness. The overall goal of groupware is to increase sources of gain that can arise from group work while limiting potential losses (Holsapple et al., 1996). Groupware not only supports the organization's mission and objectives but also facilitates individuals' ability to interact, communicate, coordinate, and negotiate to meet company challenges (Janson et al., 2014).

Yoo (1998) noticed that companies were changing from hierarchical to linear, decentralized, networked organizations. Yoo argued that the only way to support flat organizations is through groupware. However, the effective adoption of the technology depends on its acceptance by the intended users, which is not always a guarantee. This study's findings show that during a global pandemic, the Army was able to adopt and gain user acceptance. Several researchers discovered that groupware adoption provides numerous benefits and efficiencies to organizations but sometimes these benefits are not transferred or experienced at the user-level (Baker, 2018; Denstadli et al., 2012; Grudin & Palen, 1997; Janson et al., 2014; Owonikoko, 2016; Standaert et al., 2015). Understanding the security and accessibility requirements to maximize users' benefits from groupware solutions increases the likelihood of acceptance (Hastings, 2009). "Table 1 shows a classification of groupware into two categories: systems oriented toward making information exchange easier, or 'electronic communication systems,' and systems that support the work of teams, or 'teamwork systems'" (Meroño-Cerdán,

2008, p. 88). Electronic communication systems are systems that improve the relationship between individuals or organizations. Teamwork systems integrate information into existing work processes (Meroño-Cerdán, 2008).

Table 1

Classification of Groupware Electronic Communication Systems/Teamwork Systems

Concept	It allows the exchange of information, documents, and opinions	Work is done through the system
Aim	Relation	Integration
Applications	Email, discussion forums, repositories, yellow pages	Workflow, project management, shared databases, group decision systems

Note. Adapted from "Groupware uses and influence on performance in SMEs," by A. L. Meroño-Cerdán, 2008, *The Journal of Computer Information Systems, 48*(4), 88. Copyright 2008 by Taylor & Francis.

The COVID-19 pandemic created situations that affected organizations' abilities to collaborate and share information to accomplish tasks. Workplace restrictions limited the building of effective work relationships within the organization, including relationships between employees and customers, which would be an impetus for an organization to consider its approach to using groupware. Mark and Poltrock (2011) stated that achieving organizational adoption becomes more challenging when organizations are geographically dispersed. Military organizations were already dispersed at the unit level, but the pandemic created dispersion at the user-level, which increased the Army's communication challenges.

Markus and Connolly (1990) examined social factors in adopting groupware tools, concluding that mandated use or other top-down measures appear necessary to ensure widespread adoption. By examining factors that contributed to successful groupware adoption, researchers showed the correlation between the importance of high-level support for system

adoption and the likelihood of groupware acceptance (Markus and Connolly, 1990). Achieving successful adoption and user acceptance is a difficult challenge in most organizations. The benefits of groupware adoption, use, and influence on organizational performance are only sometimes visible to senior leaders, managers, and users. Figure 2 depicts the link between groupware technologies, their perceived benefits, and the influence of groupware's perceived benefits on organizational performance (Meroño-Cerdán, 2008). Examining the links between H1, H2, H3, and H4 may help us understand what factors contributed to adopting groupware in the Army Signal Brigades.

Figure 2

Research Model Groupware Perceived Benefits
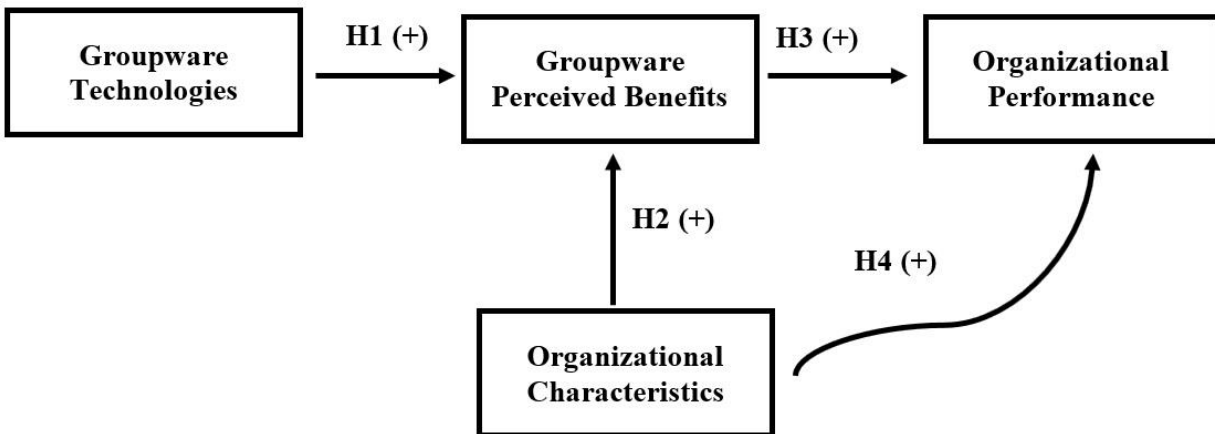
Note. Adapted from "Groupware uses and influence on performance in SMEs," by A. L. Meroño-Cerdán, 2008, *The Journal of Computer Information Systems, 48*(4), 89. Copyright 2008 by Taylor & Francis.

According to Grudin and Palen, 1995), no single adoption pattern fits every group. Groupware can succeed without mandated use, helped by the friendly functionality and interface features associated with the discretionary use of personal productivity tools. As shown in Figure

3, groupware bridges the gap between the end-user and the information systems that support

organizations (Grudin, 1994). Effective adoption is essential, but it is only half the equation.

Acceptance is critical for the successful introduction and intended use of modern technology.

Hardware, software, data, information, and networks must be managed, and people must be

addressed. Individuals must be trained to use the groupware (Barrier, 2002). Training and

processes must be developed so organizational users can use the groupware efficiently and

effectively.

Figure 3

Development and Research Context
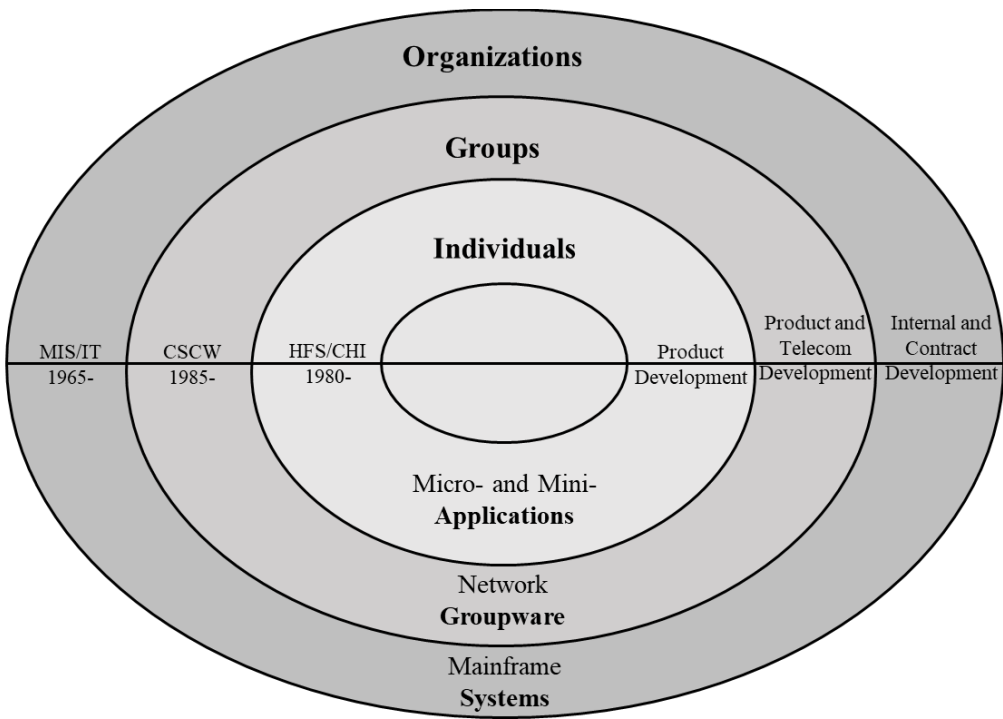
Note. From "Eight Challenges for Developers," by J. Grudin, 1994, *Communications of the*

ACM, 37(1), 93 (https://doi.org/10.1145/175222.175230). Copyright 1994 by ACM.

Theoretical Frameworks

Understanding the correlation among technology, organizational structure, and culture and how human intervention influences technology adoption and acceptance requires a theoretical examination. The researcher chose two relevant theories to study the factors influencing organizational adoption and user acceptance of groupware during the COVID-19 pandemic: the TAM and the TOE framework. Baker (2012) suggested that theoretical evolution involves exploring how theories of individual behavior and individual adoption can influence the TOE framework's explanation of organizational adoption. Technology adoption tends to take longer in the military due to the regulated standards related to design, procurement, security testing, and implementation across the entire organization (Codur & Dogru, 2009). The expedited adoption and acceptance of groupware, in less than 60 days, provided a framework to evaluate and compare the case study findings by applying theories designed to explore factors that influence top-level organization adoption and user acceptance.

Technology Acceptance Model

To understand groupware's adoption in Army Signal Brigades during the COVID-19 global pandemic, we must explore what factors contributed to the Army implementation and acceptance of groupware. According to Meroño-Cerdán (2008), the simple adoption of groupware does not guarantee its effect on performance. Fred Davis (1985) stated that use, or acceptance, can be validated by individuals' motivation to use the technology but significantly depends on the features and functionality of the technology. This concept became known as the TAM. TAM is a theory that focuses on modeling computer users and predicting technology adoption decisions. It indicates that only two factors determine the users' acceptance of a computer system: perceived usefulness and ease of use. The acceptance model concepts fit most

military organizations because the majority of their project proposals concentrate on the user experience and how the technology will enhance existing processes and operations, which is an essential component of the technology acceptance process. Although other theories would apply to this research, the TAM model helped explore what factors contributed to the adoption of groupware during the global pandemic.

Acceptance is often pointed out as a critical factor for the successful introduction and intended use of modern technology. Van der Laan et al. (1997) viewed acceptance as the link to long-term user usage. In contrast, van Driel (2007) considered acceptance as a predictor of the willingness to adopt a system (Horberry et al., 2014). The definition of acceptance is a fundamental foundation on which both assessment structures and acceptance models rely. Without a purpose, it is impossible to examine the validity and reliability of any assessment methods or models. Although there is no standard and established definition of acceptance, various meanings can be found in the literature along with descriptions of diverse types of acceptance (Horberry et al., 2014). This review of the literature was conducted to explore the conditions and factors contributing to the adoption of groupware during a global pandemic. Although much research exists on factors that influence groupware adoption in various sectors of society, minimal literature identifies the factors that influence the adoption of groupware in Army Signal Brigades.

Technology Organization Environment Framework

The innovation process begins with development and ends with the adoption and user acceptance within an organization. The TOE framework is an organizational-level theory describing the three elements influencing adoption decisions (Baker, 2012). The three elements

are technological context, organizational context, and environmental context, as illustrated in

Figure 4. Technological context refers to the technologies that organizations require to operate.

Figure 4

Technology Organization Environment Framework
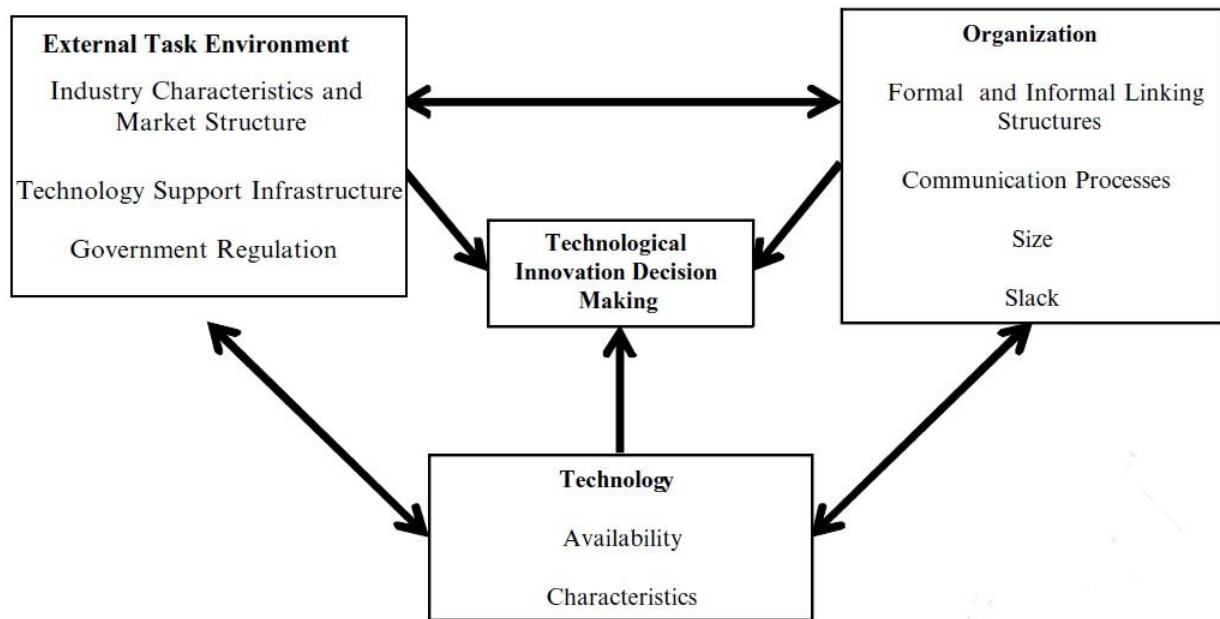
Note. From "The Technology-Organization-Environment Framework," by J. Baker, 2012,

Information Systems Theory: Explaining and Predicting our Digital Society, Vol. 1, Y. K.

Dwivedi, M. R. Wade, & S. L. Schneberger (Eds.) (p. 236). Copyright 2012 by Springer New

York.

An organization's current technology infrastructure plays a vital role in groupware

adoption because it sets a technical baseline and standard for future innovation. Groupware that

exists but has not yet been adopted by the organization also influences adoption by illuminating

potential improvements and enhancements of current systems and processes. Groupware external

to the organization is categorized into incremental, synthetic, or discontinuous changes (Baker,

2012).

Incremental changes are changes that introduce enhancements or new versions of existing technologies (Baker, 2012). Incremental changes offer less risk and change for organizations. Synthetic changes combine existing technologies to improve or develop new ways of operating. Discontinuous changes refer to changes that significantly switch from current to modern technology (Baker, 2012). One of the potential findings of this case study was what type of change groupware caused during the pandemic.

Organizational context is the people, processes, and structure that make up an organization. Senior-level, gatekeeper, and user support are essential to adopting new groupware technology. Organizational structure influences the success of innovation adoption. Orlikowski (1993) showed how organizational contexts, variations in the change process, and key players in organizations contribute to groupware adoption. Organic and decentralized networks contribute to the adoption phase of the process, whereas mechanical and centralized systems assist with the implementation phase of the innovation adoption process. Senior-level management's communication of support significantly improves the adoption and acceptance of groupware.

Environmental context relates to the industry's structure, regulatory requirements, and accessibility to innovative technology support. According to Baker (2012), organizations in competitive, developing industries are more receptive to innovation. Some organizations elect not to innovate due to the potential costs. Organizations with access to the requisite skills, experience, and suppliers influence innovation. Furthermore, governmental regulations can influence the decision on whether innovation is possible.

Tornatzky and Fleischer (1990) stated that the three contexts influence adoption, but certain factors impact the success or failure of the process. This case study explored if specific

technological, organizational, or environmental acceptance factors contributed to the adoption of groupware in Army Signal Brigades.

Pandemic Impact on Society Sectors

Due to the disruption to daily operations caused by the COVID-19 pandemic, many organizations implemented several types of groupware to continue operations. The necessity of education, healthcare, entertainment and leisure, and online commerce required society to adapt to the changes imposed by the restrictions of the pandemic (Barnes, 2020). Furthermore, the pandemic necessitated a radical transformation in how people interact and operate within the workplace, potentially influencing many facets of our daily lives for the near future (Griffin & Denholm, 2020). The impact of the COVID-19 pandemic brought unprecedented and unexpected challenges for individuals and society at large, business processes, and organizational policies, and will continue for several years (Kamal, M. & Chourie, J., 2020). Acceptance of innovative technology within any organization is only sometimes an achievable task. The COVID-19 pandemic led to virtual technology implementation and acceptance in many functions of our lives, i.e., healthcare, education, business, and the military.

Grudin and Palen (1995) stated that ease and enjoyment are potent motivators for user acceptance. Yochai Benkler (2006) shared that networking information, knowledge, and culture are essential to human freedom and development. Organizations will eventually require reconfiguration or modification of existing processes to advance, which should be expected when considering technology revolutions and innovations, such as multidimensional networks. Despite workplace personnel restrictions, organizations still had to develop new ways to operate through decentralized, virtual means during the pandemic. Conceptually, a network can mean the physical connection between individuals or the use of technology to connect geographically

dispersed individuals. Networks are imperative to produce value from sharing information and collaborating effectively and efficiently.

However, implementing groupware does not automatically lead to its adoption by organizational members (Aldenberg et al., 1999; Favela & Decouchant, 2003). This research highlighted that certain factors influencing organizational adoption and user acceptance exist across organizations. Due to the lack of existing research on groupware adoption and acceptance in the military during a pandemic, exploring the factors that influenced the adoption and acceptance of groupware in other public sectors provides historical context on the disruptive impact the COVID-19 pandemic had on society, including the military. Additionally, this research provides a basis for future studies to explore factors and conditions, i.e., culture, experience level, size, and organizational structure, which are potentially shared across the various public sectors.

Healthcare Sector Example

The effects of the COVID-19 pandemic rapidly transformed the U.S. healthcare system, with the implementation of virtual groupware called telemedicine being one of the critical drivers of the change. The transformation of the telemedicine landscape happened with breathtaking speed. With no vaccine or effective therapies, social distancing and quarantine were the only widely available interventions, creating a compelling reason for in-person care alternatives (Mann et al., 2020). The implementation of telemedicine services both for COVID-19 screening and managing non-COVID-19 cases was essential when conducting virtual meetings with patients (Kapoor et al., 2020). On March 2, 2020, the American College of Cardiology and the American College of Physicians issued a joint statement, urging policymakers to understand digital and telehealth services' vital role in the COVID-19 pandemic.

With self-quarantine and social distancing becoming increasingly important in limiting community spread, virtual care enabled healthcare workers to care for their patients remotely. Technology-enhanced learning also helped healthcare professionals learn about infection control, the isolation of suspected patients, and when and how to use personal protective equipment (Walsh et al., 2017). Some of the innovations implemented globally were virtual chatbots and web bots for COVID-19 patients so that medical providers could assess and interact with patients virtually and not risk potential infection. Telemedicine teams were able to train physicians to effectively screen COVID-19 cases by using questionnaires and triage; depending on positive test results, patients were directed to specific areas in the hospital to minimize the risk of unnecessary exposure. Patient follow-ups were conducted by virtual platforms to decrease the number of people at the hospitals and reduce the spread of the virus. Telemedicine was an invaluable tool in decreasing the volume of patients inundating the emergency rooms and transformed the everyday work practices of providers across multiple healthcare specialties (Mann et al., 2020).

Education Sector Example

According to Tarkar (2020), higher education is a critical determinant of any country's economic future. The education sector, which includes the primary, secondary, and tertiary levels, was significantly affected by the pandemic. Teaching and student assessments moved online with much trial and error and uncertainty for parents, students, and educators. Homeschooling created a massive shock to parents' productivity, children's social lives and learning, and affected how educators delivered their curriculum (Burgess & Sievertsen, 2020). Walsh et al. (2017) suggestion of an alternative approach to education, which includes exploring modern technologies and how teachers can leverage these technologies to deliver an effective

curriculum in a safe environment was severely assessed. While addressing the effects on the education sector, Pratama et al. (2020) stated that the COVID-19 pandemic significantly impacted the lives of the global community as well.

The closure of schools, colleges, and universities not only interrupted the teaching of students around the world but also coincided with a critical assessment period, and many exams were postponed or canceled. Consequently, not having a communication solution delayed the recognition of both high potential and learning difficulties and led to potentially harmful long-term consequences for the child. Walsh et al. (2017) stated that technology-enhanced learning depends on learners having access to technology and the requisite skills to use the technology to access online content. The global lockdown of educational institutions caused a significant interruption in students' learning, disruptions in internal assessments, and the cancellation of public reviews for qualifications or their replacement by an inferior alternative (Burgess & Sievertsen, 2020). The existence of remote learning was a groupware solution for the community to reduce the impact of outbreaks. To avoid canceling courses, universities focused their efforts on the online teaching methodology by leveraging groupware technologies, such as learning management software and open-source digital learning solutions (Tarkar, 2020). This alternative changed the direction of physical learning to online and virtual learning. The use of groupware was an option that provided many conveniences for students and teachers to achieve learning goals without being in class.

Business Sector Example

Electronic commerce (e-commerce) platforms experienced a massive increase in traffic as individual preference significantly shifted from buying online to using other services that are subscription-based or free of charge (Galhorta & Dewan, 2020). E-commerce platforms

experienced greater challenges worldwide associated with increased dependence and utilization

due to the COVID-19 pandemic. COVID-19 impacted customer shopping trends on many virtual

platforms. The pandemic influenced individuals' online behavior, purchases, shipping locations,

and supplies. People tended to feel treacherous while buying goods online, which led to

significant variations in the number of orders of goods, such as groceries, healthcare, luxury, and

fashion (Galhorta & Dewan, 2020).

Managing a workforce comprised of internal and external players aligned with an

organization's strategic goals and consistent with its values is now a critical business necessity

(Altman et al., 2021). Kamal (2020), referencing COVID-19's disruptive nature, stated its impact

has compelled rapid transformation in business processes and operational practices. The use of

virtual groupware platforms, such as MS Teams and other digital technologies for teaching,

learning, and meeting, has significantly grown in speed and scale compared to the glacial

implementation during the pre-COVID-19 era.

Military Sector

The researcher has observed that when military leaders schedule a meeting/briefing, the

meetings are held around a large conference table, with designated seats identified by placards

showing rank or position. During 15 years of serving as information systems engineer in military

organizations, the researcher has witnessed technology acceptance and adoption challenges

experienced by IT professionals when trying to improve the efficiency and effectiveness of the

organization's collaboration and information-sharing processes. Groupware is meant to enhance

shared understanding and effective decision-making by ensuring relevant data and information

are retainable and accessible to individuals to enable analysis and real-time, informed decisions

(Owoh & Warman, 2019). However, despite the potential effect on information sharing, often

organizations are not focused on how their personnel, processes, and technology tools, i.e., groupware, affect the organization's information flow and processes (Owoh & Warman, 2019). The organization leaders acknowledged the need for viable solutions to improve information sharing and collaboration but achieving user acceptance and approval to implement innovative solutions to replace manual processes was a persistent challenge.

On April 1, 2020, military leaders realized that their organizations could not maintain operational readiness without conducting meetings, individual and unit training, and other mission-essential daily tasks. Military organizations started relying on various groupware platforms, i.e., Zoom, Google Meet, Cisco WebEx, Skype, and Microsoft Teams to meet and share information. Over the next 30 days, platforms were eliminated from operational use due to security concerns, a lack of functionality, or scalability. One of the platforms that became popular was Microsoft Teams. Microsoft Teams allowed users to videoconference, share documents, collaborate, text, call, send calendar invites, and build virtual teams.

By June 1, 2020, military staff had started creating processes to prepare and conduct virtual meetings. Contrary to the previous meeting traditions, new innovative practices were being developed. Staff would prepare the briefing slides, but instead of printing them, they would post them to the file tab of the unit team's channel. Instead of emailing bulky slides that consumed space in an individual's inbox, attendees could preview the slides by navigating to the meeting team's channel. On the day of the meeting, the action officer would conduct a virtual recall, ensure video and audio connections, and display the briefing slides. The senior leader now has the option to enable their video or conduct an audio meeting.

Common Effects Across All Sectors

Organizations across various industries have successfully adopted groupware platforms. The versatile functionality and ease of use associated with discretionary products appeared to lead to adoption. Additional factors included organization-wide infrastructure and substantial peer pressure that developed over time (Grudin & Palen, 1995). The terms *Zoom* and *MS Teams* have been incorporated into the everyday lexicon as these platforms have seen widespread personal and organizational use to affect meetings, education, and training (Dwivedi et al., 2020). An organization must collaborate internally with its various sections or departments and externally with customers, partners, or higher headquarters to ensure information is disseminated effectively. As organizations became more geographically dispersed, coordinating project objectives, goals, and milestones was essential. As a result of a dispersed workforce, organizations relied on groupware technologies, e.g., Lotus Notes, which were used to coordinate and collaborate without physically being in the office (Malone & Crowston, 1993). Lotus Notes was a type of groupware that used collaborative applications, i.e., email, calendars, and personal information managers to share information across the organization. Similar to Lotus Notes' use cases, modern groupware, e.g., Microsoft Teams, is used for collaboration, information sharing, virtual meetings, calendar, and voice calls, which illustrates the evolution of groupware due to technology advancements and growing operational needs, similar to the requirements during the pandemic.

The COVID-19 pandemic limited personnel in the workplace in all sectors, forcing organizations to develop new ways to share information and collaborate to continue operations. The closure of schools and universities had not only a short-term impact on the continuity of learning of young learners, but also had a significant effect on the country's economic growth as

well as a significant impact on society (Tarkar, 2020). In every sector of society, introducing new innovations requires leaders from any industry to devote time and resources to ensure their employees are adequately trained to use the latest technology. Collaboration and coordination are critical business components used in planning, task tracking, scheduling, job deconfliction, and time management, contributing to effective resource management (Malone & Crowston, 1993). This case study aligned with Grudin and Palen's (1997) research that suggested the differences in groupware adoption within an organization provide insight into what factors exist between a widely accepted technology and its behaviors. This case study was conducted to explore if similar factors in the education, healthcare, and business sectors were also prevalent in U.S. Army Signal Brigades, and if those factors influenced the Army's adoption and acceptance of videoconferencing groupware during the COVID-19 lockdown.

Summary of Chapter 2

This chapter identified published and reviewed literature and underlying theories and frameworks that are relevant to technology acceptance, influencing overall adoption, and provided several relevant examples of similar phenomena and examinations in other sectors. Due to the minimal literature in existence that explored groupware adoption and acceptance in the U.S. Army Signal Brigades, the literature review included studies on groupware implementation in other public sectors to add additional context and analyze what factors existed across the sectors. This chapter included an examination of the groupware concept and the theoretical frameworks on which this study was based.

Chapter 3 will provide a description of the methodology for the research. The case study's research design will be explored to detail the methods of data collection and how they

contributed to the study. Chapter 3 also contains the process for data collection and the analytical

methods used to determine the research findings.

CHAPTER 3: METHOD

The impetus of this case study was to gain an understanding of groupware's adoption and acceptance by U.S. Army Signal Brigades. The case study was conducted to identify acceptance factors influencing groupware adoption during the COVID-19 pandemic. During a 6-month period starting in 2022, in addition to groupware metric collection, data were collected from 27 individuals via survey. The participants included top-level and middle-level managers, operational personnel, and action officers. Groupware metrics were collected to illustrate the use and frequency of meetings during workplace restrictions and after the restrictions were lifted. The survey, which could be completed in approximately 30 minutes in length, was conducted using the Qualtrics® platform.

Chapter 3 contains a description of the research purpose, method, and design. This chapter also covers participant identification, the participation process, and data gathering. The researcher reviews the research question, the research design, and the research population sample. The chapter also includes instrumentation, validity, reliability, data collection and analysis, and ethical considerations. The analysis of the metrics allowed the researcher to determine if similar factors that existed during the pandemic remained and influenced the use of groupware after personnel were allowed to return to the office.

Research Tradition

Researchers can conduct qualitative research to investigate paradigms in relation to lived experiences and beliefs by exploring various potential variables (Levy et al., 2016). Conversely, researchers use quantitative methods to identify explanations and make discoveries to further their field (Stake, 1995). A mixed-method survey within a case study is more applicable to identify and analysis the quantitative and qualitative results. Quantitative experimental design is

another example of alternative methodology. Because quantitative experimental research aims to discover a cause and effect based on variables, this approach did not fit this study's purpose and would not sufficiently support the investigation (Stake, 1995). There was no connection between quantitative or mixed methods research and the proposed study, which sought to identify the elements that contributed to the adoption and acceptance of groupware.

Researchers make decisions regarding the design of qualitative research initiatives and how they will be conducted. Narrative, exploratory, phenomenological, ethnographic, and case study approaches, as well as grounded theory, are all examples of qualitative research designs. When a researcher chooses to conduct their investigation using a case study design, they are attempting to interpret their findings in a professional context. The case study design includes the study's questions, propositions, cases, and reasoning, tying the data to each element. The design of a case study helps the researcher gain an understanding of the events that occurred at a certain location and time, and it may at times involve the use of detailed descriptions (Stake, 1995). The researcher can acquire a better knowledge of the genuine experiences participants had by utilizing a case study. Researchers use narrative designs to depict people's lives by deriving meaning from a chronological order of events (Levy et al., 2016). The lived experiences of participants are investigated in phenomenological research designs in relation to a certain topic (Moustakas, 1994). Grounded theory designs use an approach in which the theory is founded on the particular points of view held by the participants, but the theory evolves during the course of the research and changes in response to the findings of the research itself (Mills et al., 2006; Moustakas, 1994). In this study, a case study design was deemed most appropriate to answer the research questions and to explore the effects of adopting groupware technologies in U.S. Army Signal Brigades.

The use of digital technology into pandemic policy and response could be one of numerous distinguishing characteristics of countries that successfully lowered their COVID-19 incidence curves and kept their fatality rates low (Whitelaw et al., 2020). The transformation of the previously established normal into abnormality and then into the new normal was a watershed moment for the entire world. We were forced to adapt from the past methods of conducting operations and daily activities in a variety of spheres of our lives, including the medical field, the economic world, educational institutions, and the armed forces. The adoption and acceptance of inventions that improve how we meet in decentralized settings and geographically distant areas could be one of the benefits brought about by the pandemic, despite the damage that was brought about by the disease (Kamal, 2020).

One desired outcome of this study was to acquire a better knowledge of the factors that influenced the adoption and acceptance of groupware in Army Signal Brigades. After giving the topic much thought, the researcher concluded that the ideal method to use for this investigation would be a case study. The aforementioned understanding of the experience, "in depth, how things were at a particular place at a particular time"—can be gained through the use of a case study (Stake, 1995, p. 38). Case studies were used by other scholars to investigate a variety of characteristics of collaboration and information sharing among teams (Khazanchi, 2018; Mattison, 2011; Owonikoko, 2016). Although the virtual meeting platforms research explored in these case studies are comparable, this case study was original. The researcher investigated the employees' individual experiences as they related to the groupware use and perceived usefulness. Currently, there is not much research pertaining to the adoption and acceptance of groupware in the military. This study was conducted to identify specific factors that contribute to

the adoption of innovative technology, specifically groupware, by organizations as well as the user acceptability of such technologies.

Research Question

This case study was focused on groupware adoption and acceptance. U.S. Army Signal Brigades utilize groupware to collaborate, process, store, and share information to enable continuous operations. The analysis and complexity of that concept was the impetus of the research question: *what acceptance factors influenced the degree to which U.S. Army Signal Brigades adopted videoconferencing groupware technologies during the covid-19 lockdown?*

Research Design

The researcher utilized a case study of three Army Signal Brigades that used groupware to complete operational tasks. The researcher surveyed brigade personnel and analyzed the use of various online meeting tools. The researcher used a research design organized as a case study. Additional sections in this chapter include population and sample, sampling procedure, and sections relating to additional aspects of the research. The following sections contain discussions of the instrumentation and the validity of the research, along with data collection and ethical aspects. Finally, the researcher presents a summary.

Case study research is important to this field of study because it can indicate the specific experience of groupware adoption and acceptance within an organization. In this study, data were gathered data from team members within the organization to uncover their perspectives on groupware. Each personnel have the freedom to utilize the software in the way that most benefits the organization. Research that documents optimal ways to implement groupware can benefit other entities in similar situations or using similar technologies.

Population and Sample

The population that was the focus of the study considered these four essential characteristics: the type of the elements, the sample units, the geographic location, and the period of time in which the study was conducted (Daniel, 2012). Members of all three Army Signal Brigades were included in this study's population and population sample. In the past, when researchers employed quantitative methods to conduct their studies, there were a number of sampling problems that caused the results to be inaccurate and misleading. These sampling difficulties, which include coverage bias and nonresponse bias, generated issues where the generalizability of the sample to the population was flawed, and they are referred to collectively as bias (Daniel, 2012).

Studies using qualitative methods provide a unique perspective. The goal of qualitative research is not to generalize about populations but rather to gain knowledge of the characteristics of specific individuals (Daniel, 2012). When conducting qualitative research, obtaining a sample for the purpose of reaching saturation is the goal. The term *saturation* was first introduced in the context of grounded theory, and it signified that despite continued investigation, no new knowledge was being provided (Schreier, 2018). An exploratory single-case design was utilized for this case study. The crucial, extreme, common, revelatory, and longitudinal single cases are the five types of typical single-case representations (Yin, 2018). Because the virtual platform was implemented in every Army Signal Brigade, this research can function as a standard case study. Within the confines of a solitary case study design, the researcher is required to make a decision regarding which method, an embedded or holistic approach, will prove to be more fruitful. According to Yin (2018), embedded techniques are suitable in situations in which there

are subunits present within the main case. The embedded methodology was utilized for this

study, which resulted in the collection of qualitative as well as quantitative data.

Sampling Procedure

According to Yin (2018), when doing a case study, sampling should not be done with the

purpose of drawing broader conclusions. This is due to the fact that the case study itself can be

regarded as a sample. Case studies provide researchers with an opportunity to acquire empirical

knowledge. Researchers still need to do some sort of sampling in order to identify the people

who will take part in an embedded case study. A sampling method known as probability

sampling is one in which every member of a population set has an equal and nonzero chance of

being chosen for the sample (Daniel, 2012). The members of the population that were included

in the sample were chosen by the researcher using a method called nonprobability sampling.

According to Daniel (2012), nonprobability sampling approaches are favored for use in

qualitative research when the objective of the study is exploratory in nature. Nonprobability

sampling is useful for exploratory research, which is one of its strengths (Daniel, 2012).

The researcher chose to utilize a method of sampling that did not take probability into

account. Participants from three of the seven Army Signal Brigades made up the survey's sample

size. The sample had nine participants per brigade, and these individuals differed in rank,

position, and type of service (i.e., federal citizens and servicemembers). Nonprobability sampling

best supported these scattered team members. Participant accessibility and spatial distribution

both factor into using nonprobability sampling (Daniel, 2012). Nonprobability selected samples

are appropriate for qualitative research (Daniel, 2012). The goal of the qualitative researcher is to

gain a detailed description of the research. Qualitative researchers do not seek generalizability to

a larger population. Selecting a sample individually was critical to gather the rich information

needed for the research. In this study, the researcher utilized a case study in three different geographically dispersed Army Signal brigades. To help with survey distribution, the researcher enlisted the help of an organization point of contact to identify potential respondents with whom the researcher had no relationship.

Instrumentation

The researcher utilized an interview protocol as an instrument for the research (Yin, 2018). The data collection consisted of a survey to gather the required feedback. In case study research, the researcher is commonly the instrument of the research as they interview subjects according to the interview protocol and record responses (Creswell & Poth, 2016). Each participant received and signed the Invitation to Participate document, which appears in Appendix A.

Qualtrics® was used to distribute the survey. The researcher used the survey platform provided by Syracuse University. The survey asked about demographics, experience level, user acceptance, ease of use, time spent using groupware platforms, and user preference. Questions were designed to be yes or no, fill in the blank, and reply with "strongly disagree," "disagree," "neutral," "agree," and "strongly agree." Demographics included role/profession, leadership level (action officer, manager, supervisor, or senior leader), and whether the participant had an active role in implementing or adopting groupware.

The use of an online survey tool, Qualtrics®, enabled the researcher to gather information globally. Time to complete the survey was approximately 30 minutes. The survey, comprising a total of 31 questions, was shared electronically via email. Of the 31 questions, four were demographic-related, eight were questions inquiring about the user's experience and knowledge of groupware prior to the pandemic, seven were questions inquiring about the experience of

using groupware during the pandemic, and 12 were questions focusing on the users' experience after groupware was adopted. Confidentiality was maintained by not correlating responses that could identify individuals. The researcher understood that the adoption of groupware can be subjective, but the quality of the responses can be used to identify key factors that led to user acceptance.

Timeline

Groupware metrics were collected during each quarter of 2021. During this time, the workplace restrictions were enacted and eliminated. The survey was live from August 15, 2022, to October 31, 2022. Pilot testing and evaluation were conducted from July 15, 2022, to August 15, 2022. The survey was shared with a total of 60 unique individuals across the globe beginning on August 15, 2022. The variety of perspectives shared in the interviews provided insight into some of the factors that existed during the implementation of the MS Teams platform that could be useful in future research on successful groupware adoption and acceptance.

Validity

The validity of the findings is based on actual individuals' experience and feedback. In the course of this study, the researcher implemented a variety of methods to ensure that the findings are, in fact, reliable and able to be fact checked. To increase the accuracy of the findings, the researcher created procedures to guide the data collection and analysis. During the course of the study, the researcher made use of triangulation by gathering evidence from a variety of sources. The use of triangulation compares themes found in the responses of one subject with themes found in the responses of other subjects, thereby establishing their validity (Yin, 2018). Another strategy the researcher employed consisted of utilizing two preexisting theories as frameworks to analyze the findings. In this study, steps were taken to assure the

study's trustworthiness. A study that is effectively designed is evidence that the findings of the research are reliable (Yin, 2018). Studies can be relied upon if they are able to be replicated and provide comparable findings using the same participant pool (Levy et al., 2016). In the design of the research study, provisions were made to guarantee the reliability of the information gathered during the investigation. The presentation of contradictory and negative facts is one way that researchers build their credibility (Creswell, 2013). Transferability is the ability to apply findings from one location or context of study to those in other settings or contexts (Levy et al., 2016). In the context of this study, investigations into the adoption and acceptance of groupware in various business contexts were conducted. The results of future innovation projects should be able to be transferred to IT departments in order for those departments to utilize the same strategy when introducing modern technology.

Reliability

Triangulation is a process used in research to ensure reliability. Triangulation uses multiple sources of data to connect and confirm the data (Levy et al., 2016). This research was an embedded case study that featured various sources of data ready for triangulation. The research study included member checking to improve reliability. The member-checking process involves having subjects review their contributions to the research and ensure that it is reliable as intended. Additionally, the study leveraged direct observation by the researcher and survey participants to increase the reliability of the data, therefore not relying on a single observer's view (Yin, 2018).

Data Collection

This research used a case study approach to collect data and provide additional insight into the qualitative and quantitative factors that influenced the use of online collaboration

platforms in Army Signal Brigades. Data was collected in a manner consistent with case study protocol. The approach also used data retrieved from groupware platforms before, during, and after the implementation of workplace restrictions.

The researcher collected data for the case study through the use of surveys and groupware meeting logs. The research was conducted to investigate how the COVID-19 pandemic contributed to the widespread use of online meeting platforms and the impact of such a large-scale phenomenon. A survey was designed and conducted in order to provide support for the research. The survey was distributed to personnel in three of the seven Army Signal Brigades that were already in existence. Through the use of survey questions, the researcher was able to determine the participants' prior experiences, preferences, and opinions regarding the functionality of the four collaboration platforms that were available before the pandemic, as well as which platforms ended up being the most popular. Data collection included platform metrics before the COVID-19 pandemic, when employees were permitted to have in-person meetings; during the COVID-19 pandemic, when organizations were mandated to implement mass teleworking procedures, and after the COVID-19 pandemic, when workplace personnel restrictions were lifted. This process allowed the increased use of groupware platforms to be identified. The number of groupware platforms that were utilized prior to the pandemic was one of the metrics, along with graphs, the number of meetings that were held, and the number of personnel that participated in those meetings both before and during the COVID-19 restrictions. Additionally, workplace limitation policies, teleworking policies, and the HPCON decision matrix were utilized to provide additional information that may have contributed to the adoption and acceptance of the groupware platforms. The data were compiled and analyzed to determine

which platforms for collaboration were most desired, as well as expectations about frequency, convenience of use, functionality, and performance.

The survey population came from three of the seven active-duty Army Signal Brigades. The sample consisted of a minimum of nine participants per brigade. The participants were varied by rank, position, and service (i.e., federal general staff (GS) civilian and service member). The purpose of interviewing participants across various ranks and services was to gather experiences and feedback from various levels of the organization impacted by online groupware platforms. Participants consisted of one individual from the following service groups per brigade (see Table 2).

Table 2

Participants

Participants	Categories
Servicemembers	O-2–O-3
	O-4–O-5
	E-4–E-5
	E-6–E-7
	E-8
Government Civilians	GS-11–GS-12
	GS-13–GS-14
	GS-15

A series of 31 questions was developed and included as part of an ongoing organizational survey to assess individuals' beliefs about current collaborative relationships, attitudes toward collaboration in general, acceptance and availability of current collaborative tools, training for said tools, acceptance and adaptability toward new tools, and job characteristics pertaining to collaborative behaviors (see Appendix B). The items were presented using a graphic rating scale

with low and high anchors separated by a numeric scale of 1 to 9, with higher scores denoting better collaboration.

Additionally, the researcher also collected data through direct observation. Due to the nature of this case study, the researcher believed that certain social and environmental factors should be observed and used as an additional source of evidence (Morgan et al., 2016). According to Yin (2018), direct observation allows a researcher to assess certain types of behaviors over a period of time. Observational evidence was useful in providing additional insight into this specific study and understanding the groupware's use cases.

Data Analysis

Survey research is a method of understanding aspects of behavior through statistical analysis of a sample of the population. The statistical analysis allows comparisons and the strength of relationships between variables to be evaluated against the hypotheses (Mohajan, 2020). The goal of the case study was to discover factors, such as criteria, variables, elements, and characteristics that influence successful groupware adoption and acceptance (Yin, 2018). Coding is the next process. The coding process consisted of the researcher analyzing all survey questions before beginning the coding strategy. The researcher identified themes in the survey results by using description-focused coding. Descriptive coding is a first cycle method of coding that involves reading qualitative data and coding passages according to topic (Yin, 2018). The researcher utilizes IBM® Statistical Package for the Social Sciences (SPSS) software to analyze the survey's statistical results. SPSS provides data analysis for descriptive and bivariate statistics, numerical outcome predictions, and predictions for identifying groups. Codes were used to show correlation to the theoretical research frameworks.

To identify and highlight important and frequently used words to show common viewpoints and thoughts, the researcher used word cloud visualizations. Word clouds are images consisting of words specific to a particular subject that are used to assist the reader in visualizing a message or trend. The researcher leveraged word clouds to show the survey's qualitative results.

Yin (2018) suggested ground-up analysis in a case study. Using this method, the researcher utilizes codes and abstractions of potential interest. While there is a similarity to grounded theory, the use of this analysis method is not limited to only grounded theory studies. Grounded theory coding consists of at least two main phases: (a) an initial phase involving naming each word, line, or segment of data, followed by (b) a focused, selective phase that uses the most significant or frequent initial codes to sort, synthesize, integrate, and organize large amounts of data. Although grounded theory could be used for close-ended surveys, the researcher believed that due to the inclusion of open-ended questions in the survey, the use of the ground-up method would be a better approach to analyze both sets of questions. Evaluative case study research represents a favorable use of this analytical method (Yin, 2018). Accordingly, the researcher uses ground-up analysis. Triangulation was used to ensure validity and support the research findings or conclusions. The researcher also used groupware metrics and policies as additional sources to triangulate data. Furthermore, this discovery led to an implementation baseline or framework that will offer future technology implementors a foundation to evaluate and establish statistical relationships between the factors. To identify these factors, the researcher extracted and examined variables that could be used as success criteria.

Data Storage and Security

The collected data were saved on an external hard drive with a capacity of 1 terabyte, as well as on Google Drive and Microsoft OneDrive, which Syracuse University controls. All the data were encrypted and stored in a secure location, with access restricted to the researcher alone, so that the confidentiality and authenticity of the information could be maintained. Only the individual's rank and unit designation were included on the labels affixed to all interview findings and notes. To protect the privacy of the individuals being studied, the analysis and results going into the thesis were generalized over all of the brigades. All the information that was gathered by using the Qualtrics® application was safely saved on their servers. Members of the primary research and the committee were the only people who could access the data, and they could only do so by logging in securely with a password. Data were exported to Microsoft Excel for analysis, and confidentiality was maintained by storing the data on a computer that required a password to access.

Risk Mitigation

Using a case study approach does present some potential risks. The risk of concentrating too much on the meetings' participants and frequency could be very time-consuming and cause a distraction. Risk mitigation could involve establishing a specific number of meetings to collect research data. Another potential risk is overworking by adding multiple tasks to an already work-intensive day. A mitigation for this potential risk was to set specific days of the week where the daily mission requirements were not as intensive and set specific times to collect data. Another risk could be collecting data or graphics from unclassified meetings that are not necessarily acceptable for public release. The mitigation plan for this risk was to ensure the researcher

gained authorization from the organization's public affairs office or operations security office before submission.

Ethical Considerations

Before initiating research for this project, the university's institutional review board (IRB) was contacted to receive approval, which was then granted. Before being granted access to the survey, participants in the study were required to select a box indicating their consent to participate in the survey. Informed consent is one component of the ethical considerations that go into protecting individuals.

Summary of Chapter 3

This chapter provided a description of the study design and the procedure for data collection used in this case study. The researcher was able to explore the hypotheses in a variety of diverse ways because of the research methods that were selected for this investigation. First, the study assisted in the identification of specific elements that may have been present and may have contributed to the successful adoption and acceptance of groupware through the use of individual perspectives obtained through surveys. The research was conducted using a case study approach. The researcher's goal during the course of the investigation was to gain an understanding of what conditions existed in the units when the groupware technology was presented as a viable option for conducting daily operations. The data gathering process consisted of the researcher conducting qualitative interview analysis and using groupware metrics. It is possible to analyze the study's data by correlating the coded interview replies from one interview to another. The researcher analyzed the responses provided by the participants to identify any commonalities, then presented those findings as research results. This research topic was based on the analysis and complexity of that notion. The research question explored in this

study was, "During the COVID-19 pandemic, what acceptance factors influenced the degree to which organizations that adopted groupware platforms in U.S. Army Signal Brigades?" The specifics of the study's findings, as well as an interpretation of those results, will be presented in the following chapter.

CHAPTER 4 FINDINGS

The purpose of the research was to identify the factors that influenced the adoption and acceptance of groupware during a pandemic. In chapter 2 the researcher reviewed preexisting literature related to groupware adoption and acceptance during the pandemic. The researcher discussed various areas that contributed to effective technology adoption and successful user acceptance. This study aimed to pinpoint the specific factors that influenced the adoption of groupware technology within U.S. Army Signal brigades amid the COVID-19 pandemic.

Quantitative Survey Results

Participants were administered a survey, which consisted of 31 items. Survey results are reported in the order of the questions asked on the survey. Data were analyzed with SPSS version 23 for Windows and Pro Word Cloud by Orpheus Technology Ltd.

Qualifying Questions

Q1. What role/position do you currently serve?

Current reported roles/positions were varied, such as Army Operations (3.7%, $n = 1$), Assistant S3 (3.7%, $n = 1$), Battalion XO (3.7%, $n = 1$), and Chief of Operations (3.7%, $n = 1$). By surveying action officers to senior leaders enables the study to uncover factors that are present across various organizational levels, providing a comprehensive understanding of the work environment. This approach helped capture insights from both top-level decision makers and those responsible for implementing actions on the ground. See Table 3.

Table 3

Current Role/Position

Current Role/Position	n	$\%$
Army Operations	1	3.7
Assistant S3	1	3.7
Battalion XO	1	3.7
Chief of Operations	1	3.7
Chief, Cybersecurity Division	1	3.7
Civilian Executive Officer/Chief of Staff	1	3.7
Commander	1	3.7
Cybersecurity Division Chief	1	3.7
Deputy Commander 106th Signal Bde	1	3.7
Executive Officer	1	3.7
Human Resources Technician	1	3.7
Information Security System Manager	2	7.4
Information Tech Chief	1	3.7
Manager	1	3.7
Operations Officer	1	3.7
Operations Sergeant Major	1	3.7
Operations Supervisor	1	3.7
Project Manager	2	7.4
S3 Cybersecurity	1	3.7
Senior Enlisted Advisor (1SG)	1	3.7
Senior level management	1	3.7
Senior Network Engineer	1	3.7
Senior Technical Advisor	1	3.7
Supervisor	1	3.7
Supervisory Management Analyst	1	3.7
Total	27	100.0

Q2. Is your role/position considered action officer, managerial, supervisory, or senior management?

Thirty-seven percent ($n = 10$) of participants indicated that their roles/positions were considered managerial, 29.6% ($n = 8$) responded that their roles were considered senior management, and 18.5% ($n = 5$) selected action officer. See Table 4.

Table 4

Role/Position Type

Role/Position	n	%
Action Officer Level	5	18.5
Managerial Level	10	37.0
Supervisory Level	4	14.8
Senior Level	8	29.6
Total	27	100.0

Q3. How knowledgeable are you with using Groupware?

Responses ranged from not knowledgeable at all (18.5%, $n = 5$) to very knowledgeable (40.7%, $n = 11$), which was the largest category of responses. By surveying individuals' knowledge of using groupware, the study can determine whether the lack of knowledge or prior experience with groupware has an impact on the acceptance process, and ultimately organizational adoption. This approach allowed the study to examine how familiarity with technology influences people's willingness to accept and integrate groupware into their work processes. See Table 5.

Table 5

Self-Reported Groupware Knowledge Level

Knowledge Level	N	%	Cumulative %
Not knowledgeable at all	5	18.5	18.5
Slightly knowledgeable	3	11.1	29.6
Moderately knowledgeable	8	29.6	59.3
Very knowledgeable	11	40.7	100.0
Total	27	100.0	

Q4. Did you play a role in implementing or adopting Groupware in your organization?

Thirty-seven percent ($n = 10$) selected "yes," and 11.1% ($n = 3$) chose "maybe." However, 51.9% ($n = 14$) answered "no." See Table 6.

Table 6

Played Role in Implementing or Adopting Groupware in Organization

Response	N	%	Cumulative %
Yes	10	37.0	37.0
Maybe	3	11.1	48.1
No	14	51.9	100.0
Total	27	100.0	

Groupware Experience Pre-Pandemic

Q5. Do you think Groupware enhances or degrades your organization's productivity?

Options were enhances, degrades, or neither. Approximately 78% selected "enhances,"

whereas 22.2% (*n* = 6) chose "neither." No participants indicated that groupware degraded their

organizations' productivity. Evaluating whether individuals perceived groupware as enhancing

or degrading their productivity provides valuable insights into whether this factor played a role in

influencing their acceptance of the technology. This analysis helps gauge the real-world impact

of groupware on productivity and its connection to overall technology adoption. See Table 7.

Table 7

Impact of Groupware on Organizational Productivity

Response	N	%
Enhances	21	77.8
Neither	6	22.2
Total	27	100.0

Q6. How often did you participate in a meeting on a Groupware platform prior to the

COVID-19 pandemic? (# of days per week)

Respondents reported that they participated in meetings on a groupware platform prior to

the COVID-19 pandemic 0 to 5 days a week (*M* = 1.77, *SD* = 1.86) with a median of 1.00 day

per week.

Q7. How often did you participate in a meeting on a groupware platform during the COVID-19 pandemic after the work restriction was implemented? (# of days per week)

Respondents participated in meetings on groupware platforms during the COVID-19 pandemic 0–7 days a week ($M = 4.63$, $SD = 1.61$) with a median of 5.00 days per week. The pandemic prompted a shift in mindset, emphasizing the importance of staying connected and efficient through digital means, making groupware adoption more achievable.

Q8. How often do you participate in a meeting on a groupware platform now? (# of days per week)

Respondents reported currently participating in meetings on groupware platforms 0–7 days per week ($M = 4.54$, $SD = 1.56$) with a median of 5.00 days per week. As organizations saw positive impact of using the groupware during challenging times, they remained consistent with incorporating it into their daily operations even after the pandemic.

Q9. On average, how many hours each day did you spend using a groupware platform prior to the COVID-19 pandemic?

Respondents reported spending 0–9 hours ($M = 2.19$, $SD = 2.79$) each day using a groupware platform prior to the COVID-19 pandemic with a median of 1.00 hour.

Q10. On average, how many hours each day did you spend using a groupware platform during the COVID-19 pandemic after the work restriction was implemented?

Respondents reported spending 0–14 hours a day ($M = 6.11$, $SD = 3.13$) using a groupware platform during the COVID-19 pandemic after the work restriction was implemented with a median of 6.00 hours.

Q11. On average, how many hours each day do you spend using a groupware platform now?

Respondents reported currently spending 0–13 hours each day ($M = 5.70$, $SD = 3.15$) using a groupware platform with a median of 6.00 hours. Responses to survey items 6–11 are summarized in Table 8.

Table 8

Responses to Survey Items 6–11

	Questions	Min.	Max.	M	Median	SD
Q6.	How often do you participate in a meeting on a groupware platform prior to the COVID-19 pandemic? (# of days per week)	0	5	1.77	1.00	1.86
Q7.	How often do you participate in a meeting on a groupware platform during the COVID-19 pandemic after the work restriction was implemented? (# of days per week)	0	7	4.63	5.00	1.61
Q8.	How often do you participate in a meeting on a groupware platform now? (# of days per week)	0	7	4.54	5.00	1.56
Q9.	On average, how many hours each day, did you spend using a groupware platform prior to the COVID-19 pandemic?	0	9	2.19	1.00	2.79
Q10.	On average, how many hours each day, did you spend using a groupware platform during the COVID-19 pandemic after the work restriction was implemented?	0	14	6.11	6.00	3.13
Q11.	On average, how many hours each day, did you spend using a groupware platform now?	0	13	5.70	6.00	3.15

Qualitative Survey Results

Groupware Experience During Pandemic

Q12. Why did your organization decide to use groupware?

Survey question #12 was an open-ended question. The pandemic served as a catalyst,

compelling both organizations and employees to reconsider traditional work processes and procedures and embrace technology-driven alternatives. Many respondents indicated that enhanced collaboration ($n = 8$) and the COVID-19 pandemic ($n = 5$) were the reasons their organizations decided to use groupware. It enabled them to communicate better with the team. The pandemic forced them to telework, and they found email and video teleconferencing (VTC) insufficient. Due to the COVID-19 pandemic, work restrictions were imposed on participants for safety and health reasons. One participant responded, "More effective way to communicate with everyone, across multiple locations, and with COVID restrictions to keep everyone safe and have an effective work environment along with finding new ways to keep stress levels down and productivity up." The urgency of the situation led to reduced resistance to change, as employees recognized the necessity of technology for business continuity. Responses are summarized in a word cloud in Figure 5, while the reasons the organization decided to use groupware are presented in Table 9.

Figure 5

Word Cloud: Groupware Use

Table 9

Reasons Organization Decided to use Groupware

Response	n
Collaboration	9
Covid	8
Pandemic	5
Restrictions	4
Effective	4
Telework	3
Cost	3
Communication	2
Health	2
Safety	2

Q13. Did your organization leverage groupware prior to the pandemic? If not, what do you think contributed to the use of groupware during the pandemic?

Survey question #13 was an open-ended question. Many (*n* = 11) participants responded that their organizations did not leverage groupware prior to the pandemic. Eighteen participants

(66.7%) answered the question. Participants listed reasons such as limiting exposure to COVID-19, childcare issues, safety of people, the ability to stay connected, and that groupware enabled teleworking and social distancing. Groupware facilitated easier communication with personnel. The organization needed to implement a more effective method of accountability and participation verification procedures to ensure work tasks are performed efficiently and everyone is online and contributing as required. The health risks imposed by COVID forced organizations to search for safer means of information sharing and collaborating daily. See Figure 6 and Table 10.

Figure 6

Word Cloud: Contributing Factors

Table 10

Factors Contributing to Use of Groupware During Pandemic

Response	n
Yes	2
No	24
Communicate	5
Pandemic	4
Groupware	4
Organization	3
Safety	2
Requirement	2
Telework	1
N/A	1
Total	27

Q14. What benefits did your organization experience while using Groupware?

Survey question #14 was an open-ended question and describes some of the acceptance factors that contributed to groupware use withing their organization. Eighteen participants (66.7%) answered the question. Several ($n = 6$) participants responded that the groupware provided opportunities for collaboration remotely. Participants could work together from anywhere and at any time. Groupware helped participants stay engaged. Four participants mentioned communication as a benefit. Groupware facilitated communication through laptops, use of webcams, and the scheduling calendar in Microsoft Teams. Groupware provided multiple ways of communicating by avoiding in-person contact. Time was another recurring theme in the pattern of responses ($n = 5$). Groupware enabled respondents to "sync" in real time. Participants spent less time driving to and from work. Team members used their time more efficiently. Three participants mentioned family as a benefit to using groupware. "Life and time with family became more valuable than work." Using groupware allowed participants to spend more time with their families. It allowed them to better manage the balance between work life and family. Groupware also enabled respondents to provide quality work to their organizations. Individuals'

personal and professional factors could have played a significant role in how they perceived and

used the groupware videoconferencing technology. These factors can impact whether the team

members see the benefits of using the technology outweighing the challenges, influencing their

overall acceptance of the technology. See Figure 7 and Table 11.

Figure 7

Word Cloud: Organizational Benefits

Table 11

Organizational Benefits to Using Groupware

Responses	*n*
Ability to Work	6
Collaboration Remotely	6
Continued Communications	4
Family	3
Easy	2
Teams	2
Safety Reasons	1

Q15. Did groupware degrade your organization's ability to operate during the pandemic? If so, please explain.

Survey question #15 was an open-ended question. Eighteen participants (66.7%) answered the question. The majority of respondents who answered Question #15 ($n = 11$) stated that Groupware did not degrade their organizations' ability to operate during the pandemic, but instead enhanced it. Morale and work production was at their highest. One participant disclosed that labor jobs that required hands-on work (ex: mechanical and electric) were on pause for a while. A participant indicated that some staff were not technically savvy, saying that "There was a significant learning curve among some sections of the staff that were not as technically [sic] savvy. However, once a baseline level of understanding was reached, productivity and performance rose to pre-pandemic levels." Another participant cited the lack of usage rules and standards for groupware decreased operational effectiveness, stating that the "Use of groupware alone did not, not developing usage rules and standards did decrease operational effectiveness— this still affects operations today". See Figure 8 and Table 12.

Figure 8

Word Cloud: Groupware Effectiveness

Table 12

Groupware Degrade Organizational Effectiveness

Response	*n*
Yes	0
No	15
Enhanced	4
Increased Productivity	4
Increased Performance	4
High Morale	3
N/A	12
Total	27

Q16. Did senior-level leadership influence your acceptance of groupware?

Survey question #16 was an open-ended question. Eighteen participants (66.7%)
answered the question. When senior leaders endorse and promote the use of innovative
technology, it can positively influence employees' attitudes and willingness to adopt the
technology for their daily tasks. Leadership support can enhance employees' confidence in the
technology's value and encourage its effective implementation. Most respondents ($n = 12$)
answered, "yes." Responses included "It was mandated." "Senior leadership fully supported it."
"They mandated the use of Microsoft Teams." However, three participants responded, "No."
Senior leadership had to learn how to use groupware and become familiar with it. See Figure 9
and Table 13.

Figure 9

Word Cloud: Influence

Table 13

Senior-Level Leadership Influence Acceptance of Groupware

Response	*n*
Yes	12
No	3
N/A	12
Total	27

Q17. What conditions led to you accepting the use of Groupware?

Survey question #17 was an open-ended question that received a variation of acceptance factors responses. Several conditions were identified that contributed to the regular use of groupware technology. Some of the conditions that were identified were remote work necessity due social distancing measures. Employees had to leverage technology to maintain productivity and collaboration from home. The need for instant and efficient communication influenced the use of groupware platforms to bridge the communication gap caused by physical separation. Groupware technology provided flexibility and accessibility capabilities that allowed employees

the ability to access work-related information remotely, which provided a degree of mobility and flexibility that were not as prevalent previously. Nineteen participants answered (70.4%) the question. Four respondents replied that it was mandatory. Five participants mentioned COVID-19 or the pandemic restrictions. Two respondents suggested need: "There was a need to support communication and to collaborate." "It improved workgroup coordination." See Figure 10 and Table 14.

Figure 10

Word Cloud: Acceptance Conditions

Table 14

Conditions That Led to Acceptance of Groupware

Response	n
Covid	5
Mandatory	4
Pandemic	4
Collaboration	3
Need	3

Q18. Do you prefer the traditional meeting in a conference room or a virtual meeting using groupware?

Twenty-one participants (77.8%) answered Question #18. Approximately half (51.9%, *n* = 14) preferred online virtual meetings, whereas 25.9% (*n* = 7) preferred traditional meetings in a conference room. See Table 15.

Table 15

Meeting Preference

Meeting Preference	*n*	*%*	Valid *%*
Traditional Meeting in a conference room	7	25.9	33.3
Online Virtual Meeting	14	51.9	66.7
Total	21	77.8	100.0
Not Answered	6	22.2	
Total	27	100.0	

Q19. Did groupware improve your organization's ability to operate during the pandemic? If so, please explain.

Twenty-five participants (92.6%) answered Question #19. Sixteen participants answered, "yes." Responses included, it eased the pressure of taking care of family and maintaining operations and communication. As a result, morale and productivity were high. It facilitated collaboration. It improved knowledge management and impromptu meetings. It allowed organizations to conduct business without putting staff at risk. It empowered the unit to conduct business from any internet-capable device anytime and anywhere. Two participants responded both "yes" and "no," as there were still colleagues who demanded in-person meetings and "hated" using groupware or could not get the platforms to work. One respondent cited inconsistent criteria for determining organizational productivity, saying that "As the organization is primarily a knowledge-based work organization, objective determinations for organizational

productivity were not consistent. Subjectively, employees have noted increases in productivity".

Users' opinion on whether groupware influenced their organization's ability to operate may

influence technology acceptance, leading to adoption. See Figure 11 and Table 16.

Figure 11

Word Cloud: Organizational Effects

Table 16

Groupware Improved Organization's Ability to Operate During Pandemic

Response	n
Yes	16
No	7
N/A	2
Total	27

Groupware Experience Post-COVID

Q20. Using groupware allows me to be more interactive with my co-workers than before

the pandemic workplace restrictions. (Scale 1 to 5, with 1 = Strongly Disagree, 2 =

Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 1 to 5 ($M = 3.83$, $SD = 1.27$). With a mean of 3.83, overall, participants agreed.

Q21. Using groupware contributes to my daily tasks. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 3 to 5 ($M = 4.09$, $SD = 0.75$). With a mean of 4.09, overall, participants agreed.

Q22. Using groupware degrades my ability to effectively complete my daily tasks. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 1 to 5 ($M = 2.13$, $SD = 1.25$). With a mean of 2.13, overall, participants disagreed.

Q23. Using groupware enhances my ability to collaborate with people I work with? (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 3 to 5 ($M = 4.21$, $SD = 0.78$). With a mean of 4.21, overall, participants agreed.

Q24. I prefer to use groupware instead of in-person meetings. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 1 to 5 ($M = 3.50$, $SD = 1.22$). With a mean of 3.50, overall, participants agreed.

Q25. I started using the groupware before the COVID-19 pandemic. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 1 to 5 ($M = 2.71$, $SD = 1.43$). With a mean of 2.71, overall, participants were neutral.

Q26. I started using the groupware during COVID-19 Pandemic. (Scale 1 to 5, with 1 =

Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 1 to 5 ($M = 3.75$, $SD = 1.33$). With a mean of 3.75,

overall, participants agreed.

Q27. I still use the virtual meeting platform after COVID-19 Pandemic. (Scale 1 to 5, with 1

= Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 3 to 5 ($M = 4.38$, $SD = 0.71$). With a mean of 4.38,

overall participants agreed. Survey responses to Questions 20–27 are summarized in Table 17.

Table 17

Survey Responses to Questions 20–27

	Questions	*M*	*SD*
Q20.	Using GroupWare allows me to be more interactive with my co-workers than before the pandemic.	3.83	1.27
Q21.	Using groupware contributes to my daily tasks.	4.09	0.75
Q22	Using groupware degrades my ability to effectively complete my daily tasks.	2.13	1.25
Q23.	Using groupware enhances my ability to collaborate with people I work with.	4.21	0.78
Q24.	I prefer to use groupware instead of in-person meetings.	3.50	1.22
Q25.	I started using the groupware before COVID-19 Pandemic.	2.71	1.43
Q26.	I started using the groupware during COVID-19 Pandemic.	3.75	1.33
Q27.	I still use the virtual meeting platform after COVID-19 Pandemic.	4.38	0.71

Note. Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree

Q28. I prefer to use the following virtual meeting platform the most: Google Meet, Cisco Web Ex, Adobe Connect, MS Teams, or Skype. (Rank from 1-5, with 1 being the most preferred)

_____ **Google Meet (1)**

_____ **Cisco Web Ex (2)**

_____ **Adobe Connect (3)**

_____ **MS Teams (4)**

_____ **Skype (5)**

Question #28 was answered with descriptive statistics, which were generated for each platform and arranged in ascending order by the means. Thus, the most preferred virtual meeting platforms were MS Teams ($M = 2.28$, $SD = 1.87$), Adobe Connect ($M = 2.87$, $SD = 0.92$), Skype ($M = 3.20$, $SD = 1.61$), Cisco Web Ex ($M = 3.40$, $SD = 1.12$), and Google Meet ($M = 3.64$, $SD = 1.15$) respectively. See Table 18.

Table 18

Preferred Virtual Meeting Platform Ranked in Ascending Order by Means

Platforms	*n*	*Minimum*	*Maximum*	*M*	*SD*
MS Teams	18	1	5	2.28	1.87
Adobe Connect	15	1	4	2.87	0.92
Skype	15	1	5	3.20	1.61
Cisco Web Ex	15	2	5	3.40	1.12
Google Meet	14	2	5	3.64	1.15

Q29. I prefer to use groupware for sharing information versus sending emails. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 1 to 5 ($M = 3.83$, SD = 0.98). With a mean of 3.83, overall, participants agreed.

Q30. My organization is more efficient after incorporating groupware into our daily operations because of the workplace restrictions. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 3 to 5 (M = 4.00, SD = 0.72). With a mean of 4.00, overall, participants agreed.

Q31. As a result of the pandemic workplace restrictions, my organization is more effective when using groupware for our daily operations. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

Participant responses ranged from 3 to 5 (M = 4.00, SD = 0.83). With a mean of 4.00, overall, participants agreed. Survey responses to Questions 29-31 are summarized in Table 19.

Table 19

Survey Responses to Questions 29–31

Questions	M	SD
Q29. I prefer to use groupware for sharing information versus sending emails.	3.83	0.98
Q30. My organization is more efficient after incorporating groupware into our daily operations because of the workplace restrictions.	4.00	0.72
Q31. As a result of the pandemic workplace restrictions, my organization is more effective when using groupware for our daily operations.	4.00	0.83

Analysis Tool Screenshots

When collecting groupware metrics, the researcher was unable to collect data due to the lack of frequency and use of specific groupware platform prior to the COVID-19 pandemic. Over a 90-day period, one Signal Brigade had almost 600 users using groupware for internal meetings, as depicted in Figure 12.

Figure 12

Number of Users in a 90-day Period
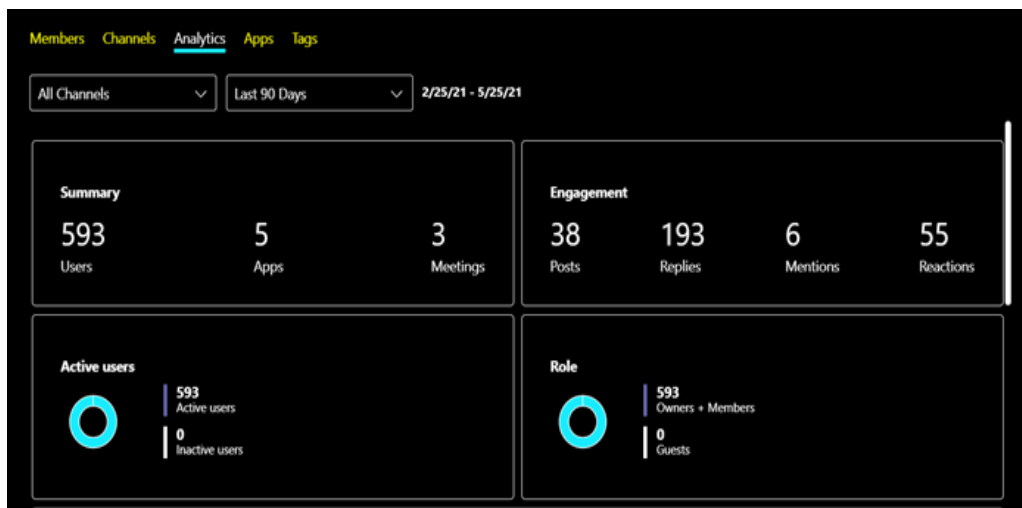
Over the same 90-day period, the organization had up to 268 personnel using the

groupware platform on a given day, as illustrated in Figure 13.

Figure 13

Number of Users per day During a 90-day Period

During the same 90-day period, for one Teams group, consisting of 20 users, engagement

consisted of 1,518 posts, 1,106 replies, and 2,139 reactions, as shown in Figure 14.

Figure 14

Number of Members in a Single Teams Group

The same Teams group was consistently active every day during the same 90-day period, as depicted in Figure 15.

Figure 15

Teams Group Activity

During the pandemic, multiple teams' channels were created by the organization to hold specific meetings and trainings. A single person can belong to various channels depending on their job requirements. The groupware software allowed small, medium, or large collaboration teams to be established depending on the topic. See Figure 16.

Figure 16

Various Team Channels with Varying Participants

Active users	People	Guests	Posts	Replies
620	1,010	0	0	33
3	7	0	0	0
203	358	0	1	10
575	864	0	5	34
20	20	0	1,458	977
132	166	0	5	11
117	250	5	0	0
201	250	4	24	110
2,968	3,087	1	972	6,221
74	137	5	1	0
8	26	0	0	0
56	67	0	1	2
14	25	0	0	0
1,243	1,269	0	21	18
589	621	0	33	172
268	320	0	54	218
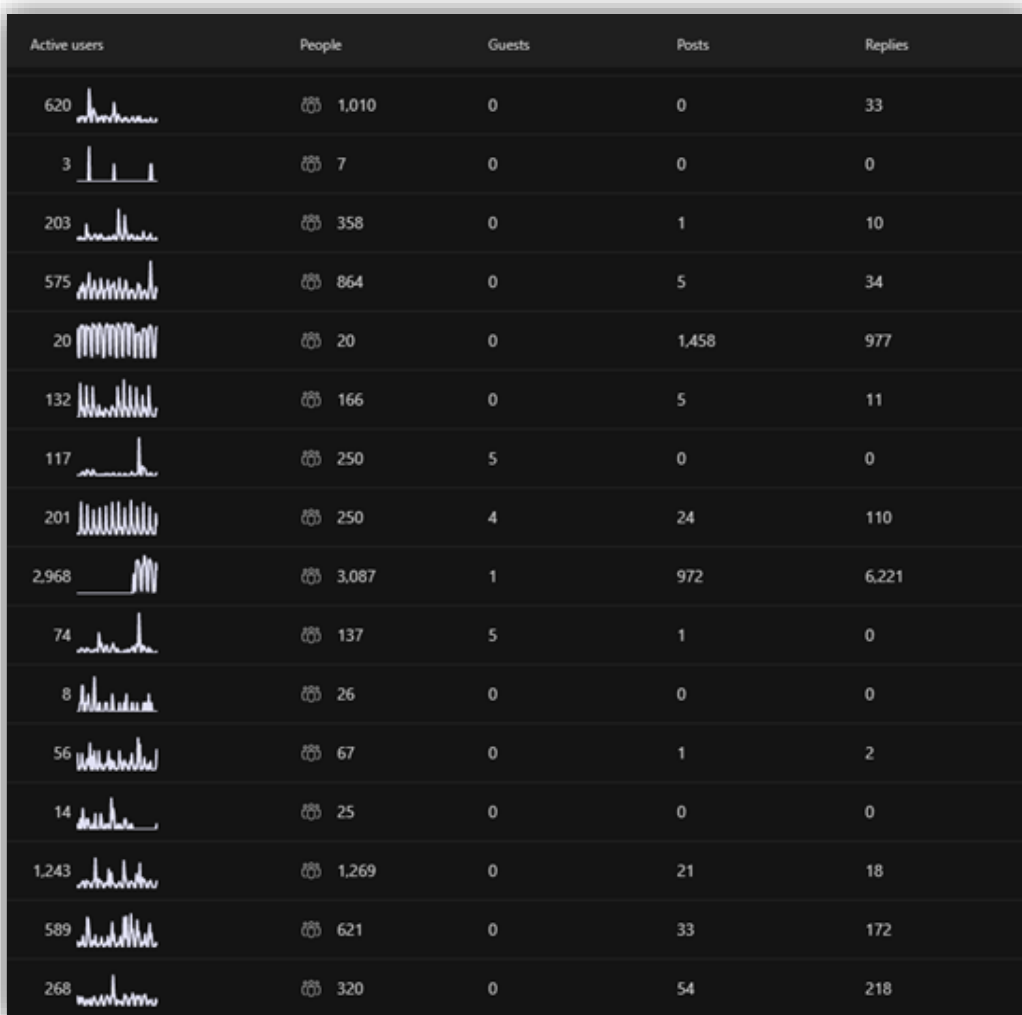
Figure 17 shows the scalability of groups and the frequency of active users over a 90-day period.

Figure 17

Various Team Channels with Varying Participant Sizes

Active users	People	Guests	Posts	Replies
13	13	0	2	3
88	129	0	5	2
52	81	0	2	0
56	69	0	4	2
18	60	4	0	0
615	593	0	38	181
440	712	1	5	14
201	378	0	0	2
76	81	0	1	5
620	1,010	0	0	33
3	7	0	0	0
203	358	0	1	10
575	864	0	5	34
20	20	0	1,458	977
132	166	0	5	11
117	250	5	0	0

Due to the increase security parameters of MS Teams, access to the application's metrics were disabled. Metrics showing the use of MS Teams post-pandemic were not able to be accessed or collected.

Summary of Chapter Four

The case study research data collection was conducted via a survey, groupware metrics, and organizational policies over a 6-month period in 2022. A total of 27 participants were surveyed during that 6-month period. The survey results were analyzed using SPSS and word cloud software. The researcher identified themes in the survey results by using description-focused coding. The researcher utilized SPSS software to analyze the survey's statistical results. Codes were used to show correlation to the theoretical research frameworks.

To identify and highlight important and frequently used words to show common viewpoints and thoughts, the researcher used word cloud visualizations. Word clouds are images consisting of words specific to a particular subject that are used to assist the reader in visualizing a message or trend. The researcher leveraged word clouds to show the survey's qualitative results. The researcher used coding and triangulation to ensure consistency in the data analysis. Participants cited limiting COVID-19 exposure, childcare issues, and the ability to stay connected as reasons for using groupware to continue operations.

The case study's research question was directly addressed through the survey results, which identified several factors that played a role in the acceptance of groupware technology within Army Signal brigades during the COVID-19 pandemic, collectively leading to the technology's adoption within the organization. These factors included elements such as the urgency of remote communication needs, leadership support, training requirements, perceived benefits of groupware, and the broader context of the pandemic's impact on work dynamics and collaboration within the units. The goal was to gain insights into how these factors interacted to drive or hinder the adoption of groupware in a unique and challenging work environment.

While Chapter 4 explores the data collection findings, Chapter 5 will discuss the significance of those findings. Additionally, Chapter 5 will encompass research conclusions and recommendations. The conclusion of the case study will also offer insights and suggestions for future research endeavors.

CHAPTER 5 CONCLUSION AND RECOMMENDATIONS

Chapter 5 will cover limitations, interpretations, implications, and recommendations for further research. The researcher will highlight his perspective on the major themes. The researcher will also provide implications and recommendations for further research. The objective of this case study was to investigate diverse perspectives on groupware implementation but also to identify and analyze key acceptance factors that can contribute to the adoption of innovative technologies. The researcher leveraged TAM to guide the study and data collection to identify which user acceptance factors influenced the TOE framework adoption factors. The results and interpretation of the research are related to the stated purpose of the research.

This study aimed to investigate the circumstances that IT organizations and professionals encounter when seeking support and acceptance for new technological initiatives, as well as achieving widespread adoption of these initiatives. According to participants Robinson's (2015) study, user acceptance of modern technology was hampered by a lack of communication in 58% of cases, a lack of collaboration in 42% of cases, and a lack of involvement in 29% of cases. To explicitly answer the study's research question, "W*hat acceptance factors influenced the degree to which U.S. Army Signal Brigades adopted videoconferencing groupware technologies during the COVID-19 lockdown?"*, organizations started using new methods of coordination and collaboration to sustain operations because of the COVID-19 pandemic restriction on personnel in the workplace, leading to user acceptance that contributed to the overall organizational adoption of groupware use. The organizations experienced cultural challenges and financial losses when new initiatives were not adopted or accepted.

Limitations of Study Findings

One of the restrictions placed on the research study was the intended sample size. According to Yin (2018), the purpose of doing research using a case study is to investigate the most important aspects of the case. The researcher asked a variety of questions to a wide range of respondents who held varying titles and degrees of responsibility. The researcher posed questions to individuals with diverse perspectives and levels of influence over how groupware was used in their organizations. According to Yin (2018), statistical generalization is the commonly understood form of generalizing research. Statistical generalization allows an inference to be made about a population based upon a sample from that population (Yin, 2018). The themes that were discovered by the researcher were written down and generalized so that they could be looked at in further depth later. The findings of the research represent certain viewpoints on what elements contributed to user acceptability and do not necessarily exist in each of the three brigades. In addition, because of access restrictions, groupware metrics could only be collected from a single signal brigade.

Interpretations

In the following section, the researcher provides an interpretation of the study findings. The researcher discusses multiple relevant findings depicting user acceptance that influenced organizational adoption, including collaboration, COVID-19 pandemic implications, accountability, work production, personal life, and training requirements. These findings were sourced from the individual users' responses and can be useful in future technology implementations. The COVID-19 pandemic presented unique challenges to the military, including the need for social distancing, remote work, and reduced physical interactions. As a

result, groupware technologies have played a crucial role in facilitating communication, collaboration, and maintaining operational readiness.

Collaboration

With restrictions on in-person meetings, the military relied on groupware tools for virtual meetings and videoconferencing. Groupware allowed military personnel to conduct important briefings, planning sessions, and coordination efforts remotely, ensuring continuity of operations while minimizing the risk of virus transmission. Videoconferencing software enables teams to communicate and collaborate in real-time, regardless of their physical locations. It allows for face-to-face interactions, promoting better understanding, idea sharing, and brainstorming. This fosters collaboration among team members and improves overall productivity. The majority of participants (93%) indicated that the groupware's ability to facilitate collaboration improved knowledge management and impromptu meetings. Participants described how the groupware allowed organizations to continue operations without putting staff at risk. Participants cited that groupware allowed personnel the ability to work together from anywhere and at any time. Some participants stated that the groupware technology facilitated communication and information sharing through laptops, webcams, and calendar scheduling. Groupware provided multiple modes of communicating while avoiding in-person contact.

COVID-19 Pandemic

Five participants mentioned the pandemic workplace restrictions as one of the contributing factors for accepting groupware. The researcher believes that the workplace restrictions and need to continue operations to ensure mission readiness was a significant factor to users' acceptance of the videoconferencing initiative. The pandemic forced participants to telework; email and video teleconferencing (VTC) were insufficient means of communication.

Due to the COVID-19 pandemic, work restrictions were imposed on participants for safety and health reasons. One participant responded, "[The work restrictions were a] more effective way to communicate with everyone, across multiple locations and with COVID restrictions to keep everyone safe and have an effective work environment.

Accountability

Groupware facilitated easier communication with personnel. The organization needed to increase accountability and participation in work tasks. The videoconferencing groupware platform provided notifications of when their personnel were last online and the duration of their activity. Leaders were able to visually check whether their employees were online by either a green circle with a check, which meant that individual was currently active, a yellow circle with a check, which meant the individual was temporarily away, a solid red circle that signaled that the individual was in a meeting or on a call, or a white circle with a red arrow, that meant the individual was offline.

Work Production

Groupware tools facilitate remote work by enabling employees to connect and participate in meetings from anywhere with an internet connection. This flexibility promotes work-life balance, accommodates diverse schedules, and allows organizations to tap into talent from different geographical areas. Participants stated leadership involvement contributed to the use of videoconferencing groupware. The majority of the participants felt like senior leadership fully supported the use of groupware. Some senior leaders supported the videoconferencing option despite having any previous knowledge or training. Senior leadership had to learn how to use groupware at the same time as their employees, placing everyone on the same learning curve. Most respondents stated that both morale and work production were at their highest. One

respondent stated the lack of governance decreased operational effectiveness rather than the technology itself. Time was another recurring theme in the pattern of responses. Groupware enabled respondents to "sync' in real time. They spent less time driving to and from work. Team members used their time more efficiently.

Training

One research participant indicated that some staff members were not technically savvy, which created a significant learning curve. Once training was provided and a level of understanding was established, productivity and performance rose to pre-COVID levels. Once the decision was made to use MS Teams to conduct daily meetings and collaboration tasks, leaders had to make sure training was available for those individuals unfamiliar with how to use the groupware. Training "how-to" papers, pre-recorded videos, and live sessions were developed in order to minimize the knowledge gap.

Personal Life

Videoconferencing eliminates the need for extensive travel for meetings, conferences, or client interactions. By conducting virtual meetings, organizations can significantly reduce travel expenses, such as transportation, accommodation, and meals. It also saves valuable time that would otherwise be spent on travel. Three participants mentioned family as a benefit to using groupware. One of the participants stated, "life and time with family became more valuable than work". Being at home allowed them to spend more time with their families. It allowed them to better manage the balance between work life and family. Individuals were able to multitask between work and home tasks in some cases. Individuals also experienced cost savings due to decreased fuel usage, vehicle maintenance, child-care expenses, and additional meal expenses, often occurred due to being in the office. Some individuals were able to save money due to

decrease vehicle fuel and maintenance costs that they incurred due to driving to and from the workplace. Additionally, individuals saved childcare or afterschool program expenses because now the child or children were able to stay at home.

Recommendations

This study augments the current knowledge to provide additional research information on practices that can be used in future research on contributing factors in organizations implementing innovative technology and gaining user acceptance. Future researchers can also analyze the procedures and processes used to adopt and accept innovative technologies in a time-constrained, dispersed environment. Future researchers can expand this study to identify additional correlations of TAM and TOE factors that can contribute to the development of a formalized technology implementation plan.

Technology Enhancement

Future researchers can study how groupware influence on collaboration and work production. Users' ability to collaborate effectively may drive the use of groupware in the future. Researchers can analysis if collaboration and work production continue to improve post-pandemic and after the return to the workplace. The U.S. Army eventually transitioned to multiple Microsoft services, i.e., email, file storage, Power BI, etc., after the decision was made to use MS Teams as the daily operational option for meetings, collaboration, voice calls, and information sharing. Groupware allowed military personnel in remote locations to connect with subject matter experts or senior personnel for guidance, advice, and knowledge sharing. This can be particularly valuable in scenarios where immediate on-site expertise may not be available, enabling remote support and mentoring.

Groupware Use Post-COVID-19

During this study, many organizations lifted workplace restrictions and allowed personnel to return to the office. Future researchers can explore if efficiencies or cost savings were achieved by leveraging groupware technology. Future research can explore what additional technology was implemented due to the initial adoption of groupware during the pandemic. The entire Department of Defense transitioned to Microsoft Office 365 during the pandemic. A future study can explore what factors during the acceptance of videoconferencing groupware led to the new initiatives. Groupware tools can facilitate remote command and control operations by enabling real-time collaboration among military leaders, commanders, and personnel located in different geographical areas. This allows for swift decision-making, situation awareness, and coordination of military operations. Researchers can explore ways to improve the user experience of groupware tools, making them more intuitive, user-friendly, and tailored to specific user needs. This includes designing interfaces that accommodate diverse user preferences, accessibility requirements, and varying levels of technological proficiency.

Integrating artificial intelligence (AI) capabilities into groupware can enhance collaboration by automating routine tasks, providing intelligent recommendations, and improving information retrieval. Future research may focus on developing AI algorithms that can understand and assist in complex collaborative scenarios, such as facilitating decision-making or managing information overload. Exploring the integration of augmented reality (AR) and virtual reality (VR) technologies with groupware could enable immersive and interactive collaborative experiences. This may involve creating virtual meeting spaces, virtual whiteboards, or shared 3D environments where users can collaborate and visualize information in a more engaging manner.

Training

  Several participants stated the lack of procedures or training on the use of the videoconferencing groupware. Future research can be used to explore various training delivery modes and their influence on user acceptance. Additionally, future researchers can study how to implement and enforce standards in a decentralized environment. Groupware technologies have enabled the military to continue training and professional development activities despite travel restrictions and social distancing requirements. Videoconferencing software can be utilized for training sessions, webinars, and workshops. Organizations can conduct remote training programs, reaching a broader audience without the need for physical gatherings. This expands learning opportunities, enables knowledge sharing, and facilitates professional development.

Security

  With increased reliance on groupware tools, the military has had to place significant emphasis on cybersecurity to protect sensitive information and prevent unauthorized access. Cyber defense measures and protocols have been strengthened to mitigate potential threats and vulnerabilities associated with the expanded use of groupware technologies. Organizations' decision to adopt MS Teams as the primary means of information sharing, collaboration, and meeting, a more secure version was implemented that only allowed authenticated access while connected to the Department of Defense network. Zoom, one of the previously used videoconferencing applications, had significant security and privacy breaches so a decision was made to transition solely to MS Teams. Researchers could study security and privacy aspects of videoconferencing applications. Groupware technologies with robust encryption and security measures can enhance secure communication and information sharing within military organizations. These tools can facilitate classified discussions, document sharing, and real-time

collaboration while ensuring the integrity and confidentiality of sensitive information. As groupware often involves the sharing of sensitive information, research can delve into enhancing privacy and security measures. This includes developing robust encryption techniques, authentication mechanisms, and secure data transmission protocols to safeguard confidential data during collaborative activities.

Conclusion

In the following section, the researcher presents a summary of findings, applicability, and recommendations. Through this study, discovered multiple user acceptance factors that influenced the adoption of groupware videoconferencing software within the Army Signal brigades. The study enhances current insights and understanding of groupware technology, complementing Jonathan Grudin's prior work. By building upon Grudin's research, our study's findings enrich the existing body of knowledge, advancing the field and offering fresh perspectives on how TAM and TOE influence the implementation and utilization of groupware technologies. Additionally, the researcher presents recommendations for future research directions.

Future research may focus on leveraging data analytics to gain insights from groupware usage patterns. Analyzing interaction data, user behaviors, and collaboration dynamics can provide valuable insights into team performance, communication patterns, and overall productivity. Researchers can develop techniques to extract meaningful analytics that inform organizational decision-making and improve collaborative processes. These areas represent potential avenues for future research in groupware, with the aim of advancing collaboration technologies and further improving the efficiency and effectiveness of collaborative work.

An IT team can apply these findings to understand the diverse perspectives and factors when implementing new groupware technology. A paradigm shift or significant crisis can compel people to accept new ways of doing things and serve as the impetus for the technological disruption that follows. Leaders were less reluctant to meet in-person and chose to leverage virtual meeting platforms to continue operations because of the unfavorable circumstances surrounding COVID-19 and the constraints that were placed on the workplace. Future research can extend the current study. Participants stated not only did work production increase to pre-pandemic levels, but morale was also high. The level of work production and Groupware use, post-COVID, would be an interesting topic for future research. Overall, groupware, particularly videoconferencing software, empowers organizations with efficient collaboration, cost savings, flexibility, improved decision-making, better communication, and enhanced learning opportunities. It has become an essential tool for modern workplaces, particularly in the context of remote work and geographically dispersed teams.

Groupware can be used to create virtual training environments where military personnel can engage in realistic simulations, scenario-based exercises, and mission rehearsals. This allows for remote training, interconnectivity between multiple training sites, and the replication of complex operational scenarios. These potential future applications of groupware in the military aim to enhance operational capabilities, situational awareness, and collaboration among military personnel. As technology advances and new capabilities emerge, the military is likely to leverage groupware solutions to further optimize its effectiveness in diverse operational scenarios.

The adoption of groupware technologies in the military during the pandemic enabled remote command and control procedures and processes. Military leaders and commanders were

able to monitor and direct operations from remote locations, leveraging groupware tools to maintain situational awareness, issue orders, and ensure effective coordination of forces. The researcher described findings on how the organizations used groupware to continue daily operations and information sharing despite being geographically dispersed. Groupware fostered increased communication and coordination within the organizations. Videoconferencing provided visual cues, tone of voice, and body language, which enhanced the clarity and effectiveness of communication. It created a more engaging and interactive environment for team members, boosting morale and team cohesion. Videoconferencing software enabled real-time discussions and decision-making, ensuring quick and efficient resolution of issues. It brought key stakeholders together, allowing for faster alignment and consensus building. Decision-making processes were streamlined, reducing delays, and enhancing overall organizational agility. In summary, the case study highlights that the organization's effective adoption of groupware technology stemmed from a combination of factors that collaboratively nurtured user acceptance.

While traditions are often cherished within organizations, unforeseen circumstances can prompt unexpected changes. In the military, the longstanding tradition of gathering in conference rooms around large wooden tables has evolved to embrace groupware videoconferencing as a viable alternative, even as personnel return to the workplace. The benefits identified during the pandemic have led leaders to recognize the opportunities and efficiencies afforded by groupware for collaboration and information sharing.

APPENDIX A

INVITATION TO PARTICIPATE

S**YRACUSE**** U****NIVERSITY**** S****CHOOL OF**** I****NFORMATION**** S****TUDIES**

My name is Jeremiah S. Owoh, and I am a doctoral student at Syracuse University. I am inviting you to participate in a research study.

I am interested in learning about how the COVID-19 pandemic influenced the percentage of organizations that use online collaboration platforms in U.S. Army Signal Brigades. You will be asked to give your opinion on how the pandemic influenced your and your organization's adoption and acceptance of groupware. Groupware is any application software designed to help people working on a common task attain their goals. This will take approximately 30-45 minutes of your time.

Involvement in the study is voluntary. This means you can choose whether to participate and that you may withdraw from the study at any time without penalty.

If you have any questions, concerns, or complaints about the research, please contact Jeremiah Owoh, at jsowoh@syr.edu.

Whenever one works with email or the internet, there is always the risk of compromising privacy, confidentiality, and/or anonymity. Your confidentiality will be maintained to the degree permitted by the technology being used. It is important for you to understand that no guarantees can be made regarding the interception of data sent via the internet by third parties.

I am 18 years of age or older, and by clicking here, I agree to participate in this research study.

https://syracuseuniversity.qualtrics.com/jfe/form/SV_dpuQr1iUqCp6grY

APPENDIX B

RESEARCH QUESTION: What factors influenced the degree to which U.S. Army Signal Brigades adopted and accepted videoconferencing groupware technologies during the covid-19 lockdown?

Note: Groupware is any application software designed to help people working on a common task to attain their goals.

TELL US ABOUT YOURSELF INCLUDING ROLE AND TECHNICAL SKILL LEVEL (QUALIFYING QUESTIONS)

1. What role/position do you currently serve?

2. Is your role/position considered action officer, managerial, supervisory, or senior management?

3. How knowledgeable are you with using groupware?

4. Did you play a role in implementing or adopting groupware in your organization?

TELL US ABOUT YOUR EXPERIENCE WITH GROUPWARE PRIOR TO 2020

5. Do you think groupware enhances or degrades your organization's productivity?

6. How often do you participate in a meeting on a groupware platform prior to the COVID-19 pandemic? (# of days per week)

7. How often do you participate in a meeting on a groupware platform during the COVID-19 pandemic after the work restriction was implemented? (# of days per week)

8. How often do you participate in a meeting on a groupware platform now? (# of days per week)

9. On average, how many hours each day did you spend using a groupware platform prior to the COVID-19 pandemic?

10. On average, how many hours each day did you spend using a groupware platform during the COVID-19 pandemic after the work restriction was implemented?

11. On average, how many hours each day did you spend using a groupware platform now?

12. Why did your organization decide to use groupware?

TELL US ABOUT HOW YOU EXPERIENCED THE PANDEMIC AS IT AFFECTED YOUR USE OF NEW MEETING TOOLS

13. Did your organization leverage groupware prior to the pandemic? If not, what do you think contributed to the use of groupware during the pandemic?

14. What benefits did your organization experience while using groupware?

15. Did groupware degrade your organization's ability to operate during the pandemic? If so, please explain.

16. Did senior-level leadership influence your acceptance of groupware?

17. What conditions lead to you accepting the use of groupware?

18. Do you prefer the traditional meeting in a conference room or a virtual meeting using groupware?

19. Did groupware improve your organization's ability to operate during the pandemic? If so, please explain.

TELL US ABOUT THE RETURN TO IN-PERSON BASE OPERATIONS AND YOUR EXPERIENCE WITH GROUPWARE AFTER THE ACUTE STAGE OF THE PANDEMIC

20. Using GroupWare allows me to be more interactive with my co-workers than before the pandemic workplace restrictions. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

21. Using GroupWare contributes to my daily tasks. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

22. Using GroupWare degrades my ability to effectively complete my daily tasks. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

23. Using GroupWare enhances my ability to collaborate with people I work with? (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

24. I prefer to use GroupWare instead of in-person meetings. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

25. I started using GroupWare before COVID-19 Pandemic. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

26. I started using the GroupWare during COVID-19 Pandemic. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

27. I still use the virtual meeting platform after COVID-19 Pandemic. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

28. I prefer to use the following virtual meeting platform the most: Google Meet, Cisco WebEx, Adobe Connect, MS Teams, or Skype. (Rank from 1-5, with 1 being the most preferred)

29. I prefer to use GroupWare for sharing information versus sending emails. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

30. My organization is more efficient after incorporating GroupWare into our daily operations because of the workplace restrictions. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

31. As a result of the pandemic workplace restrictions, my organization is more effective when using GroupWare for our daily operations. (Scale 1 to 5, with 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 =Strongly Agree)

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Information Technology Infrastructure Library (ITIL) v3 Foundation
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Professional Experience:
Director, Task Force Mercury / Chairman, C4I Joint Working Group

United States Forces Korea (USFK) (June 2022 – Present)

Job Description:

Working Group responsible for planning, negotiating, validating, engineering, programming and implementing C4I capabilities to support the realignment and relocation of U.S. Forces Korea.

Cybersecurity, Deputy Division Chief

Fort Sam Houston, TX (July 2020 – June 2022)

Job Description:

Responsible for overseeing the Cybersecurity (CS) program for 16 Network Enterprise Centers (NEC) and 26 network convergence locations in the Brigade's Area of Responsibility (AOR); accountable for establishing, managing, and assessing the effectiveness of all aspects of the CS program within the AOR.

Cyberspace Current Operations, Chief

NATO Allied Land Command in Izmir, Turkey (May 2019 – July 2020)

Job Description:

Responsible for the supervision and coordination of multinational, 26-member NATO Cyberspace Staff (consisting of US, Turkish, German, Spanish, Canadian, Polish, French, British, and Italian officers, NCOs, and civilians to resolve CIS/cybersecurity issues and mission critical tasks.

Command Knowledge Management Chief

Fort Sam Houston, TX (January 2017 – May 2019)

Job Description:

Established a sustainable Command KM Program that strengthened and improved the organization's information flow, accessibility, and dissemination in support of mission objectives and decision-making.

HQs IT Support Division, Deputy Division Chief

Fort Sam Houston, TX (June 2016 – December 2016)

Job Description:

Serves as the Deputy to the Headquarters Information Technology Support Division Chief; assists with the management of a twenty person-assigned Division consisting of Officers, Civilians, Soldiers, and Contractors.

Cybersecurity Office, Supervisor

Camp Red Cloud, South Korea (May 2015 – May 2016)

Job Description:

Responsible for coordinating IA related actions to include disseminating virus alerts, reporting incidents, information spillages, network vulnerability scanning and network remediation and patching.

CIO/G-6 Strategic Plans Officer

Rock Island, IL (July 2012 – May 2015)

Job Description:

Provides vision and leadership for developing and implementing information technology initiatives. Responsible for the planning and implementation of enterprise IT policies in order to improve cost effectiveness, quality of service, and development of our customer.

Lead Network Operations Engineer

DISA/JSSC Pentagon Washington, D.C. (September 2010 – July 2012)

Job Description:

Leads a team of 10 Joint military, civilian and contract personnel as the Network Section OIC for a nominative manned Joint organization overseeing C4I systems supporting the President, Secretary of Defense, National Military Command Center, Joint Staff (JS), Combatant Commanders and other federal agencies.

Senior System Operations Manager

DISA/JSSC Pentagon Washington, D.C. (April 2009 – September 2010)

Job Description:

Tracks unscheduled/scheduled Global Command & Control Systems (GCCS) – Joint, Top Secret and Global Common Operating Picture outages and implements restoration procedures. Directs 24x7 help desk support for global users; coordinates immediate resolution to critical command & control systems/network problems.