

**THE EFFECT OF COLLABORATION QUALITY AND  
SOCIAL TECHNOLOGY USE ON  
DECISION-MAKING PERFORMANCE**

Dissertation  
for the Doctorate in the Economic Sciences Program



by  
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**POSTGRADUATE PROGRAM  
FACULTY OF BUSINESS AND ECONOMICS  
UNIVERSITAS ISLAM INDONESIA  
YOGYAKARTA  
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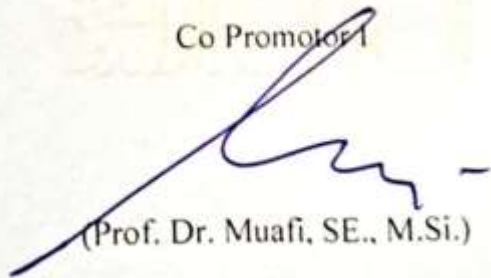
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## **PREFACE**

Praise be to Allah Subhanahu Wa Ta'ala who has bestowed His mercy and blessings, and the Prophet Muhammad Shallallahu 'Alaihi Wa Sallam, so that the writer can complete his dissertation with the title “THE EFFECT OF COLLABORATION QUALITY AND SOCIAL TECHNOLOGY USE ON DECISION-MAKING PERFORMANCE”. This dissertation was prepared to fulfill one of the requirements in obtaining a Doctoral degree in the Doctoral Program in Economics, Human Resources Concentration in the Postgraduate Programs of the Faculty of Business and Economics (FBE), Universitas Islam Indonesia (UII) Yogyakarta, Indonesia.

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## **ABSTRACT**

The use of social technology is expected to rise in the future, with more digital natives constituting the workforce. The attitudes and behaviors of digital natives relative to digital immigrants are understandably different since the former were born into a world that was almost exclusively reliant on digital technology. With this in mind, organizations would be wise to prepare the integration of social technologies in its business practices, especially in the process of decision-making.

A better understanding of the relationships between social technology and collaboration on decision-making are vital for an organization, since the intensive use social technology would require several changes in an organization's culture and business process. The organization also needs to ensure that the decision-making process is not hindered, and if possible, is improved by the use of social technology. Unfortunately, there has not been sufficient research studying the relationships between on decision-making, collaboration, and social technology. In addition, most of the research on these subjects have been conducted in corporation, while higher educational governance research on these subjects has not gained enough traction.

In this context, the importance of this study is to gain a better understanding of 1) how decision-making performance is affected by the use of social technology; 2) the factors needed to be taken into account to increase the use of social technology; 3) how decision-making performance is affected by collaboration quality, and 4) the capabilities that are needed to improve collaboration quality. This study was conducted in the context of Higher Education Institution governance, and received responses from 218 study programs of 16 Muhammadiyah and 'Aisyiyah universities in the Special Region of Yogyakarta and the Province of Central Java. From this dataset, 200 responses were further analyzed using Structural Equation Modelling with AMOS software, and supported by descriptive analysis. The findings provided contributions to both theory and practice.

# CHAPTER I

## INTRODUCTION

### A. Background

The use of social technology will inevitably rise in the future, with more digital natives constituting the workforce. The attitudes and behaviors of digital natives relative to digital immigrants are understandably different since the former were born into a world that was almost exclusively reliant on digital technology (Campos-Castillo, 2015, in Cramer, 2014). With this in mind, organizations would be wise to prepare the integration of social technologies in its business practices, especially in the process of decision-making.

The unfortunate events occurring during the Covid-19 pandemic outburst has forced many companies to promote *work-from-home* procedures, and consequently has put forth the urgency to identify critical success factors and develop best practices for the use of *social technologies*. In the long run, these practices may turn out to be the main practice of doing business, rather than being an emergency response to external conditions. For instance, Anane et.al (2020) forecasts that there would be a huge and lasting change from office-based work to blended-work among administrative and professional staff in universities in the post-pandemic era.

*Information and communications technology* (ICT) has emerged as the main enabler to support social technology, which currently includes social media networking and teleconferencing. Throughout the years, Andriessen (2003)

observed that the role of ICT has undergone several developments. Initially, information technology was developed to support the routine processing of standardized data resulting in the popularization of Management Information Systems, and subsequently the incorporation of communications technology allowed Electronic Data Interchange between companies, as well as teleshopping and telebanking facilities for consumers. Further advancements brought us Intranets, Extranets and electronic commerce, and eventually the role of ICT was aimed to support collaborative work (Andriessen, 2003) and used as a medium of social interaction (Kling, 2007).

For the purpose of this study, the term Social Technology will be used, which is defined by Chui et.al (2012) as “digital technologies used by people to interact socially and together to create, enhance, and exchange content”. Based on a McKinsey Global Survey of 4,200 executives, Bughin, Byers, and Chui (2011) found that companies are using social technologies to enhance operations and exploit new market opportunities, and when integrated into the work processes of employees, these technologies can increase the company’s financial performance and market share. Chui et.al (2012) noted that companies mostly use social technologies to gather insights for product development, marketing, and customer service, but do not reach the full potential of these technologies, since twice as much potential value lies in the use of social tools to enhance communications, knowledge sharing, and collaboration within and across companies.

This is in line with a more recent survey that found most companies initially tested the use of social technologies in the mid-2000s within business units and within business functions, e.g. for marketing purposes to acquire new customers and maintain existing ones. Subsequently, around the year 2010, companies started to use social technology with a collaborative approach by adopting internal platforms to connect employees. At the time, up to three-quarters of respondents used social technologies to increase collaboration, gather insights, or manage knowledge systematically (Harrysson, Schoder, and Tavakoli, 2016). It is thus evident that one of the key benefits of social technology is to increase collaboration in the organization. The benefit of collaboration is highlighted by Gaskell (2017), citing a study examining 1,100 companies which found that companies which promoted collaborative working practices were 5 times as likely to be high performing.

A survey of 105 respondents in 97 organizations and 20 countries has shown that social network participation increasingly affects executive decision-making in companies, with 80% of respondents reporting that decision process and information/strategy development is accelerated by participating in online communities (Bulmer and DiMauro, 2011, in Power and Phillips-Wren, 2011). This is potentially beneficial, since competitive advantage is positively impacted by an organization's ability to make sound decisions and judgements (Nicolas, 2004).

## **B. Research Gap**

### **B.1. Theoretical Gap**

In the phenomenal book *Administrative Behaviour*, Herbert Simon (1947) defines the term organization as “the pattern of communications and relations among a group of human beings, including the processes for making and implementing decisions” and describes organizational behavior as “a complex network of decisional processes, all pointed toward their influence upon the behaviors of the operatives — those who do the action ‘physical’ work of the organization”. The importance of decision-making processes in an organization has thus been established in this definition, and this study will further investigate the factors that would be needed to agree upon decisions that are *satisficing* (March and Simon, 1958 in Pettigrew, 1973).

Being in a “pattern of communications”, members of an organization would seek to obtain information needed for decision-making, since information is not given to the organization, but must be obtained (March and Simon, 1958 in Pettigrew, 1973). The influence of communication on *group decision-making* can be seen from two perspectives: 1) communication as the channel for the effects of various factors on group decision processes and outcomes (*medium of group interaction*), and 2) communication as the means for creating the social reality in which a decision is constructed (*constitutive of group decisions*) (Hirokawa and Poole, 1996).

The use of social technology, together with other related terminologies, has become more prevalent and widespread as an organizational means of communications. For the *millennial generation*, which are currently starting to fill the workforce, social technology has emerged as the preferred means of communication. Payton (2015) has observed that the millennial generation is collaborative, social, and surprisingly idealistic. A survey of 4,364 millennials conducted by Price Waterhouse Coopers in 2011 found that 41% prefer to communicate electronically at work rather than face to face or by phone, and around 75% believe that access to technology increases their effectivity at work. A similar finding was reported by Luttrell and McGrath (2016), showing that millennials are more than willing to collaborate with others via social media and may even have social anxiety when making a phone call. This generation is estimated to constitute 50% of the global workforce in 2020 (PwC, 2011), and it thus seems inevitable for social technology to obtain a more dominant role in organizational decision-making.

The above premises have shown that decision-making is one of the main functions of an organization, and an effective means of communication is essential for coming up with satisficing decisions. Meanwhile, social technology has emerged as a potentially dominant means of communication and collaboration championed by millennials who will exceedingly dominate the workforce. However, the effect of both *social technology* and *collaboration* on *decision-making* has yet to be sufficiently studied.

Several studies have linked the use of information technology or social technology with decision-making in organizations (Easley, Devaraj, and Crant, 2003; Carey and Kacmar, 2003; Hess, Fuller, and Mathew, 2006; Turban, Liang, and Wu, 2011; Kehl, 2017; Valos, 2017; Pena, 2019), while other studies have linked collaboration with decision-making or performance (Frost and Sullivan, 2006; Romano, Pick, and Roztocki, 2010). Interestingly, no studies were found to link *social technology*, *collaboration*, and *decision-making* together.

Liang et.al. developed the Fit and Viability model for mobile commerce which found that Fit and Viability would have an effect on a company's performance in terms of capital and number of employees. Unfortunately the research was very limited due to the participation of six respondents from four companies. In addition, the focus on financial performance seems to also limit its use to for-profit organizations.

In developing the Global Collaboration Index, Frost and Sullivan (2006) had found that collaboration capability would increase collaboration quality, which in turn would increase the firm's performance in terms of profitability, innovation, quality and growth. This is obviously a much broader and trustworthy research which engaged 946 decision makers from 3 continents. However, the dependent variable of the research was similarly related to firm performance, albeit including indicators of profitability, innovation, quality, and growth.

A wider search of published papers using the Publish or Perish application (Table 1.1) has shown that there has been very limited research on the tenets of this research. The search for papers on "social technology use" only resulted in 8 papers,

while combining “social technology” and “collaboration” merely resulted in 2 papers. The combination of "decision-making" and "collaboration quality" (2 papers); "decision-making" and "social technology" (3 papers); "collaboration quality" and "decision-making" (2 papers); and “collaboration capability” and "collaboration quality" (1 paper) yielded similar results. Meanwhile, a combined search on "social technology", "decision-making", and “collaboration” did not result in any papers. In addition, most of the previous studies on these subjects were conducted in corporations, and not many were conducted in an education institution setting.

**Table 1.1. Research Gap Based on Number of Paper Publications & Citations**

<b>Scopus Search Terms</b>	<b>Papers</b>	<b>Cites</b>	<b>Cites/yr</b>
"social technology"	200	5868	68.23
"social technology use"	8	161	23.00
"social technology" collaboration	2	4	0.80
"decision-making" "collaboration quality"	2	1	0.20
"decision-making" "social technology"	3	35	0.69
"social technology" "decision-making" collaboration	0	0	0
"collaboration quality" "decision-making"	2	1	0.20
“collaboration capability” "collaboration quality"	1	0	0.20
fit "social technology"	6	125	13.89
viability "social technology"	0	0	0

## **B.2. Empirical Gap**

For better or for worse, Social Technology has been adopted by universities as a means to overcome the barriers formed by the current Covid-19 pandemic. Social Technology has since been used not just for teaching and learning, but also

for internal communications which forms part of the decision-making process. Unfortunately, it has not been certain whether the use of social technology is an enabler or an obstruction in the decision-making process in a university environment. Furthermore, the interactions of the various dimensions of collaboration capability and collaboration quality with the use of social technology in such an environment has not been fully understood.

Previous studies have confirmed that higher education institutions have converted to online teaching and learning during the pandemic, for instance Marinoni, van't Land, and Jensen's (2020) global research which showed that two-thirds of higher education institutions had replaced classroom teaching with distance teaching and learning, and Sutrisno's (2022) research that found higher education institutions in Indonesia has switched to online learning as well. However, these research were limited to the use of social technologies for teaching and leaning, and not on its use for higher education governance. In addition, it has not yet been established whether the use of social technologies would be sustained in the post-pandemic era, as noted by Van Schalkwyk (2020), Dumulescu and Muțiu (2021), and Sutrisno (2022).

### **B.3. Importance and Novelty**

A better understanding of the relationships between *social technology* and *collaboration on decision-making* are vital for an organization, since the intensive use social technology would require several changes in an organization's culture and business process. The organization also needs to ensure that the decision-

making process is not hindered, and if possible, is improved by the use of social technology. With this flow of thought, this study is needed to better understand 1) how decision-making performance is affected by the use of social technology; 2) the factors needed to be taken into account to increase the use of social technology; 3) the effect of social technology use on collaboration quality, which in turn would affect decision-making performance, and 4) the capabilities that are needed to improve collaboration quality. The context of this study would also contribute the research in Higher Education institution governance.

This research is expected to contribute to the body of knowledge in this field by introducing *social technology use* as a separate entity in Frost and Sullivan's (2006) Global Collaboration Index model; analyzing the effect of Social technology on Collaboration; combining Liang et al.'s (2007) Fit and Viability model with Frost and Sullivan's (2006) Global Collaboration Index model which would in effect introduce the variables of *social technology fit* and *social technology viability*; designating *decision-making performance* as a dependent rather than firm performance as was done by various previous research; and studying the possibility of *collaboration quality* as a mediator between *social technology use* and *decision-making performance*. In addition, this research will broaden the context of previous research by situating the research in Indonesia to gain insight on collaboration and social technology use in this country; using non-profit higher education institutions as the context of this research to test whether previous partial models would be applicable in such an environment; focusing on the governance of Higher Education; and timing the research at the presumable end of the Covid-19 pandemic

to gain insight on the possible sustained use of social technology for collaboration and decision-making. These novelties will be explained further in Chapter 3.

### **C. Research Problem**

The study expects to answer the following research questions:

1. Does *social technology fit* have a positive effect on *social technology use*?
2. Does *social technology viability* have a positive effect on *social technology use*?
3. Does *social technology use* have a positive effect on *collaboration quality*?
4. Does *social technology use* have a positive effect on *decision-making performance*?
5. Does *social technology use* have a positive effect on *decision-making performance* with *collaboration quality* as a mediating variable?
6. Does *collaboration capability* have a positive effect on *collaboration quality*?
7. Does *collaboration quality* have a positive effect on *decision-making performance*?

### **D. Research Objectives**

As a continuation of previous the discussions, the study aims to:

1. Analyze the effect of *social technology fit* on *social technology use*
2. Analyze the effect of *social technology viability* on *social technology use*
3. Analyze the effect of *social technology use* on *collaboration quality*
4. Analyze the effect of *social technology use* on *decision-making performance*
5. Analyze the effect of *social technology use* on *decision-making performance* with *collaboration quality* as a mediating variable

6. Analyze the effect of *collaboration capability* on *collaboration quality*
7. Analyze the effect of *collaboration quality* on *decision-making performance*.

## **E. Research Contribution**

### **E.1. Theoretical Contribution**

From a theoretical perspective, this study is expected to advance the body of knowledge on the effect of *social technology use* and *collaboration quality* on *decision-making* within an organizational context. More specifically, this study will provide a better understanding of how decision-making performance is affected by the use of social technology; the factors needed to be taken into account to increase the use of social technology; the effect of social technology use on collaboration quality, which in turn would affect decision-making performance; and the capabilities that are needed to improve collaboration quality.

### **E.2. Practical Contribution**

From a practical point of view, this thesis would provide insights for managers on the benefits of social technology in terms of collaboration and decision-making, and a better understanding of the conditions that are needed to make the best use of social technology to improve decision-making in the organization. In particular, this research will provide Muhammadiyah and 'Aisiyah university decision makers with recommendations on the best use of social technology, and the factors needed to increase collaboration in the pursuit of making better decisions.

## **CHAPTER II**

### **LITERATURE STUDY**

A list of relevant studies is presented in Table 2.1, while a more detailed exposition on decision-making, social technology, and collaboration quality is described below.

#### **A. Grand Theory on Bounded Rationality**

Tzeng and Huang (2011) quoted Herbert Simon, often mentioned as the founder of the bounded rationality, when pointing out that “most people are only partly rational, and are in fact emotional or irrational in the remaining part of their actions”. Due to various cognitive limits on rational behavior, March and Simon (1958 in Pettigrew, 1973) theorized that people aim to achieve satisfaction (“seek”) rather than “maximizing” in making decisions. The process of obtaining satisficing decisions also brings forth the existence of search behavior, rooted in the understanding that information is not given to the firm but must be obtained (March and Simon, 1958 in Pettigrew, 1973). In the context of strategic decision-making, Eisenhardt (1992) concludes that “people are rational, but only boundedly so”. Furthermore, it was observed that the notion of perfect rationality is based on unrealistic assumptions, and a synthesis of bounded rationality and political perspectives would provide a better description of strategic decision-making.

Lejarraga and Pindard-Lejarraga (2020) argued that heuristics are seen as ecologically rational because decision-making will depend on the demands of the

existing environment. Individuals will use social heuristics to make decisions when time, information and resources are minimal. Heuristics will ignore non-relevant information and only care about rules of thumb. In decision-making, individuals are generally heuristics or based on available data. However, to minimize bounded rationality, especially in management, an organization must have complete information about all the decision alternatives, the benefits and consequences, and then calculate which alternative is better and order the priorities. All alternatives are possible within the constraints of environmental problems, but individuals can determine the one with the greatest possibility and optimal solution.

Bounded rationality also contributes in making a company's business decision to become a much better business than before. However, it seems that companies still often experience regrets about decisions taken when obtaining external information after the decision has been agreed. In fact, rationality in every decision-making can only be obtained if more time is available to search for information. It would be thus possible to conduct an evaluation of a limited number of options. This is in accordance with the results of research found by Cohen (2018). A coherent homogeneous theory is not established by models of bounded rationality. Instead, there is a collection of distinct straightforward decision-making heuristics (Strater, 2019). In addition, according to Farhi (2019) there is a significant interaction between the frictions of incomplete markets and bounded rationality.

## B. Decision-making

There have been significant changes in the perspectives and methodologies used to study decision-making. Edwards (1954) observed that theories of decision-making, in particular related to consumer's choice, had become exceedingly elaborate, mathematical, and voluminous. It was further noted that this perspective is almost unknown to psychologists, thus more communication was advised between the economic and psychology disciplines. Similarly, Schoemaker (1982) considers the *expected utility theory* to be the major paradigm in studying decision-making since World War II. Schoemaker (1982) categorizes the use of expected utility theory into four conceptual purposes: descriptive, predictive, postdictive and prescriptive; *prescriptive* purposes are used in management science, *predictive* purposes are used in finance and economics, and *descriptive* purposes are used in psychology, while *postdictive* purposes are used in theories of measurable utility.

More than a decade later, Klein (1993) found that classical decision theory has been so heavily grounded in economics and mathematics up to the point that it becomes unproductive, while laboratory studies about how people actually handle difficult and interesting tasks have little to be learned from. The *naturalistic model* of decision-making is prescribed to address the way people use experience to frame situations and adopt courses of action (Klein, 1993). These two different approaches to decision-making have been previously addressed by Pettigrew (1973) as normative mathematical-economic theories as opposed to behavioral theories. More recently, Collins and Shenhav (2022) observed that models of learning address how we understand an object's value in a given environment, while models

of decision-making address how we select between multiple options with different values. Decision-making involves complex interactions between ecological, economic and social aspects and requires active participation by all relevant stakeholders and their initial involvement in the process (dos Santos et al., 2019). Aggarwal (2021) notes that decision-making should consider the agent's level of sensitivity to uncertainty, namely the tendency to exaggerate or minimize inherent uncertainty. In addition, decision-making deals with subjective and probabilistic uncertainty, which are often interrelated in context.

Decisions are often social in nature and involve multiple group members (Tindale and Winget, 2019). Shapira (2002) explains the differences between organizational decision-making and individual decision-making: 1) in organizational decision-making, *ambiguity* is pervasive, both in terms of preferences as well as interpreting the history of decisions; 2) participants are a part of ongoing processes which are sequential in manner, and thus have a *longitudinal context*; 3) incentives have an important role; 4) *repeated decisions* are made on similar issues, especially by middle management; and 5) conflict is prevalent, and thus power considerations and agenda setting often determine decisions. Decision-making involves the search for information, and could be facilitated by *communication*. Hirokawa and Poole (1996) attributes communication as a catalyst for a certain social chemistry that may benefit group decision-making by resonating ideas and synthesizing viewpoint. Communication could also serve as a medium for coordination and control of group activities, group integration, and conflict

management. In this sense, communication processes are the primary means to create and sustain social realities, and are thus prerequisites for making decisions.

Tindale and Winget (2019) further explained that group decision-making could be categorized into two dimensions: how much interaction or information sharing is permitted among the group members, and how the final decision is made. Drake et al. (2022) reported that current research has shown that shared decision-making may improve the quality of decisions in terms of knowledge and values. However, the impact of shared decision-making on adherence, illness self-management, and health outcomes remains to be studied.

### **C. Social Technology**

There are several terms used to describe the use of digital channels of communications, such as Web 2.0 (O'Reilly, 2005 in O'Reilly, 2007; Lai and Turban, 2008), Enterprise 2.0 (McAfee, 2009), Collaboration 2.0 (Coleman and Levine, 2008), Collaboration Technology (Frost and Sullivan, 2006; Vrede, 2016; Gao, 2019), Social Software (Turban, Liang, and Wu, 2011), Social Technology (Agosto, 2013; Skarzauskiene, 2013; Tatnall, 2013) and Social Information Technology (Kehl, 2017). A more recent trend is the use of Enterprise Social Media (ESM) which refers to the social media especially designed for internal use within the enterprise (Wehner, Ritter, and Leist, 2017). Li et.al (2021) identified ESM as a rapidly developing information and communication technology, which evolved from simple social software (wikis, blogs, etc.) into advanced interactive and mobile social applications for corporate use (Yammer, IBM BeeHive, etc.).

This research chooses to use the term *social technology* due to its more general connotation which allows for the use of a wider array of applications. *Social technology* is defined as “digital technologies used by people to interact socially and together to create, enhance, and exchange content” (Chui et al., 2012) and has three unique characteristics: 1) enabled by information technology; 2) provides distributed rights to create, add, and/or modify content and communications; and 3) enables distributed access to consume content and communications (Bughin, Byers, and Chui, 2011).

The use of ICT has been changing how people meet and make group decisions. As far back as 1992, Kiesler and Sproull (1992) noted that experiments have proven that computer-mediated discussion leads to more explicit and outspoken advocacy; more equal participation among group members; and more unconventional or risky decisions. However, organizations that use social technologies have to continuously put significant effort into its use to maintain the benefits that it reaped. According to the McKinsey Global Survey, only around 35% of companies were able to maintain their use, and about 50% were unable to do so (Bughin, Byers, and Chui, 2011). Maintaining the use of social technology should be a priority, since it was also found that if the number of employees integrating social technologies in their day-to-day work declined, their companies were also more likely to backslide. Meanwhile, ten Bruggencate (2019) described social technology as “any technology that facilitates social interactions and influences social processes between people”, and in more specific terms is defined in Gartner’s IT Glossary as “any technology that facilitates social interactions and is enabled by

a communications capability, such as the Internet or a mobile device” which in this definition includes social software (e.g. wikis, blogs, social networks) and communication capabilities (e.g. Web teleconferencing).

Schlagwein and Monica (2017) prefer to adopt the term *social media*, and categorizes social media into five different *use types* in organizations: broadcast, dialogue, collaboration, knowledge management and sociability. They hypothesized that these use types are related to the absorptive capacity of organizations, and found that certain social media use types (e.g., dialogue), but not all, increase organizations’ absorptive capacity and therefore also organizational performance. Thus, organizations should not just merely use social media, but should also pay attention to how social media is used.

Schroeder (2018) explained that social technology has characteristics such as accessibility and affordability in organizational knowledge practices. Effective management of organizational knowledge requires a combination of technology and people. With rapid technological advances, it can contribute to improving organizational performance and knowledge. Wilson et al. (2021) argues that having access to and skills in using social technology is important for online social connection. To be able to connect socially online, it is necessary to have access and skills to use social technology such as social internet, social media, and social applications. Social media is an online media where users can easily interact with many people, and also share and get information in a virtual world without the constraints of time and distance. The existence of social media has influenced social life in society. The high level of activity of each individual causes the lack of

encounters with many people which makes the need for social connections increasingly needed. Social connection is a clear tangible result for the use of social technology, because humans are social by nature so that the use of social technology such as visual communication tools can help each individual connect online. Tarik (2021) argues that various definitions and concepts of social technology have succeeded in contributing to the creation and development of better social innovations. Tarik (2021) also recommends that a redefinition of the concept of social technology is needed to shake the dominant image of technology. This is related to the opinion of Tarik (2021) that social technology is often misunderstood in its true meaning due to the separation of "social" and "technology". In the social realm, technology brings changes in the way individuals communicate in society and in organizations. Communication can continue even without face to face. However, it is the sophistication of this technology that brings social relations that were previously glued apart. Individuals seem to ignore social values and even create social inequality by classifying certain individuals based on ownership of social technology.

Generally speaking, social technology could also be viewed as a form of group decision-support system (GDSS). Laudon and Laudon (2018) defined GDSS as “interactive computer-based systems that facilitate the solution of unstructured problems by a set of decision makers working together as a group in the same location or in different locations”. These systems originally required dedicated conference rooms with special hardware and software, and have eventually evolved to include various mobile technologies. However, GDSS still has the connotation

of large, expensive, and centralized corporate-based system, while social technology could represent various mixes of different applications which are nimble and independent of the hardware platforms being used.

#### **D. Collaboration Quality**

Collaboration Quality characterizes the nature and extent of collaboration in an organization, and is determined by the infrastructure, processes, and culture (collaboration capability) of the company, and also depends how effectively these capabilities are deployed (Frost and Sullivan, 2006). In a global study of 946 decision makers, Frost and Sullivan found that 36% of a company's performance was the result of its collaboration index, compared to 16% resulting from its strategic orientation, and 7% due to the impact of market and technological turbulence influences (7%). Meanwhile, Sangwan (2008) found that collaboration within a team effects the decision-making processes in a collaborative environment, and Romano, Pick and Roztockki (2010) reported that collaboration quality is a multi-level process concept that may constitute several lower-level constructs such as smoothness of processes, timeliness of communications and task completion. In terms of maturity, collaboration quality could be differentiated into four levels: ad hoc, exploring, managing, and optimizing (Boughzala and de Vreede, 2015), which are observed from people, information, process, management, and technology perspectives.

Collaboration quality improvement relied upon comparing one's own performance to peer performance, motivating improvement using this comparison, deriving evidence from peers to inform improvement initiatives, and overcoming hesitancy to change by highlighting peer success (Howard et al., 2022). Collaborative Quality is able to support and at the same time can increase user engagement to participate actively (Kilander et al., 2022). The findings of Oliphant et al. (2022) show that after widely applying collaborative qualities, performance increased significantly from year to year, namely 85% in 2018, 87.9% in 2019, and 88.5% in 2020). Another study conducted by Hesko et al. (2022) showed that the quality of collaboration within and between cooperative cancer groups has resulted in better patient outcomes and improved their understanding of the disease. Collaborative quality has resulted in better results and cost savings in various specializations optimizing the benefits (Kim et al., 2022).

Interesting findings from the research of Hu et al. (2021) highlight future quality improvement efforts should target resource availability, protocol compliance and a quality collaborative culture. Collaborative quality can be utilized for multi-purpose decision-making with uncertain information, so that decision-making can be better and on target if collaborative quality can run well (Wang et al., 2020). Good collaborative quality can ultimately provide significant benefits and impacts on improving the quality of goods or services (Billig et. al, 2020). Schroeder (2018) argues that Collaboration quality could optimize the use of technology that will increase knowledge within the organization, so individual and company competitiveness will increase.

### **E. Collaboration Capability**

Frost and Sullivan (2009) defines Collaboration Capability as a construct that represents “an organization's orientation and infrastructure to collaborate”, and would effect the organization’s ability to compete in the future. Their study has shown that collaboration capability is a precursor to predict collaboration quality in an organization. Furthermore, the combination between collaboration capability and collaboration quality is needed for an organization to collaborate effectively, which in turn would impact it’s business performance.

Other terms related to collaboration capability have emerged, such as e-Collaboration capabilities which Rosenzweig (2009) defines as the “extent of facilitating coordination of various decisions and activities beyond transactions among the suppliers and distributors over the internet” in the context of manufacturing, and was more specifically studied by Chi, Zhao, and George (2015) in the context of supply chains. Blomqvist and Levy (2006) suggests collaboration capability as a valuable cross-level concept for understanding and studying relational interaction on multiple levels, including individual, team, intra-organizational, organizational, and inter-organizational. Blomqvist and Levy (2006) explained that trust, communication, and commitment for knowledge creation and collaborative innovation in networks are all aspects of the broader concept of collaboration capability, which explains and enables a great deal of what goes well when people collaborate to create new knowledge and new products.

Another recent development of the term was used by Chi et.al (2018) who defined Digital Collaboration Capability as “the extent of facilitating information sharing and coordination among distributors over the internet or digital platform”. Meanwhile, Li et.al (2022) refers Digital Collaboration Capability as “a company's ability to share and coordinate information with partners via digital channels” primarily for the purpose of gaining differentiation advantages. It should be noted that these terms were used in an inter-organizational context involving different business entities at various levels in the supply chain. More recently, Hao and Zhan (2015) found that collaborative capabilities could improve a company's ability to increase its competitiveness against the competition, and Saputra et al. (2022) report that Collaborative Capability plays a strategic role in supporting management in leading the organization during times of turbulence. Meanwhile, Jin et al. (2019) in a research among European supply chain managers defined collaborative capability as “the ability to align goals, resolve conflict, and leverage trust to improve working relationships”. This research found that collaborative capability is an enabler of performance increases for the majority of businesses. However, the results reveal that strategic constraints have a substantial impact on how this key capability is translated into enhanced firm performance. For instance, for companies which use differentiation strategies, this strategy would moderate the collaboration-performance linkage.

## **F. Social Technology Fit**

Goodhue and Thompson (1995) defined task-technology fit as “the degree to which a technology assists an individual in performing his or her portfolio of tasks”. The described concept of Task-technology fit was part of the Technology-to-Performance Chain (TPC) model with the assumption that information technology would have a positive effect on individual performance if the technology is utilized and technology has a good fit with the tasks that it supports. Thus it shows the relationship between task requirements, individual abilities, and the functionality of the technology.

The findings of the research conducted by Rai and Selnes (2019) offered a fresh perspective on what it means to have a task-technology fit and how this relates to user motivation in the context of digital learning technologies. In this case, task-technology fit was defined as “how well a technology is integrated with a set of interrelated tasks included in achieving the goal of the behavior where the technology is used”. According to the research findings, new digital learning tools must be integrated into a set of interrelated learning activities. Adopting digital learning technologies, such as digital textbook services, requires the integration of technology with a series of interrelated learning tasks, during which the influence of the new techno

logy on learning is evaluated. Rai and Selnes (2019) concludes that an a better understanding of how students learn would potentially increase the speed of digital learning technology adoption in the education sector.

In the Fit-Viability model, Liang et.al (2007) defines fit as the “the extent to which new network applications are consistent with the core competence, structure, value and culture of organization” while Turban et.al (2011) in their proposed conceptual Social Networking Software Adoption framework offers a simpler explanation of *fit* as “the extent to which the feature of a technology matches the needs of the task”. This research would adopt Turban et al.’s (2011) definition of Fit, with an emphasize on the use social technology in a higher education institution context. It should be kept in mind that even though Rai and Selnes’ (2019) research was also in the context of education, this research would focus on the governance of higher education institutions rather than on teaching and learning processes.

### **G. Social Technology Viability**

Social Technology Viability together with the construct of Social Technology Fit has been shown to be antecedents of Performance by Liang et.al (2007) and proposed as antecedents of Social Software Adoption by Turban et.al (2011). In these studies, Viability is defined as “the extent to the value-added potential of new network applications, requirements of human resource, capital needs and so on” (Liang et.al, 2007; Turban et.al, 2011). Turban et al. (2011) observed that in several cases of failures in the deployment of technology, Viability seems to be a missing component. The combination of viability and fit is expected

to avoid such failures. Turban et al. further describes Viability as “the extent to which the infrastructure of the organization is ready for adopting a new technology” and suggests adopters of new technologies consider the technology’s economic feasibility, the condition of technical infrastructure needed to support the technology, and the social readiness of the organization in receiving the technology. Technology viability has also been more recently used as antecedents of the adoption of more recent technologies such as Smart technology (Wang & Liang, 2019) and Blockchain technology (Liang et al., 2021).

**Table 2.1. Previous Literature on Decision-making, Social Technology, and Collaboration**

No	Author and Year	Title	Research Method	Variables
1	Benson and Dresdow (2003)	Discovery mindset: A decision-making model for discovery and collaboration	Literature Review  Conceptual Model Proposition	<i>Dependent Variable:</i> Discovery and Collaboration  <i>Independent Variables:</i> Systems Perspective  <i>Moderating Variable:</i> Generative Conversation
2	Brown, Dennis, and Venkatesh (2010)	Predicting Collaboration Technology Use- Integrating Technology Adoption and Collaboration Research	Quantitative, Survey	<i>Dependent Variable:</i> Outcomes (Decisions)  <i>Independent Variables:</i> Use Technology Characteristic Individual and Group Characteristics Task Characteristics Situational Characteristics
3	Boughzala and de Vreede (2015)	Evaluating Team Collaboration Quality: The Development and Field Application of	Conceptual Model Proposition	Collaboration Maturity Model (Col-MM) Collab. characteristics Collab. management Collab. process

		a Collaboration Maturity Model, Journal of Management Information Systems	Model Testing through quantitative and qualitative methods	Information and knowledge integration
4	Carey and Kacmar (2003)	Toward A General Theoretical Model of Computer-based Factors That Affect Managerial Decision-making, Journal of Managerial Issues	Experiment involving a comparison of tabular and graphical presentation formats for a trend/forecasting task, with 79 undergraduate business students	<p><i>Dependent Variable:</i> Decision-making Perf</p> <p><i>Independent Variable:</i> Manager/User Characteristic and Experiences</p> <p><i>Moderating Variables:</i> Task Characteristics Presentation Format</p>
5	Chidambaram and Jones (1993)	Impact of Communication Medium and Computer Support on Group Perceptions and Performance: A Comparison of Face-to-Face and Dispersed Meetings	Experiment	<p><i>Dependent Variable 1:</i> Group performance</p> <p><i>Independent Variables:</i> Quality of Final Decisions Quality of Decision Process Number of Alternatives</p> <p><i>Dependent Variable 2:</i> Media perceptions</p> <p><i>Independent Variables:</i> Social Presence Communication Effectiveness Communications Interface</p>
6	Easley, Devaraj, and Crant (2003)	Relating Collaborative Technology Use to Teamwork Quality and Performance: An Empirical Analysis	Quantitative Survey on 24 teams with 122 total members during 4 month period using online collaboration system	<p><i>Dependent Variables:</i> Team Performance Decision-making Perf Creative Performance</p> <p><i>Independent Variables:</i> Technology Usage Teamwork Quality</p>
7	Frost and Sullivan (2006)	Meetings Around the World - The Impact of Collaboration on Business Performance	Quantitative survey of 946 decision makers within enterprises in Europe, Asia, and North America	<p><i>Dependent Variable:</i> Performance</p> <p><i>Mediating Variable:</i> Collaboration Quality</p> <p><i>Independent Variables:</i> Collaboration Capability Collaborative Technology</p>
8	Hess, Fuller, and Mathew, J. (2006)	Involvement and Decision-Making Performance with a Decision Aid: The	Experiment with 259 undergrad students	<p><i>Dependent Variables:</i> Decision-making Outcomes Satisfaction</p>

		Influence of Social Multimedia, Gender, and Playfulness		Understanding Decision Time Use of Decision Aid Decision Quality  <i>Independent Variables:</i> Involvement with the Decision Aid Computer Playfulness Gender Personality Multimedia Vividness
9	Pittz and Adler (2016)	An exemplar of open strategy: decision-making within multi-sector collaborations,	Literature analysis  Model development	<i>Dependent Variable:</i> Open Strategy  <i>Independent Variables:</i> Goal Interdependence  <i>Mediating Variable:</i> Legitimacy of Stakeholders Participatory Decision-making Transparency Inclusiveness
10	Lai and Turban (2008).	Groups Formation and Operations in the Web 2.0 Environment and Social Networks	Literature Review  Conceptual Model Proposition	Community Rewards Social Network Web 2.0 Tools
11	Laureiro-Martinez (2014)	Cognitive Control Capabilities, Routinization Propensity, and Decision-Making Performance	Quantitative study conducted with 86 graduate students	<i>Dependent Variable:</i> Decision-making Perf  <i>Independent Variables:</i> Cognitive Control Capabilities Attention Control Planning and generativity Working memory  <i>Moderating Variable:</i> Routinization Propensity
12	Tuckman (1965)	Developmental Sequence In Small Groups	Literature analysis of 50 articles	Decision-making Process
13	Sangwan et al. (2008).	Decision-making in collaborative environment in organizational context	Quantitative survey of Chinese and international organizations in Shanghai	<i>Dependent Variable:</i> Decision-making in Collaborative Environments  <i>Independent Variables:</i> Team collaboration IT support

				Task description Incentives
14	Turban, Liang, and Wu (2011).	A Framework for Adopting Collaboration 2.0 Tools for Virtual Group Decision-making	Literature Review  Framework Proposition	<i>Dependent Variable:</i> Decision-making Process, Performance <i>Independent Variables:</i> Deployment Fit Tasks Technology Viability Economic IT Infrastructure Organization Readiness
15	Jin, et al. (2019).	Collaborative capability and organizational performance: Assessing strategic choice and purity	Quantitative Survey of European supply chain managers	<i>Dependent Variable:</i> Firm Performance Workforce performance Customer service Operating Performance Financial performance  <i>Independent Variable:</i> Collaboration Capability  <i>Moderating Variable:</i> Strategy Strategic Orientation Strategic Purity
16	Liang and Wei (2004)	Introduction to the special issue: a framework for mobile commerce applications	Literature Review  Framework Proposition	<i>Dependent Variable:</i> Performance  <i>Independent Variables:</i> Fit Task Technology Viability Economic IT Infrastructure Organization
17	Romano, Pick, and Roztocki (2010)	A motivational model for technology-supported cross-organizational and cross-border collaboration	Literature Review  Conceptual Model Proposition	<i>Dependent Variable:</i> Collaboration Quality (Task Structure, Process Structure, IT Collab Support, Proximity, Satisfaction, Performance) <i>Independent Variable:</i> Motivation (Trust, Collaborator Factors, External Pressures, Perceived Value, Commitment)

				<i>Moderating Variable:</i> Satisfaction Performance
18	Blomqvist and Levy (2006).	Collaboration capability – A focal concept in knowledge creation and collaborative innovation in networks	Literature review	Collaboration Capability as: Integrator Cross-level concept Knowledge creator Performance enhancer
19	Liang, Huang, Yeh, and Lin (2007)	Adoption of mobile technology in business: a fit-viability model	Multi-case study via the fit and viability dimensions	Task-technology Fit Organizational Viability
20	Rai and Selnes (2019).	Conceptualizing task-technology fit and the effect on adoption – A case study of a digital textbook service	Quantitative survey of Business school, students	<i>Dependent Variable:</i> Perceived usefulness Perceived ease of use Intention to use  <i>Independent Variables:</i> Task-Technology Fit Social Norm

## **CHAPTER III**

### **RESEARCH FRAMEWORK**

#### **A. Area of Interest**

Truss et al. (1997) observed that the hard and soft versions of human resource management are two of the most widely adopted models. These models adopt contrasting views of human nature and managerial control strategies. The hard model is based on notions of tight strategic control, and an economic model of man according to McGregor's Theory X perspective which entails tight strategic control, and using an economic model of man. Storey (1992, in Truss et al., 1997) further explains that this model focuses on "the quantitative, calculative and business-strategic aspects of managing the 'headcount resource in as 'rational' a way as for any other factor of production".

On the other hand, the soft model adopts McGregor's Theory Y (developmental-humanism) (Guest, 1987), and prefers basing control through commitment in which behavior is primarily self-regulated and based on high levels of trust (Wood, 1996). Soft Human Resource Management aims for flexibility and adaptability and infers that communication has a central role in management (Storey and Sisson, 1993 in Truss et al., 1997).

This research uses the Soft model of Human Resources Management. This mode's goal of flexibility and adaptability brings forth an important aspect of this research. In addition to Storey and Sisson's (1993, in Truss et al., 1997) emphasis on the importance of communication in management, Guest (1987) urges the

organization to avoid “rigid, hierarchical, bureaucratic structures” and “inhibitive demarcations among groups of workers” or between individual roles”. These narratives supports the need for collaboration in the organization which is specifically addressed in this research as the constructs of Collaboration Capability and Collaboration Quality. In the proposed model, Collaboration Capability is partly indicated by an open culture and a decentralized structure, which fits nicely with Guest’s (1987) recommendation; while Collaboration Quality is partly indicated by communication, which is in line with Storey and Sisson’s (1993, in Truss et al., 1997) statement.

Several recent studies further showcases the importance of this research. In exploring the opportunities of Knowledge Management for Human Resource Management, Kumari (2021) maintains that the organization should focus on extracting an individual’s knowledge, and then documenting and sharing this knowledge with other members of the organization, and further notes that such a practice would bring several wise decision-making opportunities for the organization. In the context of this research, social technology takes on the role of a knowledge management system in supporting decision-making.

Another study by Bolás (2019) addressing current issues and challenges in Human Resource Management and digitalization identified the urgency for studies with a strong theoretical foundation to offer guidance on the daily use of social media in the organization. In addition, Bolás (2019) mentioned that their has not been enough research on new platforms and applications of social media. This research will hopefully help fill in this gap as well.

## B. Theoretical Framework

The ability to make sound decisions is a direct factor of information presentation (Remus, 1984). However, the manner in which presentation formats are designed and used in an organization in accordance to specific decision-making tasks in general has not been standardized at the time, and organizations must adopt a systematic approach for the creation and evaluation of information displays if it were to improve managerial decision-making (Elikai, Hall, and Elikai, 1999, in Carey and Kacmar, 2003).

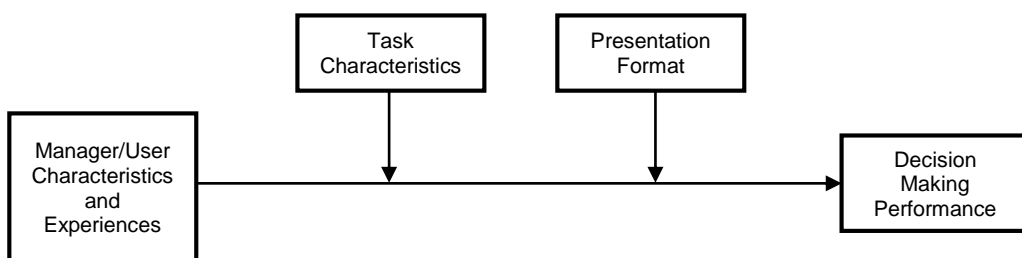


Figure 3.1. Traditional model of studies associated with the effects of presentation format on managerial decision-making (Carey and Kacmar, 2003)

Carey and Kacmar (2003) summarizes previous studies on the effect of presentation format on decision-making in the model shown in Figure 3.1. This model shows that *manager/user characteristics and experiences* directly affects *decision-making performance*, and is moderated by *task characteristics* and *presentation format*.

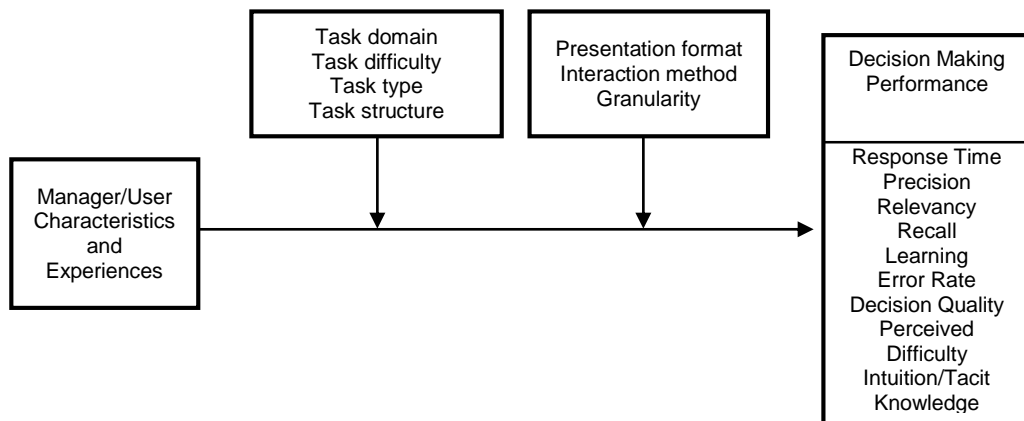


Figure 3.2. Theoretical model developed by Carey and Kacmar (2003) (simplified)

To advance the model, Carey and Kacmar (2003) developed a more comprehensive theoretical model which breaks down *task characteristics* as the core variable into task domain, task difficulty, task type, and task structure, while *presentation format* as a moderator is elaborated into presentation format, interaction method, and granularity, and *decision-making performance* is indicated by response time, precision, relevancy, recall, learning, error rate, decision quality, perceived difficulty, intuition/tacit knowledge, and confidence (Figure 3.2).

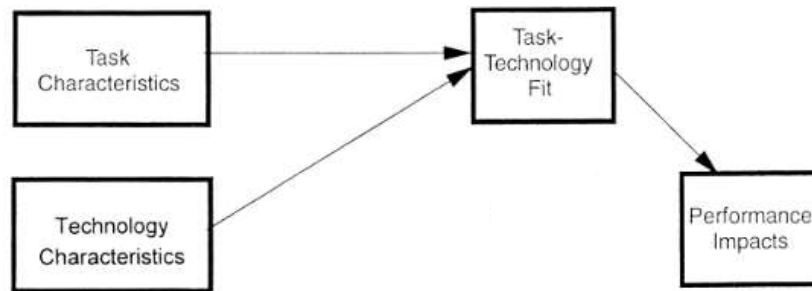


Figure 3.3. The Task-Technology Fit Model (Goodhue and Thompson, 1995)

Carey and Kacmar's (2003) model is in line with the concept of *Task-Technology Fit* (TTF) (Figure 3.3) identified from previous studies by Goodhue and Thompson (1995) which shows that a better fit between technological characteristics, task requirements, and individual abilities will lead to better performance.

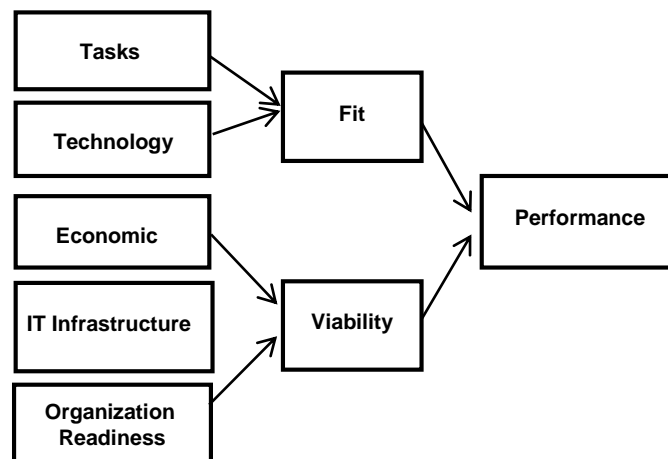


Figure 3.4. The Fit and Viability Model (Liang et al., 2007)

Studies on the effect of technology on organizational performance is further enhanced in the *Fit and Viability Model* (FVM) developed by Liang et al. (2007) in the context of mobile technology adoption. Displayed in Figure 3.4, the FVM shows that performance is affected by fit and viability, with *fit* indicated by the task and technology at hand, and *viability* indicated by economic conditions, information technology infrastructure and organization. Contrary to the TTF concept, the FVM uses an objective assessment of the match between task and technology without considering individual abilities. Thus, only the nature of technology and the requirements of task itself is used to assess fit.

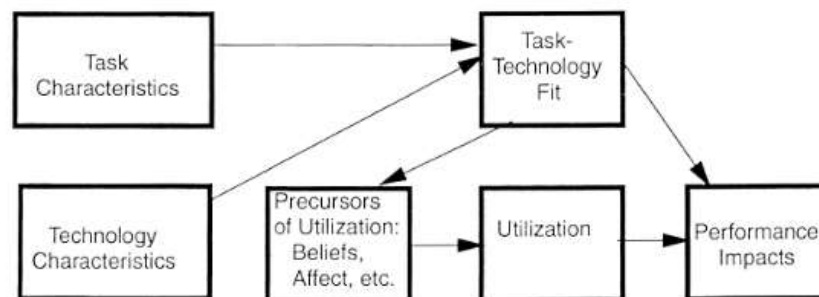


Figure 3.5. The Utilization and Fit Model (Goodhue and Thompson, 1995)

Another limitation of the TTF model was also observed by Goodhue and Thompson (1995), whom pointed out that systems have to be utilized before being able to impact performance. They also acknowledge that utilization is a complex outcome that is affected by several situational factors. The resulting *Utilization and Fit Model* (Figure 3.5) similarly had task characteristics and technology characteristics affecting technology fit, but added *utilization* as a construct

alternatively preceding performance. Several precursors to utilization was also introduced, such as expected consequences, beliefs, and social norms.

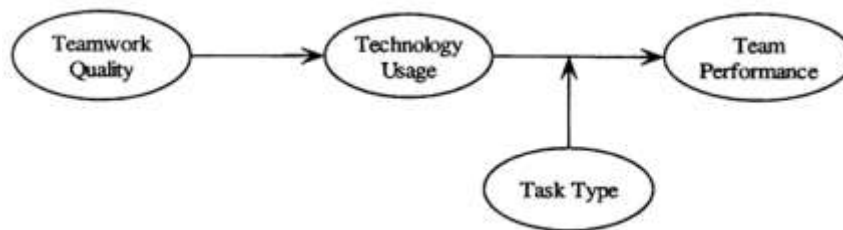


Figure 3.6. Conceptual relationships between teamwork quality, technology usage and team performance (Easley, Devaraj, and Crant, 2003)

The importance of *collaboration* is highlighted in the model conceptualized by Easley, Devaraj, and Crant (2003) (Figure 3.6). Rather than using *fit* and *viability* as antecedents of *technology use* (the term deployment and adoption is used by Turban, Liang, and Wu (2011)), the model depicts *teamwork quality* as an antecedent of technology usage in the context of collaborative technology. Easley, Devaraj, and Crant (2003) developed the model based on their finding that shows previous research at the time has examined the relationships between *team characteristics* and performance, and between *system use* and *team performance*, but none had combined the three variables together.

Liang et al. (2007) developed the Fit and Viability Model which placed Fit and Viability as antecedents of performance (Figure 3.4). The research was limited in scope, with six respondents from four companies. By combining the Fit and Viability Model (Liang et al., 2007) with the construct of *utilization* in the

Utilization and Fit Model (Goodhue and Thompson, 1995), Turban, Liang, and Wu (2011) proposed an untested modified fit-viability-based framework for adopting social networking software for virtual group decision-making. There are two major components of the framework: 1) the opportunity that emerges from the intended decision-making tasks and available social software tools; and (2) the implementation factors and constraints that have to be taken into account to assess project viability. If both fit and viability are met, the deployment of social software could be expected to improve collaboration, quality, and speed of the decision process.

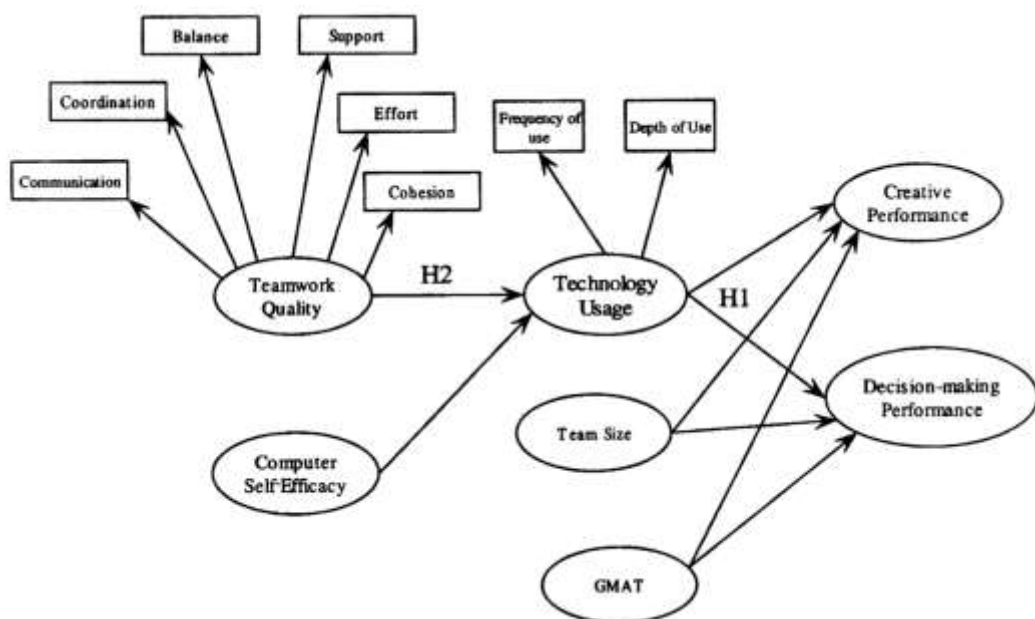


Figure 3.7. Operational research model of teamwork quality, technology usage and team performance (Easley, Devaraj, and Crant, 2003)

The concept was empirically validated using the research model displayed in Figure 3.7. In this model, *team performance* is indicated by decision-making performance and creative performance, *technology usage* is indicated by frequency

and depth, while *teamwork quality* is indicated by communication, coordination, balance, support, effort, and cohesion.

A more recent research on collaboration capability and firm performance was conducted by Jin et al. (2019) which surveyed 192 European supply chain managers. This research was based on the premise that collaborative capability effects firm performance, and its effect is moderated by strategy orientation and strategy purity. It was found that find that differentiation strategy moderated the collaboration-performance linkage, while strategic purity resulted in counterintuitive results which could be explained by strategic intensity.

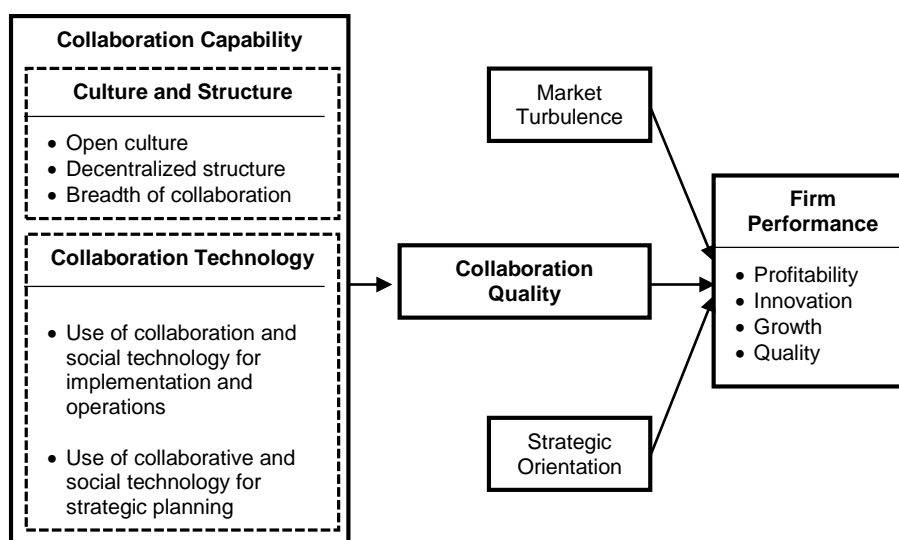


Figure 3.8. Global Collaboration Index Model (Frost and Sullivan, 2006)

A model of collaboration quality and firm performance was offered by Frost and Sullivan (2006) in the Global Collaboration Index Model (Figure 3.8) to measure sustainable and competitive collaboration that impacts the performance of companies. The model depicts *collaboration capability* as an antecedent of

*collaboration quality*, while collaboration quality becomes an antecedent of *firm performance*. Collaboration capability is comprised of culture and structure indicated by open culture, decentralized structure, and breadth of collaboration; and collaboration technology indicated by the use of collaboration technology for implementation and operations, and the use of collaborative technology for strategic planning. This model was used to survey 946 decision makers in Europe, Asia, and North America to better understand the interaction between technology and culture in global enterprises. It was found that collaboration quality directly impacts business performance through four channels: 1) the productivity of collaborative efforts to achieve a given task; 2) the effectiveness of supporting business strategy; 3) the recognition that collaboration is a sustainable, competitive advantage; and 4) a coordinated team that is committed to driving collaboration as a process in the path to success.

The model tested in this research further enhances the Global Collaboration Index model (Frost & Sullivan, 2006) by separating Technology as a separate entity from Collaboration Capability. Rather than depicting technology as collaboration technology, this research adopts Social Technology Use as an antecedent of Collaboration Quality to emphasize the use of various mixes of off-the-self applications rather than a centralized corporate collaboration system. In addition, this research incorporates the concepts of technology Fit and Viability from Liang et al. (2007) as antecedents of Social Technology Use. Another distinction is the introduction of Decision-making Performance instead of Firm Performance used in the Collaboration Index model and the Fit and Viability model.

## **C. Empirical Framework**

### **C.1. Characteristics of Higher Education Institutions**

In order to better understand decision-making in Higher Education, the unique characteristics of these institutions should first be discussed. Maassen & Potman (1990) characterizes Higher Education Institutions as *professional bureaucracies* where activities are mainly arranged around experts. This phenomenon is described by Perrow (1970, in Maassen & Potman, 1990) as 'pigeonholing' in which these professionals or experts do not spend much time coordinating activities with their peers. Pigeonholing can best be observed in the process of organizing courses and programs which tend to maximize the ability of lectures to carry out tasks in isolation (Hardy et al., 1988 in Maassen & Potman, 1990). Maassen & Potman (1990) further highlighted that professional bureaucracies uniquely democratic, with extensive autonomy given to professional workers. Such a bureaucracy raises major issues in coordination between the professionals and the supportive staff as well as communication between Professionals. Mintzberg (1992) concludes that 'Professional bureaucracies are not integrated entities, they are collections of individuals who come together to draw on common resources and support services but otherwise want to be left alone'.

More recently, Manning (2018) identified eight organizational perspectives that have been discussed based on their chronological, paradigmatic, and traditional significance to Higher Education: Bureaucracy (organized anarchy); Collegium (collegium); Cultural (institutional); Feminist and Gendered (political);

Institutional (cultural): Organized Anarchy (bureaucratic); Political (feminist and gendered): and Spiritual. Multiple organizational models in Higher Education have evolved throughout the years and may present itself simultaneously within the same institution. However, Manning (2018) observed that the most common is the collegium and bureaucracy. The collegium model most often occurs within the faculty, although collegial behavior may also occur among certain administrators such as student affairs professionals.

In the context of this research which focuses on the department level consisting mainly of faculty members, the collegium model will be mostly adopted as a lens to analyze the results. The collegium model is characterized by its 1) fluid structure; decentralized and expert-based authority; 3) changing, ambiguous, and contested goals; 4) autonomous relationships; 5) purpose for teaching, research, and service; 5) institutional purposes regarded as primary factor; 6) alignment within the context of national and international disciplinary communities; 7) independent coupling with other departments; 8) change adverse; 9) long range tenure; and 10) effectiveness of products in the form of teaching, research, and service that are difficult to measure (Manning, 2018, adapted from Alpert, 1985 and Birnbaum, 1991). Several other features of higher education institutions have also been observed, such as “lifetime employment, collective decision-making, individual responsibility, infrequent promotion, and implicit, informal evaluation” (Dill, 1982 in Tierney, 2008); and having an ideal governance model in which “collaboration among the various governance components is the rule” (Ramo, 1998 in Tierney, 2008).

These findings have made apparent the characteristics of higher education institutions, and the uniqueness of their decision-making processes. It is in this context that this research will be conducted. It should be kept in mind that the characteristics of higher education institutions are distinctly different from corporations, since it would be useful for the analysis and interpretation of the results of this research.

## **C.2. Decision-making in Higher Education Institutions**

The above characteristics should be kept in mind to understand Chaffee's (1983) observation that decision-making in Higher Education mainly adopts the Collegial Model which rests on the value of shared responsibility in which decisions should sufficiently satisfy all participants in the organization to generate commitment to these decisions. Chaffee (1983) points out that while the collegial model would apply to academic decisions, it might not fully apply to non-academic decisions, which could result in major problems for administrators. Tierney (2008) uses the term participative governance and shared governance for this characteristics, and considers it to be the root cause of several Higher Education institutions' problems that hinders it from becoming more strategic and efficient.

In such cases, Chaffee (1983) suggests the Political Model may be more appropriate especially for interdepartmental decisions. The basis of the political model is conflict resolution, in which the university exhibits itself as a forum for different actors to solve their differences. Aside from the 1) Collegial Model and 2) the Political Model, the other models of decision-making in Higher Education

identified by Chaffee (1983) are: 3) the Bureaucratic Model usually applied to low-visibility decisions through unobtrusive processes in which the actors may not even be aware of; 4) the Rational Model based on the economic theory of the firm which actually better reflects corporations but are also used in certain decision-making processes in higher education; and 5) the Organized Anarchy Model in which decisions are made place through accidents of timing and interest and are usually featured in organizations with a diversity of goals, lack of time and resources, and limited understanding of technology.

Meanwhile, Tierney (2008) notes that most decision-making analysis in Higher Education institutions focus on faculty interactions with the academic senate while actually faculty interact in various venues and with various levels of input and authority senate, and suggests analysis should include multiple venues and units of analysis of decision-making. Tierney (2008) further recommends studies to avoid the perspective of a hierarchical chain of decision-making and adopt a more protean analysis which acknowledges that not all decisions require a hierarchical chain of command with a faculty or board having veto power over a decision.

In terms of strategic decision-making, Chaffee (1985, in Maassen & Potman, 1990) found three different but not always mutually exclusive strategy models: 1) linear strategy model where the environment is mostly composed of competitors and thus strategy consists of integrated decisions, actions, or plans which brings forth strategic planning, formulation, and strategy implementation; 2) adaptive strategy model in which the organization and its environment are very open to each other and thus the organization should change with its environment;

and 3) interpretive strategy model with complex relationships between an organization and its environment and thus strategy would be understood as might be defined as 'orienting metaphors or frames of reference that allow the organization and its environment to be understood by organizational stakeholders'. Maassen & Potman (1990) points out that the interpretive model of strategic planning would be better suited for higher education institutions due to the unique characteristics of these institutions.

Several measures are widely used for the performance of corporations, for instance the Balance Scorecard coined by Kaplan and Norton (1996) which links together the Financial performance perspective with Customer, Internal Business, and Innovation and Learning performance perspectives. The performance of Higher Education institutions might be a different case, and Hirsch and Weber (2001) found that "the governance of universities is becoming increasingly crucial". In this regard, Tierney (2008) suggests that indicators of effectiveness are needed for Higher Education governance since it has experienced great changes in the last century.

Based on Tierney's (2008) observation that research on decision-making in higher education institutions mostly focus on faculty interactions with the academic senate, and lacks analysis on decision-making at various units of analysis, this study focuses on decision-making at the academic department level. This level of analysis is expected to have higher levels of interactions between faculty members, in which decisions are made in a collegial manner without the heads of secretaries of the department having much stronger decision-making authority with their peers. In

addition, regarding Tierney's (2008) suggestion that indicators of effectiveness are needed for Higher Education governance, this study will use Decision-making Performance as a proxy for performance in Higher Education institutions.

There has not been many research conducted in Muhammadiyah and 'Aisyiyah Universities in regards to decision-making. In general, these existing research on decision-making could be categorized to be in the areas of organizational culture, and information systems. Research regarding decision-making using information systems in Muhammadiyah universities studied the use of Decision Support Systems for Quality Assurance (Sunardi, Fadlil, and Pahlevi, 2021); the use of Business Intelligence for academic decision-making (Taufiqurrochman, Indrajit, and Fauzi, 2017), and the use of Fuzzy Multi-Attribute Decision-Making for lecturer performance evaluation (Widaningrum, 2013). These type of research do not intersect much with this research.

Meanwhile, examples of organizational culture research include Wasono (2016) which found that education quality improvement in Muhammadiyah universities could be by creating a conducive environment through the implementation of Theory Z by taking into account six elements, including shared decision-making; Binangkit and Siregar (2020) which found that Muhammadiyah universities need to increase decision-making speed in its attempt to increase its international exposure; and Hasna (2022) which analyzed the decision-making processes of the Covid-19 Mitigation Team of Universitas Muhammadiyah Yogyakarta and found the criterion used for decision-making to be based on the available reference, benefit, and the need to do good, while the group think

phenomenon that was found was based on morality, solidarity, and mutual interest. These research found the need for shared decision-making and decision-making efficiency which are indicators of Decision-Making Performance in this research, while the need for group think could be interpreted as Collaboration, which are also investigated in this research.

### **C.3. Collaboration in Higher Education Institutions**

Higher education institutions have for hundreds of years been represented by departmental silos and bureaucratic, hierarchical administrative structures, and Kezar (2005a) has noted that these norms, structures and culture have been so deeply ingrained that massive change, both in breadth and depth, has to be undergone for Higher Education institutions to work differently. On a different note, Tierney (2008) suggest that in shared governance environments such as universities, decentralization should be encouraged to endure change, and thus ongoing communication regarding the institution's identity and direction is essential.

For the purpose of redesigning academic organizations, Kezar (2005a) has identified eight key organizational features that are needed for an institutional environment that be conducive to collaborative work, of which three are most significant: 1) a mission that respects and empowers collaboration, 2) a network of relationships among people that share a present or future goal, and 3) structures that sustain collaboration and link work that has been done in isolation. Furthermore, it

is thus essential to develop mechanisms that would make it easier for people to interact.

Newell and Bain (2019) found that there has been little empirical research related to the readiness and capacity of academics for team-based collaboration. In a study involving a group of academics engaged in course design, it was found that participants of the study were willing and mostly prepared to collaborate as individuals but felt that institutional level conditions has become inhibitors to collaboration. In the case of institutions failing to provide broad organizational structure and support, the group of academics noted that collaboration relied on individuals' goodwill to collaborate. Such conditions seem to be widespread in Higher Education institutions, as indicated by Kezar (2005b) which concluded that 50% of collaborations in higher education institutions fail even though the benefits of collaboration have been recognized. A three-stage model is recommended to facilitate institutions to change from an individual work culture to a culture that supports collaborative work: 1) building commitment, 2) executing commitment, and sustaining commitment, which includes developing structures, networks, and rewards to support collaborations. Kezar (2005b) further noted that there has been virtually no research regarding how to empower higher education institutions in conducting collaborative work.

Newell and Bain's (2019) findings that higher education institutions fail to provide broad organizational structure and support for collaboration and Kezar's (2005b) assertion that there had been virtually no research on how to empower higher education institutions in conducting collaborative work even though 50% of

collaborations in higher education institutions fail, strengthen the urgency of conducting this research which would investigate the dynamics between Collaboration Capability, Collaboration Quality, Social Technology, and Decision-Making Performance. Culture of openness as depicted by ease of communication within the organization and structure of decentralization which serves indicators of collaboration capability is mentioned in Kezar's (2005a) research on higher education collaboration: while an indicator of mutual support depicted by willingness to achieve common goals serving as an indicator of collaboration quality is mentioned as well.

#### **C.4. Social Technology Use in Higher Education Institutions**

Most discussions of the use of Social Technology Use Higher Education institutions views it from the lens of teaching and learning. For instance, Isaías (2018) proposed the Emerging Learning Technologies Model (ELTM) in Higher Education which provides a scaffolding of emerging technologies used to attain five core characteristics of learning: personalized, ubiquitous, collaborative, lifelong and authentic. Mabhele and Van Belle (2019) argues that this model uses tools come from disparate viewpoints, and proposed a conceptual model that provides higher education institution decision makers with a clearer context of the types of technologies to consider against organizational contexts and/or objectives. The model follows the quadrant principle in which Quadrant 1 is made up of technologies that fit within existing as well as new institutional capabilities. In the Mabhele and Van Belle (2019) model, social technology is regarded as a

Collaborative Learning technology which addresses new missions and markets while utilizing existing institutional technology capabilities. This quadratic model is useful to understand social technology in this research, even though it would not just be used in the context of learning technologies.

Other types of research on Social Technology use Higher Education refers to students as beneficiaries, even though not always directly in the context of teaching and learning. These research for instance investigate the adoption of social media in Higher Education using the Technology Acceptance Model (Dumpit and Fernandez, 2017; Al-Rahmi et.al, 2022), the benefits of using Facebook as an educational instrument for learning and teaching (Chugh and Ruhi, 2017), the use of social media as communication and promotional tools (Peruta and Shields, 2016; Hamid et.al, 2017; Gutiérrez and Del Pino, 2020).

The need for research on the role of social technology in higher education governance has also been previously stated by Tierney (2008) which recognized that discussions are increasingly being mediated by electronic technologies and questions how higher education governance has been effected by these technologies, while Kezar (2005a) reminds us that redesigning academic organizations should include mechanisms for interactions between people to better enable collaboration that would make it easier for people to interact. It then becomes even more apparent that the use of Social Technology by faculty members for the purpose of Higher Education management remains a topic that has rarely been studied, and thus further strengthens the importance of this research.

### **C.5. Higher Education During the Covid-19 Pandemic**

There have been several research that study the impact of the Covid-19 pandemic on Higher Education Institutions. Possibly the most geographically wide ranging was the Global Survey conducted by the International Association of Universities (Marinoni, van't Land, and Jensen, 2020) which covers 109 countries and 424 institutions. It was found that during the height of the Covid-19 pandemic, almost all of the responding institutions report that Covid-19 has effected teaching and learning with two-thirds replacing classroom teaching with distance teaching and learning, and 80% reported that research has been affected as well. Fortunately 91% have sufficient infrastructure to communicate with students and staff.

Research on the effect of Covid-19 on higher education seems to focus two different aspects: 1) teaching and learning, and 2) higher education governance. Research on teaching and learning for instance has found that the pandemic has shown the weaknesses of the current higher education system, and suggest that more training in digital technology is needed for educators to adapt to the fast changing education climate that is felt throughout the world (Rashid and Yadav, 2020). Furthermore, it was suggested that higher education institutions and universities should plan post-pandemic education and research strategies to make sure student learning outcomes and educational quality is up to standard. Rashid and Yadav (2020) also notes that there are no best practices or known models for universities and other higher educational institutions to follow, these institutions would need to identify issues and make decisions to ensure that education processes are not compromised. More specifically, Sutrisno (2022) reports that Higher

Education institutions throughout Indonesia had promptly moved to online learning due to Covid-19, but questions the degree in which online learning will remain a feature of higher education in Indonesia.

Meanwhile, research on the pandemic's impact on higher education governance have found that the decision-making process in higher education institutions have been supported by the shared leadership culture in universities which allowed them to adapt to the pandemic (Fernandez and Shaw, 2020). The benefits of this distinct culture in higher education was further strengthened by Pekkola et.al's (2021) study of Finnish universities which demonstrated the important role of collegial coordination and maintenance work competencies of university managers. Decision making in higher education institutions had also been aided by a culture of collaboration, shared support, innovation, and organizational agility (Fernandez and Shaw, 2020). Navickienė et.al (2021) have found that successful management decisions during the pandemic in Lithuanian universities had been greatly supported by the collaboration between the different levels of authorities and the academic community, which includes communication between different levels of management, communication between university authorities and teaching staff, and communication with students. This research will hopefully help to better understand the dynamics between the quality of Collaboration and Decision-Making.

In terms of technology, several higher education institutions possess all the resources and tools needed to implement effective decisions and digitalization of processes during the Covid-19 pandemic (Strielkowski, 2020). A different situation

was found in Ghana where even during pandemic shutdowns most university administrators still chose to work in the office due to technology limitations in the country (Anane et.al, 2020). Based on these conflicting circumstances, it would be interesting to see how this research would shed light on the effect of social technology use and its viability on decision-making.

Meanwhile at the national higher education policy level, Sutrisno (2022) reported that government policies coincidentally announced prior to the pandemic were beneficial to the ability of higher education institution in Indonesia in building resilience in face of the pandemic: greater autonomy for government higher education institutions, and new regulations allowing for distance and online education. It is interesting to note that centralization of higher education policies at the government level may have beneficial effects on the ability of institutions in facing the pandemic as well. Such is the case in Turkey which Ergin (2022) found that governance of higher education has become even more centralized than before which resulted in its ability to safeguard the health of higher education staff and students while enhancing institutional capacity to conduct online teaching and learning.

### **C.6. Higher Education in the Post Covid-19 Era**

Several findings have cast doubt on whether the current changes in social technology use for teaching and learning will hold in the future. Van Schalkwyk (2020) reported that even though the pandemic has resulted in many changes in teaching and learning in South African universities, but questions how much of

these changes will actually be internalized by these universities after the pandemic have resided. A similar perception was stated by Sutrisno (2022) which found that while higher education institutions in Indonesia promptly adopted online learning, but also questioned the permanency of the move in a post Covid-19 landscape.

On the other hand, there seems to be a more optimistic perspective on whether the pandemic would become an inflection point on the use of social technology for higher education governance. For instance, Anane et.al (2020) predicts that in the post-pandemic era in Ghana there would be a dramatic shift from office-based work to blended-work among administrative and professional staff in universities. Dumulescu and Muțiu (2021) perceives that university governance online practices in Romania during the Covid-19 pandemic would be beneficial to be applied in non-pandemic situations, and more importantly could be an opportunity to redesign university organizations to be more efficient, accessible, and adaptable in the future.

This research is conducted at the stage where the Covid-19 pandemic seems to be in control due to the availability of vaccines and medications. Most higher education institutions in Indonesia have already adopted blended learning practice, while some have even gone back to full offline classes supported by online learning management systems. University administrators have started to mainly work in the office, while interaction with faculty members have started to become a mix of online and offline communication. The difference between the pre-pandemic work environment seems to be in the higher acceptance of social technology use for decision-making as well as for day to day activities. In this context, the results of this study is expected to provide more insight on how social technology use,

collaboration, and decision-making would interact in, optimistically speaking, the post Covid-19 pandemic era.

#### **D. Novelty**

This research advances knowledge through theoretical and contextual novelties as follows:

##### ***Theoretical Novelty:***

*Introducing social technology use as a separate entity in Frost and Sullivan's (2006) Global Collaboration Index model.*

The model introduced by Frost and Sullivan (2006) included the construct of collaborative technology as part of collaborative capability. However, Soeldner (2020) argues that future research should study these technologies more comprehensively in order to better understand how they can best be designed to facilitate collaboration by proposing and validating frameworks that help organizations successfully implement such technologies. For this purpose, it is justified that social technology should be a separate construct in itself.

Frost and Sullivan's (2006) concept of collaborative technology merely included web conferencing, audio conferencing, and meeting scheduler tools, and had not included more recent developments included in this research's concept of social technology, which includes direct messaging applications, file sharing and collaboration tools, and social media applications. In addition,

several previous studies of collaborative technology were based on the notion that these technologies are enterprise based due to the expenses incurred, while the newest iteration of these technologies are individual based and could reach a wider audience.

#### *Analyzing the effect of Social technology on Collaboration*

As a consequence of the separation of Technology from Culture and Structure in the Global Collaboration Index (Frost and Sullivan, 2011), the effect of social technology on collaboration quality will be studied in this research. Such an analysis has also been advocated by Bolás (2019) which suggest that the integration of social media tools into day to day business life is critical to safeguard the value of organizational communication. Furthermore, social media can contribute to several organizational dimensions, including improvement of communication processes, consolidation of organizational culture, and collective intelligence. Having stated this, Badea (2014) calls for the development of social media implementation conceptual models to identify how it fits within the organization's communication needs.

#### *Combining Liang et al.'s (2007) Fit and Viability model with Frost and Sullivan's (2006) Global Collaboration Index model.*

Task-technology fit is often used as a measure in whether a particular technology can improve the performance of a task, such as in the research conducted by Goodhue and Thompson (1995). Another factor to consider on the use of technology is that appropriate organizational settings are crucially

needed for its successful deployment (Turban, Liang, and Wu, 2011). These two considerations are depicted by Liang et al. (2007) as Fit and Viability which they have proven to be antecedents of performance.

In continuation of this theory, Turban, Liang, and Wu (2011) further proposed fit and viability to be potential antecedents of social software adoption. A recent study by Soeldner (2020) which reviewed 17 years of research on Research Collaboration and Social Software concluded that further research should continue to investigate factors that influence adoption and (dis)continuance of Web 2.0 applications, which in certain aspects intersect with social technology. More specifically, Julich (2012, in Badea 2014)) states that “the development of organizational structures and processes that are flexible enough to meet the communicative demands in the era of social media” is a great challenge for organizations.

Having separated social technology from Frost and Sullivan’s (2006) construct of culture and structure, this study in effect would link the Fit and Viability model with the Global Collaboration Index by adding *social technology fit* and *social technology viability* to the latter model. Thus, following-up on Turban, Liang, and Wu ‘s (2011), Julich’s (2012, in Badea 2014), and Soeldner’s (2020) recommendations, this research will study the effect of fit and viability on social technology use.

*Designating decision-making performance as a dependent variable rather than firm performance.*

Frost and Sullivan (2006) used firm performance as a dependent variable, indicated by a company's profitability, innovation, growth, and quality. This research substitutes firm performance with decision-making performance as indicated by efficiency, process satisfaction, and outcome satisfaction. This change is meant to follow up on Turban, Liang, and Wu (2011) finding that there is a lack of empirical scientific evidence concerning the risks and usefulness of social software especially in supporting decision-making process of virtual teams. Turban, Liang, and Wu (2011) also found that not much research has connected the theory of fit and viability to group decision-making. In addition Social technology as an antecedent of decision-making could also fulfill the need to extract, document, and share knowledge as an asset to provide wise decision-making opportunities for organizations (Kumari, 2021).

*Studying the possibility of collaboration quality as a mediator between social technology use and decision-making performance.*

Easley, Devaraj, and Crant (2003) has validated their model depicting collaborative technology usage intervening between team work quality and decision-making performance. This finding seems to contradict Frost and Sullivan's model which suggest that collaborative technology affects collaboration quality ("team work quality"), which in turn affects performance. For the purpose of clarifying the contradiction, this research will analyze

whether collaboration quality acts as a mediator between social technology use and decision-making performance.

***Contextual Novelty:***

*Situating the research in Indonesia to gain insight on collaboration and social technology use in this country*

The global research conducted Frost and Sullivan (2006) was conducted in three regions, with Asia represented by Australia, Japan, and Hong Kong. However, the research did not report any companies in the Southeast Asian region, and in particular, Indonesia. This exclusion is unfortunate, since these three countries would not necessarily be able to represent Asia as a whole. This would seem more evident if these countries were compared based on Hofstede's cultural framework (Hofstede, Hofstede, and Minkov, 2010) as depicted in Table 3.1.

**Table 3.1. Comparison of Four Countries Based on Hofstede's Cultural Framework**

	<b>Power Distance</b>	<b>Individualism vs collectivism</b>	<b>Masculinity vs femininity</b>	<b>Uncertainty Avoidance</b>
Australia	38	90	61	51
Japan	54	46	95	92
Hong Kong	68	25	57	29
Indonesia	78	14	46	48

Table 3.1 shows that culture-wise, Indonesia is very different from the three countries representing Asia in Frost and Sullivan's (2006) study. Indonesia has been found to have the largest power distance among these four

countries by a significant margin, and on the flip side, was found to be much more collectivistic by a wide margin. Indonesia was also found to be the most feminine among the four countries, while in terms uncertainty avoidance ranked in the middle.

Based on these differences, it is evident that Frost and Sullivan's study may not be representative of countries in Asia. To partly rectify this shortcoming, this research will be conducted in Indonesia. However, it should be noted that Suharnomo and Syahruramdhan's (2018) research suggests that Indonesia's position in Hofstede's framework are only able to explain the cultural characteristics Javanese people.

#### *Using non-profit higher education institutions as the context of research*

The global survey conducted by Frost and Sullivan (2006) involved companies / organizations in financial services, healthcare/pharma, professional services, manufacturing, high technology, and government. Unfortunately, the education sector was not part of the survey. This research will be conducted in the context of higher education institutions to study whether parts of the previous models would be applicable in such an environment.

#### *Focusing on the governance of Higher Education*

As has been discussed in the previous section, a large part of research on the use of technology in higher education has focused on teaching and learning. In line with this discussion, Zachos (2018) in a review of 77 articles published

from 2010 found that these articles mostly deal with users' learning style and personality, and not much on organizational issues. This is unfortunate, since Tierney (2008) has advocated the need for research on the role of social technology in higher education governance and questioned how higher education governance has been effected by these technologies. This research would contribute to help remedy this deficiency by focusing on the governance of Higher Education.

Meanwhile, the lack of research on decision-making in Muhammadiyah and 'Aisyiyah universities has led to the choice of institutions to be studied. Previous research has identified the need for shared decision-making (Wasono, 2016) and decision-making efficiency (Binangkit and Siregar, 2020) in Muhammadiyah universities will be followed up by including these elements as indicators of Decision-Making Performance in this research. The importance of group think Hasna (2022) for these universities would also be studied in this research as part of the Collaboration construct .

*Timing the research at the presumable end of the Covid-19 pandemic to gain insight on the possible sustained use of social technology for collaboration and decision-making.*

The previous section has suggested that higher education institutions have converted to online teaching and learning during the pandemic and cited several research confirming this finding. However, it is not yet clear whether social technology would still be widely used in the post-pandemic era (Van Schalkwyk, 2020; Dumulescu and Muțiu, 2021; and Sutrisno, 2022). Barua and

Bhattacharya (2023) has also observed that organizations have experienced the benefits of new technologies in terms of speed and instantaneous communications, but also questions whether this newly adapted change will be sustained after the pandemic. This research is conducted at the end of the pandemic, and will hopefully provide a better glimpse of the future use of social technology for collaboration and decision-making.

### **E. Hypothesis and Research Model**

Previous research on the suitability of technology to tasks by Goodhue and Thompson (1995) has proven that task characteristics have a significant effect on technology suitability to tasks (Task Technology Fit). Goodhue and Thompson (1995) developed a model that investigates how users of different information technologies evaluate their own performance. This model is referred to as the task-technology fit model. The reasoning behind this is that productivity will increase if the technology being used is well-suited to the requirements of the specific task being performed. When the characteristics of the task and the characteristics of the technology are more closely aligned, this will result in higher utilization and improved performance. This demonstrates the connection between the requirements of the task, the capabilities of the individual, and the capabilities offered by the technology. According to the Fit-Viability model, fit is defined by Liang et.al (2007) as "the extent to which new network applications are consistent with the core competence, structure, value, and culture of organization." On the other hand, Turban et.al (2011) provides a more straightforward explanation of fit

by defining it as "the extent to which the feature of a technology matches the needs of the task." Several other studies have also proven that task technology fit are factors that affect technology adoption and use (Lin & Huang, 2008; Larsen, Sørenbø, & Sørenbø, 2009; Zhou, Lu, & Wang, 2010; Oliveira, Faria, Thomas, & Popovic, 2014; Lu & Yang, 2014; Yadegaridehkordi, Iahad, & Ahmad, 2014). A person involved in non-routine tasks in their work would make an assessment on the suitability of technology with tasks when using information technology (D'Ambra, Wilson, & Akter, 2012). Finally, users will make more demands and know more about the shortcomings of the use of social technology that they use so that they will be adapted to the user's tasks. Based on these studies, this research proposes:

**H1: Social technology fit has a positive effect on social technology use**

Technology characteristics are the tools (hardware, software, and data) used by individuals to help complete the continuity of tasks (D'Ambra & Wilson, 2004; Goodhue & Thompson, 1995). Goodhue & Thompson's (1995) research proves that the characteristics of technology in the use of technology are factors that influence the continuity of technology on tasks. Several previous studies have also shown that technology characteristics are factors that influence the continuity of technology use (D'Ambra, Wilson, & Akter, 2012; Yadegaridehkordi, Iahad, & Ahmad, 2014). In an organization, the characteristics of technology are the basis for the use of social technology to evaluate the use of information technology and users' assessments of the level of technology continuance in the daily economy.

Technology continuance on task is a rational perspective on IT infrastructure whether the technology used can optimize user work or tasks in organizational readiness (Oliveira, Faria, Thomas, & Popovic, 2014). This further emphasizes that the continued use of technology for tasks is influenced by the characteristics of the task and the practicality of the technology used in assisting the work or daily tasks of users. Liang et al. (2007) showed that Viability, in conjunction with the of Fit, is a precursor to performance, and Turban et al. (2010) suggested that it is also a precursor to the acceptance of social software (2011). The term "viability," as defined by this body of work, is "the extent to the value-added potential of new network applications, requirements of human resource, capital demands, etc" (Liang et.al, 2007; Turban et.al, 2011). In the context of mobile technology adoption, Liang et al. (2007) devised the Fit and Viability Model (FVM). It was conceived as a means of bolstering research on technology's impact on business efficiency. The studies concluded that two parameters, fitness and viability, have the greatest impact on performance. Viability is based on the interaction between economic conditions, IT infrastructure, and organizational structure, while fit describes the compatibility between the task at hand and the available technology.

The construct of Utilization from the Utilization and Fit Model (Goodhue and Thompson, 1995) is combined with the construct of Viability from the Fit and Viability Model (Liang et al., 2007) by Turban, Liang, and Wu (2011) to produce a more holistic representation of decision-making. For the purpose of online group decision-making, Turban, Liang, and Wu (2011) provided a revised fit-viability model for the widespread use of social networking software. To evaluate a project's

feasibility, it is important to consider both the opportunity presented by the targeted decision-making tasks and the accessible social software tools, and the implementation factors and restrictions. These two factors are crucial to the project's success or failure. If the requirements for fit and viability are met, the use of social technology would in turn likely benefit teamwork and decision quality. Thus this study proposes that:

**H2: Viability has a positive effect on social technology use**

The use of social technology towards tasks requires the quality of collaboration as a determinant of beliefs about the usefulness and importance of use (D'Ambra, Wilson, & Akter, 2012). The use of sophisticated advanced technology does not always increase productivity, and information technology must have been supported by the quality of collaboration in helping individuals complete their tasks (Lin & Huang, 2008; Zhou, Lu, & Wang, 2010). In other words, although the use of advanced technology is used, but if it does not meet the requirements of the user's task and there is a lack of quality collaboration quality, it is likely that they will find it difficult to use it. Frost and Sullivan (2006) has confirmed that Collaboration Capability effects Collaboration Quality, with Collaboration Quality consisting of Culture and Structure and Collaborative Technology. Laudon and Laudon (2018) agree with this finding, and acknowledges that successful collaboration requires an appropriate organizational structure and culture as well as appropriate collaboration technology (Laudon & Laudon, 2018). However, it has

not been established that as a separate entity Collaboration Technology would effect Collaboration Quality. To fill in this gap, this research proposes:

**H3: Social technology use has a positive effect on collaboration quality**

Goodhue & Thompson's (1995) research proves that technology Utilization together with Task-Technology Fit has a positive effect on perceived individual performance. The results show that data quality, timeliness, and relationship with information systems predict the positive perceived impact of performance in decision-making. This model is consistent with DeLone and McLean (1992) who investigated the use of and attitudes toward technology that affect outcome and process satisfaction. Several related studies have also shown that the use of technology on tasks has an effect on the impact of individual performance in the efficient use of information technology (McGill & Klobas, 2009; D'Ambra, Wilson, & Akter, 2013). The use of technology on tasks will affect individual performance if the function of information technology available in the organization has the ability to support the daily tasks of users on relation to decision-making performance. The use of technology on tasks will affect individual performance if the function of information technology available in the organization is able to support the daily tasks of users so that it is related to decision-making performance. Therefore, this study proposes:

**H4: Social technology use has a positive effect on decision-making performance**

According to Easley, Devaraj, and Crant (2003), collaboration quality is reflected in measures such as communication, coordination, balance, support, effort, and cohesion, while decision-making performance and creative performance are indicators of team performance. In addition to facilitating collaboration between different departments, technology facilitates the careful identification of risks that is essential to the decision-making process. This is helpful since modern technology allows it. The findings by Treem (2022) shows that differences in the use of communication technology by employees will result in different communication visibility due to different ways of communicating between individuals.

Task-Technology Fit has been shown by Goodhue and Thompson (1995) to be an antecedent of Performance, while Fit together with viability has been demonstrated to effect Performance (Liang et.al, 2007). However, Social Technology has not been explicitly shown in these models. The framework proposed by Turban, Liang, and Wu (2011) takes a step further and proposes Fit and Viability as antecedents of Social Software Deployment which in turn is an antecedent of Decision-Making Performance. Meanwhile, Frost and Sullivan (2006) has demonstrated in their Global Collaboration Index that Collaboration and Social Technology effects Collaboration Quality which in turn effects Firm Performance. In order to bridge the Fit and Viability Model (Turban, Liang, and Wu, 2011) and the Global Collaboration Index Model (Frost and Sullivan, 2006), this research proposes:

**H5: Social technology use has a positive effect on decision-making performance with collaboration quality as a mediating variable**

Boughzala and de Vreede (2015) stated that to achieve team collaboration quality is need collaboration capability. According to Frost and Sullivan (2006), outstanding organizational performance is predicated on having the suitable collaboration capabilities as well as the proper collaboration technology with the appropriate fit measurements. The impact of the quality of collaboration is that it will boost the productivity of collaboration as well as the efficiency with which it will support the achievement of corporate goals and strategies. The capacity for collaboration is comprised of factors such as open culture, decentralized structure, and breadth of collaboration, among others. Jin et al.. (2019) explained that a collaborative capability is an enabler of performance gains for most organizations, the results also indicate that strategic limits have a significant impact on how this critical capability is converted into improved firm performance.

While Frost and Sullivan's (2006) Global Collaboration Index Model has shown that collaboration capability effects collaboration quality, Boughzala and de Vreede (2015) coined the term Collaboration Maturity Model and recommends that collaboration capability is needed for Team Collaboration Quality. Thus, this research proposes that:

**H6: Collaboration capability has a positive effect on collaboration quality**

The recognition of collaborative efforts and the coordination of team efforts are key drivers of cooperation in improved company success. Additionally, effective collaboration influences teamwork and has the potential to resolve a problem in the corporate world. One of the greatest advantages of group decision-making is that it can encourage participation from people who might not otherwise

work together, as well as speed up decision-making activities like prioritizing and analyzing alternative solutions, collect more opinions, and streamline the sharing of information (Turban, 2011). Collaboration within a team makes the many processes that decision makers must navigate easier to understand and more streamlined (Pau, 2008).

Individual performance (individual performance) in using information technology is generally based on the theory of attitudes and behavior (beliefs, influencing) of users to predict the use of information technology. Several previous studies have proven a positive relationship between utilization (utilization) and the impact of performance in decision-making performance at the individual level using information technology (McGill & Klobas, 2009; D'Ambra, Wilson, & Akter, 2013). This relationship is further strengthened by research by Delone and McLean (19922003) which identified the quality of collaboration model as an antecedent to the its impact of on performance which emphasizes the relationship between the use of information systems by individuals on the impact of organizational performance found in subsequent research (Delone & McLean, 2003). Individual performance in decision-making is a function of usage and user satisfaction which aims to show how information technology improves performance (Igarria & Tan, 1997). The implication is that improving the quality of collaboration in the use of technology will have a positive effect on the impact of individual decision-making performance. Thus, this research proposes that:

**H7: Collaboration quality has a positive effect on decision-making performance**

This proposed study will further enhance the studies presented in the previous sections in order to obtain a more comprehensive view on the relationships between *collaboration*, *social technology*, and *decision-making* through the theoretical framework shown in Figure 3.9. The framework integrates the *social networking software for group decision support framework* of Turban, Liang, and Wu (2011) and the *Global Collaboration Index Model* of Frost and Sullivan (2009), and also takes into account the *fit and viability model* of Liang et al. (2007), the *utilization and*

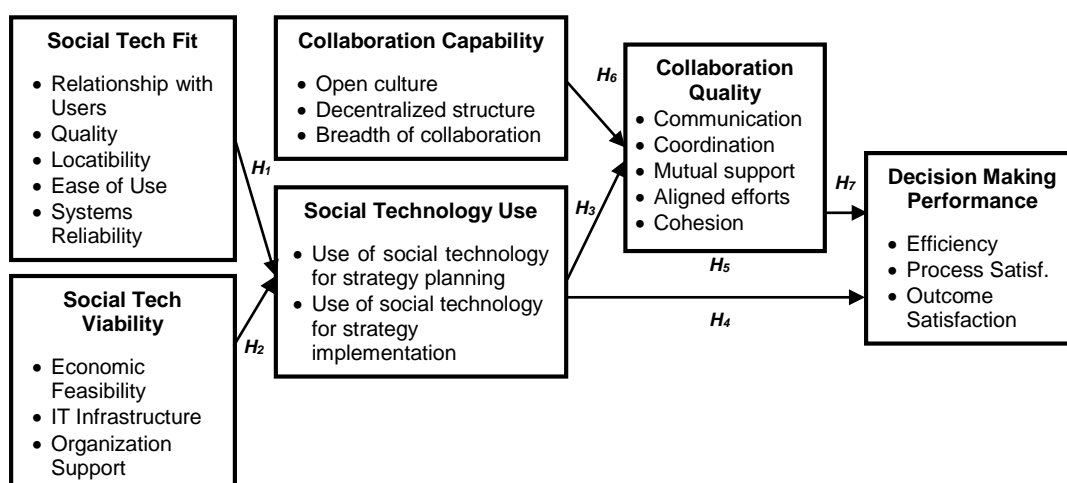


Figure 3.9. Proposed Research Model

*fit model* of Goodhue and Thompson (1995), and the *teamwork quality, technology usage and team performance* of Easley, Devaraj, and Crant (2003). The proposed model regards the term *collaborative technology* used in Frost and Sullivan's (2009) model and *social software* used in Turban, Liang, and Wu's (2011) as similar, and uses the term *social technology* to represent both.

There are seven hypotheses that will be tested in this study:

Hypothesis 1 (H<sub>1</sub>): *Social technology fit* has a positive effect on *social technology use*

Hypothesis 2 (H<sub>2</sub>): *Social technology viability* has a positive effect on *social technology use*

Hypothesis 3 (H<sub>3</sub>): *Social technology use* has a positive effect on *collaboration quality*

Hypothesis 4 (H<sub>4</sub>): *Social technology use* has a positive effect on *decision-making performance*

Hypothesis 5 (H<sub>5</sub>): *Social technology use* has a positive effect on *decision-making performance* with *collaboration quality* as a mediating variable

Hypothesis 6 (H<sub>6</sub>): *Collaboration capability* has a positive effect on *collaboration quality*

Hypothesis 7 (H<sub>7</sub>): *Collaboration quality* has a positive effect on *decision-making performance*.

## **CHAPTER IV**

### **RESEARCH METHOD**

#### **A. Research Design**

This study is quantitative research to test the relationships between variables that are formulated in the research hypothesis. The unit of analysis in this study is the organizational. A survey would be deployed using a closed-ended questionnaire for hypothesis testing accompanied with open ended questions as a means of clarifying respondents' answers. The research is designed to obtain generalizable results with a high level of external validity.

#### **B. Population and Sampling**

The unit of analysis of this research is organizational approach in which the population of the research are university study programs (departments) in which decision-makers use social technology for work-related tasks under the coordination of Muhammadiyah and 'Aisiyah universities in the Special Region of Yogyakarta and the Province of Central Java, Indonesia. In this regard, four universities would be included from the Special Region of Yogyakarta: Universitas Muhammadiyah Yogyakarta, Universitas Ahmad Dahlan, Universitas Aisiyah, and Universitas Siber Muhammadiyah. From the Province of Central Java, 12 universities from the would be included in the study.

Sampling is done using non-probability sampling methods and purposive sampling techniques. The probability sampling method is a method in which not all

members of the population are given the same chance to be chosen as a sample, while the purposive sampling technique is deployed to choose samples based on certain fixed criterion (Sekaran and Bougie, 2016). The criterion that will be used for sampling are heads or secretaries of study programs. The number of samples will be based on Hair et al.'s (2010) suggestion of between 5 and 10 times the number of parameters. Thus in this research, at least  $5 \times 37$  parameters or 185 samples will be used.

### **C. Data Collection**

Data is collected through a survey based on a questionnaire with close-ended questions accompanied by open-ended questions to clarify the answers. The survey would be conducted once, and is thus a cross-sectional representation of reality. Open-ended questions would also be posed to obtain a better understanding on the problems identified by respondents, and suggestions for the improvement of the variables in this research.

### **D. Operational Definitions and Variable Measurement**

In order to render abstract concepts in a tangible way to make them measurable a process called operationalizing of concepts should be taken. This is done by identifying behavioral dimensions, facets, or properties denoted by the concept, which are then converted into observable and measurable elements (Sekaran and Bougie, 2016).

The dependent variable in this research is *decision-making performance*. In the context of social technology enabled decision-making, this variable adopts the concept of group decision-making in which a set of individuals discuss and reach a consensus on some course of action (Tindale and Wingate, 2019), although in practice it might be a result of an aggregation of members' preferences such as in the case of elections and polls. Turban, Liang, and Wu (2011) identified decision-making performance as having process and outcome dimensions. Process assesses the efficiency of the group decision-making process and the satisfaction of members, while outcome measures the effectiveness of group decision-making. In this research the Process Efficiency indicator is measured based on the perception of decision-making speed and the amount of feedback garnered, while Outcome Effectiveness is measured by the perception of decision outcome quality and usefulness, as suggested in the framework developed by Turban, Liang, and Wu (2011).

In this research, collaboration is viewed as the act of “working with others to achieve shared and explicit goals” (Laudon & Laudon, 2018). The specific context of collaboration would be at the study program level which is the lowest level of unit in the university which still has the authority to develop and implement its own strategies while still aligned with the strategies of higher echelons of power. However, the term collaboration is indeed a very broad concept, and for the purpose of this research would be segregated into Collaboration Quality and Collaboration Capability.

*Collaboration quality* as an independent variable is defined by Frost and Sullivan (2009) as “the nature and extent of collaboration within an organization, driven by the infrastructure, processes and culture inherent in the enterprise”. Romano, Pick and Roztocki’s (2010) collaboration model stating that motivation, task structure, process structure, proximity, and IT collaborative support level are indicators of collaboration quality was initially considered, however this model focuses on motivational cross-organizational and cross-border collaborations, whereas this research would provide more focus on intra-organizational aspects of collaboration. Thus as indicators for collaboration quality, this study will employ Dietrich et al.’s (2010) proposed model consisting of communication, coordination, mutual support, aligned efforts, and cohesion.

In explaining the collaboration index model, Frost and Sullivan (2009) describe *collaboration capability* as an organization's orientation and infrastructure to collaborate. It is a forward-looking construct that influences the ability of an organization to compete in the future. As suggested by Frost and Sullivan (2009), the indicators of collaboration capability in this study are culture of openness, structure of decentralization, and breadth of collaboration. Since Frost and Sullivan (2009) did not explicitly explain structure of decentralization in enough detail, this research adopts Mintzberg’s (1983) observation of decentralization in an organization consisting of vertical decentralization, horizontal decentralization, and physical dispersion.

Rather than using the term social software (Turban, Liang, and Wu, 2011) or collaborative technology (Frost and Sullivan, 2009), this study uses the term

*social technology* as an antecedent to collaborative quality in order to combine both terms. Social technology seems to be more recently adopted in the context of information and communications technology, and is defined by Chui et al. (2012) as “digital technologies used by people to interact socially and together to create, enhance, and exchange content”. This definition is more appropriate to avoid the inclusion of more formal information systems such as Decision Support Systems.

More specifically, this research studies social technology in the form of direct messaging applications (WhatsApp, Telegram, Line, etc.), teleconference applications (Zoom, Google Meet, MS Teams, etc.), content distribution channels (Youtube, Tik-Tok, etc.), document sharing and collaboration tools (Google Drive, One Drive, etc.), and social media (Facebook, Instagram, Twitter, etc.). These applications are not as wide scoped as Turban et al.’s (2011) assertion of Collaboration 2.0 tools which included blogs, search tools, wikis, RSS feed, and virtual worlds due to the consideration that such applications would not be regularly used for collaborating inside a study program.

While Laudon and Laudon (2018) adapts Frost and Sullivan’s (2009) construct of collaboration technology in the collaboration index model into collaborative and social technology, this research only uses the term social technology to better reflect the aforementioned application and tools. Thus the indicators for social technology used in this study are: 1) use of social technology for implementation; and 2) use of social technology for strategic planning. The measurement of these indicators adopts Bughin et al.’s (2011) survey of companies’ usage of social technology.

*Viability* is defined by Turban et.al (2011) in the *fit-viability model* as the extent the infrastructure of an organization is ready to adopt a new technology. The indicators of viability used in this research are 1) economic feasibility; 2) IT infrastructure; and 3) organization readiness, with question items adapted from Liang et al.'s (2007) research.

The construct of *fit* adopts the concept of *task-technology fit* (Goodhue and Thompson, 1995) which shows the “degree a technology assists an individual in performing his or her portfolio of tasks”. In more specific terms, it includes the relationship between “task requirements, individual abilities, and the functionality of the technology”. Turban et.al (2011) offers a simpler explanation of *fit* as “the extent to which the feature of a technology matches the needs of the task”, however the indicators that were used (information sharing, idea generation, idea evaluation, solution selection, and solution implementation) would partly coincide with the indicators of Social Technology Use, and thus these indicators are not used in this research. Goodhue and Thompson's (1995) *task-technology fit* model refers to the perceived individual performance resulting from the use of information technologies. The rationale is that technology would enhance performance if it fits the nature of the task at hand. Higher utilization and better performance will be achieved if there is a good fit between task characteristics and technology characteristics. The indicators of *fit* (relationship with users, quality, locatibility, ease of use, systems reliability) and its question items are adopted from the strongest factors and most relevant dimensions in this model as well.

**Table 4.1. Operational Definition of Research Variables**

Variable	Definition	Indicator	Question Item	Q No.
Social Technology Fit	“The degree to which a technology assists an individual in performing his or her portfolio of tasks. More specifically, the correspondence between task requirements, individual abilities, and the functionality of the technology” (Goodhue and Thomson, 1995 on Task-technology fit)  “The extent to which the feature of a technology matches the needs of the task”. (Turban et.al., 2011)	Relationship with Users	Responsiveness	1
		Quality	Currency of the data	2
		Locatability	Meaning of data is easy to find	3
		Ease of Use	Ease of Use	4
		Systems Reliability	Systems Reliability	5
		(Goodhue and Thomson, 1995)	(Goodhue and Thomson, 1995, adapted)	
Social Technology Viability	“The extent to which the infrastructure of the organization is ready for adopting a new technology”. (Turban et.al., 2011)	Economic Feasibility	Project budget	6
		IT Infrastructure	Physical asset	7
			Human assets (Training needs)	8
			Hardware infrastructure	9
			Software infrastructure	10
			(Network management system)	11
		Organizational Support	IS staff competence	12, 13
	User competence	14		
	Top management support	(Liang et.al., 2007, adapted)		
Social Technology Use	Social technologies are “digital technologies used by people to interact socially and together to create, enhance, and exchange content”. (Chui et.al, 2012)	Use for Strategy Planning	Scanning external environment	15
		Use for Strategy Implementation	Finding new ideas	16
			Developing strategic plan	17
			Managing projects	18
			Allocating resources	19
			Matching employees to tasks	20
			(Bughin et.al., 2011, adapted)	
	(Frost and Sullivan, 2009)			
Collaborative Capability	“A forward-looking construct that represents an organization's orientation and infrastructure to collaborate”. (Frost and Sullivan, 2009)	Culture of Openness	Ease of communication within organization (work unit)	21
		Structure of Decentralization	Inter-unit cooperation	22
			Inter-unit accessibility	23
			Vertical decentralization	24
		Breadth of Collaboration	Horizontal decentralization	25
			Physical dispersion	26
			Breadth of strategic planning collaboration	27
			Breadth of strategy implementation collaboration	28
	(Frost and Sullivan, 2009, adapted) (Mintzberg 1983 on indicators of Decentralization)			
Collaboration Quality	“The nature and extent of collaboration within an organization, driven by the infrastructure, processes and culture inherent in the enterprise”. (Frost and Sullivan, 2009)	Communication	Information exchange	29
		Coordination	Mutual understanding	30
		Mutual support	Willingness to achieve common goals	31
		Aligned efforts	Alignment of contributions	32
		Cohesion	Collaborative spirit	33

Variable	Definition	Indicator	Question Item	Q No.
	“The fluency of interactional activities taking place between the collaborative actors”. (Dietrich et.al, 2010)	(Dietrich et.al, 2010)	(Dietrich et.al, 2010)	
Decision-Making Performance	“Group decision-making has two kinds of performance measures: process and outcome. The process measure evaluates whether the group decision process is more efficient and whether the members are more satisfied with the process. The outcome criteria assess the effectiveness of a group decision-making, which may include economic and other measures”. (Turban, Liang, and Wu, 2011)	Process efficiency  Outcome effectiveness  (Turban, Liang, and Wu, 2011)	Speed of decision process Amount of feedback Decision outcome quality Decision outcome usefulness  (Turban, Liang, and Wu, 2011, adapted)	34 35 36 37

### E. Data Analysis Methods

Data analysis for hypothesis testing will utilize SEM (Structural Equation Modeling) with AMOS. Descriptive statistical analysis would be conducted for the purpose of mapping out the respondent profile and understanding the respondent’s response on the questions posed in the questionnaire. An analysis of open ended questions would be conducted as well, to gain additional insight on respondent’s perspectives.

### F. Descriptive Analysis

Descriptive analysis is an analytical tool used to determine the characteristics of respondents’ answers to the questionnaire. Haryono (2017) explains that the results of descriptive analysis can be used to obtain the tendency of respondents' answers in regards to the variables used in the study. In this case, the mean of each questionnaire response and the standard deviation would be reported. Answers to the open-ended questions would be categorized, and the

frequency would be tabulated. In addition, noteworthy details of the categorized answers would be reported as well.

## **G. Instrument Quality Test**

### **1. Validity Test**

The Validity Test is intended to measure construct validity to show how well the collected data fit the theories around which the test is designed (Sekaran and Bougie, 2016) and thus used to test the validity of a theoretical construct (Ghozali, 2018). In testing the validity, the indicator is said to be valid if the *loading factor* is  $\geq 0.50$ . In social research, loading factor  $\geq 0.50 - 0.70$  can still be tolerated (Hair, *et. al.* 2006; Ghozali, 2018). In this study the researchers used a loading factor of  $\geq 0.50$ .

### **2. Reliability Test**

Reliability is an index that shows the stability and consistency in which the instrument measures the intended concept and in this case supports the assessment of the “goodness” of a measure (Sekaran and Bougie, 2016). In other words, it indicates how much a measuring instrument can be trusted or relied upon. If a measuring instrument is used repeatedly to measure the same symptoms and the results obtained are relatively consistent, then the measuring instrument is said to be *reliable*. In other words, reliability shows the consistency of a measuring device in measuring the same phenomenon.

To assess the level of reliability of a measuring instrument, it can be seen from the resulting CR (*Construct Reliability*), VE (*Variance Extracted*) and AVE (*Average Variance Extracted*) values (Hair, *et. al.* 2006; Ghozali, 2018) . If the CR value obtained from the calculation is  $\geq 0.70$ , the VE value from the calculation is  $\geq 0.50$ , and the AVE value from the calculation is  $\geq 0.70$ , then the measuring instrument of the variable is declared to be *reliable*.

#### **H. Structural Equation Modelling (SEM) Assumptions**

According to Ghozali (2018), before testing constructs several requirements or assumptions must be met before using the SEM analysis technique, including:

1. Adequacy of Sample Size

The sample size that must be met in this modeling is a minimum of 100 - 200 samples or the number of indicators multiplied by 5 - 10 (Sekaran and Bougie, 2016).

2. *Outlier* Test

*Outliers* can be seen from the *Mahalanobis distance output* in testing using AMOS. The criterion used to assess the presence or absence of *outliers* in the study is a *p* value of  $<0.001$ . This distance is evaluated using *X* in degrees of freedom equal to the number of question items used in the research model (Hair, *et. al.* 2006; Ghozali, 2018).

### 3. Data Normality Test

Normality reflects the shape of a data distribution whether it is normal or not. If a data distribution does not form a normal distribution then the results of the analysis are feared to be biased. The data distribution is said to be normal at a significance level of 0.01 if the *critical ratio* (cr) for *skewness* (slope) or for *kurtosis* (sharpness) is not more than  $\pm 2.58$  (Hair, *et. al.* 2006; Ghozali, 2018) .

### 4. Multicollinearity Test

The multicollinearity test requires that there is no perfect or large correlation between exogenous constructs. Multicollinearity can be detected from the determinant value of the *covariance matrix*. Indications of the existence of multicollinearity and singularity can be known through the determinant value of the sample's *covariance matrix* which is really small or close to zero ( Hair, *et. al.* 2006; Ghozali, 2018). In addition, the existence of multicollinearity can also be seen if the value of the correlation coefficient between exogenous constructs obtained  $< 0.90$  (Hair, *et. al.* 2006; Ghozali, 2018).

## I. Structural Equation Modelling (SEM) Steps

The steps in SEM testing are as follows:

### 1. Development of Theoretical Models

Model development in SEM is the search or development of a model that has a strong theoretical justification. In other words, without a strong theoretical basis, SEM cannot be used. This is because SEM is not used to

produce a model, but to confirm the theoretical model through empirical data. In other words, SEM is not used to produce causality, but to justify the existence of theoretical causality through empirical data testing. That is why hypothesis testing regarding difference uses *the chi-square test* (Hair, et. al. 2006; Ghozali, 2018) .

## 2. Development of a Flowchart ( *Path Diagram* )

*The developed theoretical model is then drawn into a path diagram* to more easily understand the causal relationships to be tested. In SEM, the term factor or construct is defined as a concept that has sufficient theoretical foundation to explain various forms of relationships. According to ( Hair, et. al. 2006; Ghozali, 2018) the constructs developed in *path diagrams* could be divided into two groups:

### a. *Exogenous construct*

Exogenous constructs are referred to as independent variables that are not predicted by other variables in the model.

### b. *Endogenous construct*

Endogenous constructs are factors predicted by one or several constructs. Endogenous constructs can predict one or several other endogenous constructs, but endogenous constructs can only be causally related to endogenous constructs.

## 3. Selecting Input Matrix and Model Estimation

SEM only uses variance or covariance matrices or correlation matrices as input data for all estimates made. The correlation matrix has a

well-defined and common range of 0 to  $\pm 1$  and therefore allows for direct comparisons between the coefficients in the model. Covariance matrices are generally used more in research on relationships, because the *standard errors* reported from various studies generally show inaccurate numbers when the correlation matrix is used as input ( Hair, *et. al.* 2006; Ghozali, 2018) .

#### 4. Possible Occurrence of Identification Problems

The identification problem is basically a problem regarding the inability of the developed model to generate unique estimates. According to ( Hair, *et. al.* 2006; Ghozali, 2018) identification problems can arise through the following symptoms:

- a. *The standard error* for one or several coefficients is very large
- b. The program is unable to produce the information matrix that should be presented.
- c. Strange numbers appear, such as a negative *error variance*.
- d. The emergence of a very high correlation between the estimated coefficients obtained, for example  $> 0.9$ .

#### 5. Evaluation of Goodness of Fit Criteria

According to Hair, *et. al.* (2006) and Ghozali (2018), the first action that should be taken is to evaluate whether the data used can meet the SEM assumptions. After the SEM assumptions are met, the next step is to determine the criteria that will be used to evaluate the model and the effects displayed in the model. The suitability and statistical tests are carried out

using several *fit indices* to measure the correctness of the proposed model. Several *Goodness-of-Fit Indexes* and *cut-off values* can be used to test the feasibility of a model, including:

a.  $\chi^2$ -Statistical Chi Square Test

The most fundamental test tool for measuring *overall fit* is the *likelihood ratio Chi Square Statistics*. *Chi Square* is very sensitive to the size of the sample used. The model being tested will be considered good or satisfactory if *the Chi-Square* is low. The smaller the  $\chi^2$  value, the better the model (Hair, *et. al.* 2006; Ghozali, 2018).

b. CMIN/DF

*The minimum sample discrepancy function* (CMIN) divided by the *degrees of freedom* will produce the CMIN/DF index, which is generally reported by researchers as an indicator to measure the *fit* level of a model. In this case CMIN/DF is nothing but a *chi-square statistic*,  $\chi^2$  divided by its DF so that it is called relative  $\chi^2$ . The value of  $\chi^2$  is relatively less than 2.0 or even less than 0.3 is an indication of *acceptable fit between* the model and data (Hair, *et. al.* 2006; Ghozali, 2018).

c. GFI (*Goodness of Fit Index*)

The *Goodness of fit index* calculates the weighted proportion of the variance in the sample covariance matrix that is explained by the estimated population covariance matrix. The GFI value  $\geq 0.90$  is an index indicating the good fit of the model, while the NFI value  $\leq$

0.80 to <0.90 indicates the marginal fit of the model (Hair, et. al. 2006; Ghazali, 2018).

d. AGFI (*Adjusted Goodness of Fit Index*)

AGFI is an analogue of  $R^2$  in multiple regression. This *fit index* can be *adjusted* to the available *degrees of freedom* in testing the acceptability of the model. Both GFI and AGFI are criterion that take into account the weighted proportion of variance in a sample covariance matrix. The AGFI value  $\geq 0.90$  is an index indicating the good fit of the model, while the NFI value  $\leq 0.80$  to <0.90 indicates the marginal fit of the model (Hair, et. al. 2006; Ghazali, 2018).

e. CFI (*Comparative Fit Index*)

The value of this index is in the range of 0 – 1, the closer to 1 indicates the highest level of fit, *a very good fit*. The recommended value is  $CFI \geq 0.90$  which is an index that shows the good fit of the model, while NFI values  $\leq 0.80$  to <0.90 indicate the marginal fit of the model (Hair, et. al. 2006; Ghazali, 2018).

f. TLI (*Tucker Lewis Index*)

TLI is an alternative *incremental fit index* that compares a model being tested against a *baseline* model. The recommended value as a reference for the acceptance of a model is  $\geq 0.90$  which indicates the good fit of the model, while NFI values  $\leq 0.80$  to <0.90 indicate the marginal fit of the model (Hair, et. al. 2006; Ghazali, 2018).

g. NFI (*Normed Fit Index*)

NFI is a comparative measure between the proposed model and the null model. NFI values will vary from 0 (*no fit at all*) to 1.0 (*Perfect fit*). As with the TLI there is no absolute value that can be used as a standard, but it is generally recommended to be the same or  $> 0.90$  which indicates the good fit of the model, while NFI values  $\leq 0.80$  to  $< 0.90$  indicate the marginal fit of the model (Hair , et.al 2006; Ghozali, 2018).

h. IFI (*Incremental Fit index*)

IFI is an index that can be used to see the *goodness of fit* of a research model. An IFI value of  $\geq 0.90$  indicates the *good fit* of the model, while an IFI value of from 0.80 to  $< 0.90$  indicates the *marginal fit* of the model (Hair, et. al. 2006; Ghozali, 2018).

i. RMSEA (*The Root Mean Square Error of Approximation*)

RMSEA is an index that can be used to compensate for the *chi square statistic* in large samples. An RMSEA value of  $\leq 0.08$  is an index that indicates the *good fit* of the model, while an RMSEA value of 0.80 to  $< 0.90$  indicates the *marginal fit* of the model (Hair, et. al. 2006; Ghozali, 2018).

j. RMR/RMSR (*The Root Mean Square Residual*)

RMR represents the average residual value obtained from matching the variance-covariance matrix of the hypothesized model with the observed variance-covariance matrix, thus it is difficult to

interpret. An RMR/RMSR value of  $\leq 0.05$  indicates the *good fit* of the model (Hair, *et. al.* 2006; Ghozali, 2018). As a summary, the indices that can be used to test the feasibility of a model are presented in Table 3.2.

**Table 4.2. Goodness Fit Index**

<i>Goodness of Fit Index</i>	<i>Cut Off Value</i>
<i>X<sup>2</sup> – Chi Square</i>	Small Expected
<i>Significance Probability</i>	$\geq 0.05$
<i>CMIN/DF</i>	$\leq 2.00$
<i>GFI</i>	$\geq 0.90$
<i>AGFI</i>	$\geq 0.90$
<i>CFI</i>	$\geq 0.90$
<i>TLI</i>	$\geq 0.90$
<i>NFIs</i>	$\geq 0.90$
<i>IFI</i>	$\geq 0.90$
<i>RMSEA</i>	$\leq 0.08$
<i>RMR</i>	$\leq 0.05$

k. Parameter Significance Test

Decisions about whether or not a variable is significant can be made by comparing the *p-value* with the level of significance used. The value of  $\alpha$  is usually 5% (0.05) (Hair, *et. al.* 2006; Ghozali, 2018).

l. Model Interpretation and Modification

The last step is to interpret and modify models that do not meet the requirements for the tests carried out ( Hair, *et. al.* 2006; Ghozali, 2018).

#### m. SEM Test with Mediation

The SEM test with mediation in this study was used to analyze whether the variable mediates the effect of exogenous constructs on endogenous constructs. The mediation model in SEM can be seen from direct and indirect influences. This relationship can be measured from the *standard loading factor value* of each variable at the *output of standardized regression weights* (Hair, *et. al.* 2006; Ghozali, 2018).

## **CHAPTER V**

### **RESEARCH RESULTS AND DISCUSSION**

#### **A. General Description**

The Muhammadiyah organization is an Indonesian non-governmental organization founded in 1912 by Ahmad Dahlan in the city of Yogyakarta. The organization offers Social, education and health services throughout the country in the spirit of “amar maruf nahi munkar” (promoting good deeds and preventing evil) as part of the teachings of Islam. These services are known as the Three Pillars of Muhammadiyah (Trisula) and are embodied in the form of Muhammadiyah Social Enterprises.

Muhammadiyah has 384 orphanages as part of its social services, 583 hospitals, maternity care centers, and health clinics as part of its health services, and 30,125 kindergartens and early childhood education centers, 2,766 elementary schools and Islamic elementary schools (Madrasah Ibtidaiyyah and Madrasah Diniyah), 1,826 junior high schools and Islamic junior high schools (Madrasah Tsanawiyah), 1,407 senior high schools, vocational high schools, and Islamic senior high schools (Madrasah Aliyyah), 125 Islamic boarding schools, 163 Muhammadiyah higher education institutions and 9 ‘Aisyiyah higher education institutions. In total there are 37,388 Muhammadiyah Social Enterprises spread all over Indonesia (CHERD, 2022), several overseas schools (Australia, Egypt, and others), and a university in Malaysia. Muhammadiyah has recently provided donations to mitigate the effects of the Covid-19 pandemic worth Rp 78.6 Billion

in addition to numerous medical personnel and volunteers (Fanreza and Kasduri, 2021). All Muhammadiyah higher education institutions are under the coordination of the Council for Higher Education, Research, and Development of the Central Board of Muhammadiyah with headquarters in Yogyakarta.

**Table 5.1. List of Participating Universities and Study Programs**

No.	University	Study Programs	Total Programs	% of Total
1	Universitas 'Aisyiyah Yogyakarta	18	20	90
2	Universitas Ahmad Dahlan	25	59	42
3	Universitas Muhammadiyah Yogyakarta	37	46	80
4	Universitas Siber Muhammadiyah	6	6	100
<i>Subtotal: Special Region of Yogyakarta</i>		<b>86</b>	<b>131</b>	<b>66</b>
5	Universitas 'Aisyiyah Surakarta	8	11	73
6	Universitas Muhammadiyah Gombong	7	12	58
7	Universitas Muhammadiyah Karanganyar	6	10	60
8	Universitas Muhammadiyah Kendal Batang	5	10	50
9	Universitas Muhammadiyah Klaten	4	10	40
10	Universitas Muhammadiyah Kudus	14	20	70
11	Universitas Muhammadiyah Magelang	19	22	86
12	Universitas Muh. Pekajangan Pekalongan	12	18	67
13	Universitas Muhammadiyah Purwokerto	9	49	18
14	Universitas Muhammadiyah Purworejo	8	17	47
15	Universitas Muhammadiyah Semarang	9	32	28
16	Universitas Muhammadiyah Surakarta	13	61	21
<i>Subtotal: Province of Central Java</i>		<b>114</b>	<b>272</b>	<b>42</b>
<b>Total</b>		<b>200</b>	<b>403</b>	<b>50</b>

The unit of analysis of this research are organizational at the Study Program level represented by the head or secretary of the unit. Study Programs are the smallest formal academic unit in Indonesian higher education institutions, and are

somewhat similar to the term Departments in other countries. This research focused specifically on Muhammadiyah universities in the Special Region of Yogyakarta and in Central Java. Responses from a total of 218 study programs from 16 Muhammadiyah universities were received, of which 4 universities are from the Special Region of Yogyakarta while the remaining 12 were from the Province of Central Java. Among these, 18 study programs were identified as outliers and thus the remaining 200 study programs were further analyzed (Table 5.1.). The research had initially been able to achieve a 69% response rate out of the 131 active study programs registered in the Ministry of Education and Culture database in the Special Region of Yogyakarta, and a 47% response rate from the 272 study programs in Central Java. After excluding the outlier data, a response rate of 66% and 42%, respectively, were still achieved. Study Programs are the smallest academic unit in Indonesian higher education institutions, and are somewhat similar to the term Departments in other countries.

### **B. Analysis of Respondent Profiles**

This section discusses the profile of respondents based on the first section of the research questionnaire. The section provides information on gender, age, position, degrees offered, accreditation, group of knowledge, faculty, university, region, working period at university, working period as head and secretary of the study program, and the types of social technology used in the study program.

## 1. Respondent by Gender

**Table 5.2. Respondent by Gender**

No.	Gender	Respondents	Percentage
1	Male	106	53%
2	Female	94	47%
<b>Total</b>		<b>200</b>	<b>100%</b>

Table 5.2 shows that the respondent data analyzed in this research by gender were from 106 men (53%) and 94 women (47%). It should be noted that all the respondents were decision makers in the study program; thus the proportion between men and women does not necessarily represent the proportion of faculty members.

## 2. Respondent by Age

**Table 5.3. Respondent by Age**

No.	Age	Respondents	Percentage
1	26 - 35	70	35%
2	36 - 45	66	33%
3	46 - 55	48	24%
4	56 - 65	16	8%
<b>Total</b>		<b>200</b>	<b>100%</b>

Based on the age of the respondents presented in Table 5.3, it can be seen that the data used for this research were from respondents aged 26-35 years (70 respondents or 35%), followed by respondents aged 36-45 years (66 respondents or 33%), respondents aged 46-55 years (48 respondents or 24%), and respondents aged 56-65 years (16 or 8%). Interestingly, more than 35% of

the respondents are from the millennial generation and they have already achieved a senior position in the university. However, 32% of the respondents are over 46 years, and they might have difficulty using more advanced social technology applications such as Teleconferencing (Zoom, Google Meet, MS Teams, etc.) and Content distribution (Youtube, Tik-Tok, etc.).

### 3. Respondent by Position

**Table 5.4. Respondent by Position**

<b>No.</b>	<b>Position</b>	<b>Respondents</b>	<b>Percentage</b>
1	Head of study program	174	87%
2	Secretary of study program	26	13%
<b>Total</b>		<b>200</b>	<b>100%</b>

The data in Table 5.4 show that most of the respondents were heads of study programs (174 respondents, 87%), while the remaining were secretaries of study programs (26 respondents, 13%). By having the top decision maker in the study department representing a significant portion of respondents, the research would be expected to provide more accurate findings.

## 4. Study Program by Level of Degree Offered

**Table 5.5. Study Program by Level of Degree Offered**

<b>No.</b>	<b>Level of Study Program</b>	<b>Study Programs</b>	<b>Percentage</b>
1	Diploma 3 (D3)	23	11.5%
2	Diploma 4 (D4)	7	3.5%
3	Bachelor's (S1)	128	64%
4	Master's (S2)	22	11%
5	Doctorate (S3)	4	2%
6	Professional certificate	16	8%
<b>Total</b>		<b>200</b>	<b>100%</b>

Based on the data in Table 5.5, the degree offered by the study programs which participated the most in filling out the questionnaire were those that offered Bachelor (S1) degrees (128 study programs or 64%), This is followed by study programs offering Diploma 3 (D3) degrees (23 study programs or 11.5%), study programs offering Masters (S2) degrees (22 respondents or 11%), study programs offering Professional Certificates (16 respondents or 8%), and study programs offering Diploma 4 (D4) degrees (7 respondents or 3.5%). The least number of study programs were those offering S3 degrees (4 respondents or 2%). The data in this table seems to proportionally represent the degrees offered in Indonesia. Please note that the Diploma 4 degree is a vocational degree comparable to a Bachelor's degree.

## 5. Study Program by Accreditation

**Table 5.6. Study Program by Accreditation**

No.	Accreditation	Study Programs	Percentage	Study Programs (Converted)	Percentage (Converted)
1	Unggul (Excellent)	27	13.5%	62	31%
2	A	35	17.5%		
3	Very Good	15	7.5%	81	40.5%
4	B	66	33.0%		
5	Good	30	15.0%	41	20.5%
6	C	11	5.5%		
7	Not Accredited (in process)	16	8%	16	8%
<b>Total</b>		<b>200</b>	<b>100%</b>	<b>200</b>	<b>100%</b>

There have recently been changes in the higher education accreditation system of Indonesia. For instance, the highest accreditation level in the old system is "A", while the term "Excellent" is used in the new system. The two right-most columns in Table 5.6 shows both terms combined in a single category. The study programs which participated the most in filling out the questionnaire were study programs that possess an accreditation of B (old accreditation standards) or Very Good (new accreditation standards) with a total of 81 study programs or 33%, followed by study programs which received an accreditation of A or Excellent (62 study programs or 31%), and study programs which obtained an accreditation of C or Good (41 study programs or 20.5%). In addition, there were 16 study programs (8%) still in the process of accreditation.

## 6. Study Program by Group of Knowledge

**Table 5.7. Study Program by Group of Knowledge**

<b>No.</b>	<b>Group of Knowledge</b>	<b>Study Programs</b>	<b>Percentage</b>
1	Health Science	60	<b>30.0%</b>
2	Engineering	31	<b>15.5%</b>
3	Social Sciences and Humanities	31	<b>15.5%</b>
4	Economics	31	<b>15.5%</b>
5	Educational Science	23	<b>11.5%</b>
6	Medical Science	6	<b>3.0%</b>
7	Mathematics and natural science	2	<b>1.0%</b>
8	Plant Science	2	<b>1.0%</b>
9	Animal Science	1	<b>0.5%</b>
10	Religion and Philosophy	1	<b>0.5%</b>
11	Linguistics	1	<b>0.5%</b>
12	Other Sciences	11	<b>5.5%</b>
<b>Total</b>		<b>200</b>	<b>100%</b>

Table 5.7 shows that 60 (30%) study programs in this research are from the field of Health Sciences (Nursing, Maternity, etc.), followed by Engineering, Social Sciences and Humanities, and Economics (each with 31 study programs, or 15% each), Educational Science (23 study programs, 11.5%), and Medical Science (6 study programs, 3%). This categorization is based on the Ministry of Education's list of knowledge groups in which Medical Science is separate from Health Science, even though the two groups in several universities are under one faculty. The remaining study programs only constitute between 0.5% – 1% of this research, aside from the study programs that categorize themselves as Other Sciences (11 study programs, 5.5%).

## 7. Study Programs by University

**Table 5.8. Study Programs by University**  
(in Alphabetical order)

No.	University	Study Programs	Percentage
1	Universitas 'Aisyiyah Surakarta	8	4.0%
2	Universitas 'Aisyiyah Yogyakarta	17	8.5%
3	Universitas Ahmad Dahlan	25	12.5%
4	Universitas Muhammadiyah Gombong	7	3.5%
5	Universitas Muhammadiyah Karanganyar	6	3.0%
6	Universitas Muhammadiyah Kendal Batang	5	2.5%
7	Universitas Muhammadiyah Klaten	4	2.0%
8	Universitas Muhammadiyah Kudus	14	7.0%
9	Universitas Muhammadiyah Magelang	19	9.5%
10	Universitas Muhammadiyah Pekajangan Pekalongan	11	5.5%
11	Universitas Muhammadiyah Purwokerto	9	4.5%
12	Universitas Muhammadiyah Purworejo	10	5.0%
13	Universitas Muhammadiyah Semarang	9	4.5%
14	Universitas Muhammadiyah Surakarta	13	6.5%
15	Universitas Muhammadiyah Yogyakarta	37	18.5%
16	Universitas Siber Muhammadiyah	6	3.0%
<b>Total</b>		<b>200</b>	<b>100%</b>

Based on the table of study programs by university (Table 5.8), 37 study programs (18.5%) are from Universitas Muhammadiyah Yogyakarta, followed by Universitas Ahmad Dahlan (25 study programs, or 12.5%), Universitas Muhammadiyah Magelang of Central Java (19 study programs, 9.5%), and Universitas 'Aisyiyah Yogyakarta (17 study programs, 8.5%). The largest universities in the two provinces covered in this study are Universitas

Muhammadiyah Surakarta (Central Java), Universitas Ahmad Dahlan, and Universitas Muhammadiyah Yogyakarta (Special Region of Yogyakarta).

Unfortunately, Universitas Muhammadiyah Surakarta is not proportionately represented in this study, with only 13 study programs (6.5%) participating. This study also includes two universities under 'Aisyiyah, which could be considered as the women's wing of Muhammadiyah. It should be noted that the scope of this study is on universities and does not include higher education institutions that usually have lower numbers of study programs, such as academies and polytechnics.

#### 8. Study Programs by Region

**Table 5.9. Study Programs by Region**

<b>No.</b>	<b>Region</b>	<b>Study Programs</b>	<b>Percentage</b>
1	Special Region of Yogyakarta	85	42.5%
2	Central Java	115	57.5%
<b>Total</b>		<b>200</b>	<b>100%</b>

There are 85 (45.2%) study programs analyzed from the Special Region of Yogyakarta and 115 (57.5%) study programs from Central Java (Table 5.9). Even though Central Java is a much larger province with a population of 34.74 million people in 2020, compared to the Special Region of Yogyakarta with a population of 3.92 million people in 2020 (Central Bureau of Statistics, 2020), the concentration of higher education students in Yogyakarta is much higher which is why the region is known as “Kota Pelajar” (City of Students).

## 9. Respondents by Working Period at University

**Table 5.10. Respondents by Working Period at University**

<b>No.</b>	<b>Working Years</b>	<b>Respondents</b>	<b>Percentage</b>
1	<5	58	29.0%
2	6 - 10	61	30.5%
3	11 - 20	50	25.0%
4	21 - 30	23	11.5%
5	31 - 40	7	3.5%
6	>40	1	0.5%
<b>Total</b>		<b>200</b>	<b>100%</b>

Table 5.10 describes the number of years the respondents have worked at the university. Most of the respondents who participated in the study had 6-10 years of work experience (61 respondents or 30.5%), followed by those with <5 years of work experience (58 respondents or 29%), respondents with 11-20 years of work experience (50 respondents or 25%) and respondents with 21-30 years of work experience (23 respondents or 11.5%). A smaller number of respondents had 31-40 years of work experience (7 people or 3.5%), and more than 40 years of work experience (1 respondent or 0.5%).

## 10. Respondents by Working Period at Current Position

Based on Table 5.11, it could be seen that most respondents who participated in the study had <5 years of work experience in their current position either as head or secretary of the study program (173 respondents or 86.5%), followed by those with 6-10 years in their current position (22 people or 11%). Meanwhile, the remaining respondents had been in their current

**Table 5.11. Respondents by Working Period at Current Position**

<b>No.</b>	<b>Working Years</b>	<b>Respondents</b>	<b>Percentage</b>
1	<5	173	86.5%
2	6 - 10	22	11.0%
3	11 - 20	3	1.5%
4	>20	2	1.0%
<b>Total</b>		<b>200</b>	<b>100%</b>

position for 11-20 years (3 people or 1.5%) and >20 years (2 people or 1%). These numbers are understandable since the positions of heads and secretaries of study programs are often limited to two cycles and often replaced with other faculty members at the end of their terms. This tradition also further enforces the collegial nature of higher education institutions, as observed by Chaffee (1983).

#### 11. Respondent by Social Technology Used in The Study Program

The Social Technology applications used by study programs that were assessed in the research questionnaire (Table 5.12) were Direct messaging (WhatsApp, Telegram, Line, etc.), Document sharing and collaboration (Google Drive, One Drive, Dropbox, etc.), Social media (Facebook, Instagram, Twitter, etc.). Teleconferencing (Zoom, Google Meet, MS Teams, etc.), and Content distribution (Youtube, Tik-Tok, etc.). The respondents were allowed to freely report the Social Technology applications that were used in their study programs, and thus resulted in a large variation of responses. Rather sur-

**Table 5.12. Respondent by Social Technology Used In The Study Program**

<b>No.</b>	<b>Social Technology used in the Study Program</b>	<b>Study Programs</b>	<b>Percentage</b>
1	Direct messaging, Teleconferencing, Content distribution, Document sharing and collaboration, Social media	101	51%
2	Direct messaging, Teleconferencing, Document sharing and collaboration, Social media	23	12%
3	Direct messaging, Teleconferencing, Document sharing and collaboration	19	10%
4	Direct messaging, Teleconferencing	14	7%
5	Direct messaging, Teleconferencing, Content distribution, Document sharing and collaboration	13	7%
6	Teleconferencing	9	5%
7	Direct messaging, Teleconferencing, Social media	5	3%
8	Social media	3	2%
9	Direct messaging, Document sharing and collaboration, Social media	2	1%
10	Direct messaging, Teleconferencing, Content distribution	2	1%
11	Direct messaging, Social media	2	1%
12	Direct messaging, Content distribution, Document sharing and collaboration, Social media	1	1%
13	Direct messaging, Teleconferencing, Content distribution , Social media	1	1%
14	Direct messaging, Document sharing and collaboration	1	1%
15	Document sharing and collaboration, Social media	1	1%
16	Direct messaging	1	1%
17	Document sharing and collaboration	1	1%
18	-	1	1%
<b>Total</b>		<b>200</b>	<b>100%</b>

prisingly, 51% (101 study programs) used all five types of Social Technology applications, while 7% (13 study programs) used four types of applications with the exception of social media applications. Interestingly, 14 study programs (7%) only used a single type of social technology application in their unit.

### C. Descriptive Statistics

In this section, descriptive statistics was carried out to obtain an overview or description of the variables in the study. The research has obtained 200 data points representing study programs that met the specified criteria. Table 5.13 shows the research sample characteristics based on the number of samples, minimum value, maximum value, average, and standard deviation.

**Table 5.13. Mean and Standard Deviation of Indicators**

Symbol	N	Minimum	Maximum	Mean	Std. Deviation
FIT1	200	3	5	4.50	.545
FIT2	200	2	5	4.35	.718
FIT3	200	2	5	4.61	.566
FIT4	200	3	5	4.46	.567
FIT5	200	3	5	4.56	.559
<b>FIT</b>		<b>3</b>	<b>5</b>	<b>4.49</b>	<b>0.59102</b>
VIB1	200	1	5	3.90	.903
VIB2	200	2	5	4.31	.661
VIB3	200	1	5	3.46	1.095
VIB4	200	1	5	4.06	.871
VIB5	200	2	5	4.11	.855
VIB6	200	2	5	4.11	.866

Symbol	N	Minimum	Maximum	Mean	Std. Deviation
VIB7	200	2	5	4.01	.725
VIB8	200	2	5	4.12	.636
VIB9	200	3	5	4.43	.613
<b>VIB</b>		<b>2</b>	<b>5</b>	<b>4.05</b>	<b>0.80282</b>
STU1	200	3	5	4.44	.545
STU2	200	2	5	4.43	.593
STU3	200	2	5	4.25	.644
STU4	200	3	5	4.33	.572
STU5	200	3	5	4.31	.588
STU6	200	3	5	4.36	.582
<b>STU</b>		<b>3</b>	<b>5</b>	<b>4.35</b>	<b>0.58743</b>
COC1	200	3	5	4.46	.569
COC2	200	2	5	4.24	.698
COC3	200	2	5	4.04	.792
COC4	200	1	5	4.01	.737
COC5	200	1	5	4.03	.711
COC6	200	2	5	4.21	.660
COC7	200	2	5	4.04	.682
COC8	200	3	5	4.07	.655
<b>COC</b>		<b>2</b>	<b>5</b>	<b>4.14</b>	<b>0.68793</b>
COQ1	200	2	5	4.13	.646
COQ2	200	2	5	4.17	.647
COQ3	200	3	5	4.34	.598
COQ4	200	2	5	4.05	.649
COQ5	200	2	5	4.18	.642
<b>COQ</b>		<b>2</b>	<b>5</b>	<b>4.17</b>	<b>0.63632</b>
DMP1	200	2	5	4.24	.624
DMP2	200	2	5	4.17	.610
DMP3	200	2	5	4.08	.639
DMP4	200	2	5	4.20	.585
<b>DMP</b>		<b>2</b>	<b>5</b>	<b>4.17</b>	<b>0.61464</b>
Valid N (listwise)	200				

The table above shows that N, or the amount of data for each valid variable, is 200. The FIT variable had a minimum value of 3 and a maximum value of 5. Variable FIT acquired a mean value of 4.49, which is much greater than the standard deviation value of 0.59102. This means that the deviation of the data that occurred is low and the distribution of the values is evenly distributed or homogeneous. The Viability (VIB) variable had a minimum value of 2, a maximum value of 5, a mean value of 4.05, and a standard deviation of 0.80282 indicating that the variable is homogeneous.

With a minimum value of 3, a maximum value of 5, a mean value of 4.35, and a standard deviation value of 0.58743 show that distribution of the data on Social Technology Usage (STU) is homogeneous or evenly distributed. Meanwhile, Collaboration Capability (COC) with a mean value of 4.14 and a standard deviation of 0.68793; Collaboration Quality (COQ) with a mean value of 4.17 and the standard deviation value of 0.63632; and Decision-Making Performance (DMP) with a mean value of 4.17 and a standard deviation of 0.61464 demonstrate that the samples of all of these variables were evenly distributed or homogeneous.

The following descriptive analysis provides a general description of the variables and indicators based on respondents' answers to the distributed research questionnaire. This section reports the mean values of the responses of 200 heads or secretaries of study programs regarding the indicators of the research variables, and uses the following category scheme:

- a. Index value 1.00 – 1.79 = Very Low
- b. Index value 1.80 – 2.59 = Low
- c. Index value 2.60 – 3.39 = Moderate
- d. Index value 3.40 – 4.19 = High
- e. Index value 4.20 – 5.00 = Very High

#### 1. Social Technology Fit Variable

This analysis determines the social technology fit variable according to the respondents, and the results are depicted in Table 5.14. In general, the respondents valued social technology fit very highly. More specifically, respondents considered the relationship between social technology applications and users to be very high, and found that they could easily obtain assistance when having problems with its use. Aside from the relationship with the system itself, this also indicates the responsiveness of expert staff in helping sort out the obstacles faced by faculty members. Since this is an essential factor, training on the use of social technology should be held regularly for the smooth use of social technology in universities.

One of the benefits of using social technology at work is its usefulness to help obtain the latest information. Another indicator is locatibility which shows that respondents find it very easy to clarify the information received through social technology. Interactions through online media could possibly make the delivery of some communications and information less clear. It is thus not

**Table 5.14. Social Technology Fit Variable**

<b>Symbol</b>	<b>Indicator</b>	<b>Question Item</b>	<b>Question</b>	<b>Mean</b>	<b>Category</b>
FIT1	Relationship with Users	Responsiveness	I quickly get help if I have difficulty using social technology.	4.35	Very High
FIT2	Quality	Currency of the data	I get up-to-date information when using social technology.	4.61	Very High
FIT3	Locatibility	Meaning of data is easy to find	It easy to find explanations for unclear information.	4.46	Very High
FIT4	Ease of Use	Ease of Use	I find the use of social technology easy to learn.	4.50	Very High
FIT5	Systems Reliability	Systems Reliability	Social technology is always ready to use when needed.	4.56	Very High
<b>TOTAL</b>				<b>4.49</b>	<b>Very High</b>

uncommon to have differences in perceptions between faculty members and staff. However, the collaboration between teams and optimal use of social technology can make it easier for users to get explanations for unclear information. Respondents assessed that the environment at their respective universities was very good in seeking explanations for incomplete information.

The respondents found social technology to be very easy to use. The familiarity with several social technology applications, such as Google Drive and Zoom, has benefited faculty members in using social technology. In addition, this might indicate that universities have organized events to support the proficiency of faculty members and staff in social technology use.

The indicator of locatibility receives a high rating from the respondents. Regarding the system reliability indicator, respondents strongly agree that social technology is always ready to be used when needed. This suggests that information technology infrastructure and expertise are well managed by the universities to support the use of social technology.

Having a mean value of 4.49 demonstrates that Social Technology Fit in Muhammadiyah and Aisyiyah universities is very high. This result indicates that the use of Social Technology fits with the tasks and duties of heads and secretaries of study programs.

## 2. Social Technology Viability Variable

This descriptive analysis is used to determine respondents' perspectives on the viability of social technology use in their study programs. The results of the analysis can be seen in Table 5.15. Respondents stated that economic feasibility is very important for the viability of social technology use. They reported that their university had provided an adequate budget for the use of social technology which would be used to assist faculty members and staff in carrying out their daily tasks. However, the use of social technology is not always accessible for free. Several applications require a premium account to be able to access more optimally. The use of social technology requires several costs to support its use, such as internet fees, premium access fees, security costs, and also the costs of other supporting tools. According to respondents, companies still need more financial support for using social technology.

**Table 5.15. Social Technology Viability**

<b>Symbol</b>	<b>Indicator</b>	<b>Question Item</b>	<b>Questions</b>	<b>Mean</b>	<b>Category</b>
VIB1	Economic Feasibility	Project budget	My organization provides an adequate budget to facilitate the use of social technologies.	3.90	High
VIB2		Physical asset	The use of social technology reduces the need for physical assets needed to work.	4.31	Very High
VIB3		Human assets (Training needs)	The use of social technology does not require special training.	3.46	High
VIB4	IT Infrastructure	Hardware infrastructure (Network system)	My organization has good internet network management capabilities.	4.06	High
VIB5		Software infrastructure	My organization has good software management capabilities.	4.11	High
VIB6	Organizational Support	IS staff competence	My organization has IT staff experienced in system development and maintenance.	4.11	High
VIB7		User competence	I have adequate knowledge of the use of social technology.	4.01	High
VIB8			I can use social technology effectively.	4.12	High
VIB9		Top management support	My superior supports the use of social technology.	4.43	Very High
<b>TOTAL</b>				<b>4.05</b>	<b>High</b>

An adequate budget to facilitate the use of social technology is expected to ensure the optimal use of the technology. Respondents highly agreed that using social technology could minimize the need for physical assets. This perspective might be due to the prevalent use of personal mobile gadgets to

access social technology applications, which would reduce the dependence on university facilities. As the respondents also suggested, the familiarity of social technology applications would also reduce the need for special training in its use.

In the Information Technology infrastructure indicator, respondents rated the level of the network management system in the use of social technology as being at a high level. The use of social technology is optimized if a good internet network is available. With the internet, computers in the university could be connected to any computer in the world. Therefore, a good internet network is needed for daily activities. Along with the rapid advancement of information technology, software development would also benefit the university. Software development and management are costly, but it is an investment that positively impacts a university's progress. Based on Table 5.15, the respondents rated the level of software management capability as well as the information system staff competence in system development and maintenance in the university as high. The role of IT staff is essential in a university to develop systems as well as to troubleshoot problems in its use.

Respondents assessed that their competence in using social technology was at a high level in the indicator of organizational support of viability. It could also be seen that the respondents rated top management support in the use of social technology in the university as being at a very high level. Top management support is needed to encourage the use of social technology, as well as to provide technological facilities. With a mean value of 4.05, it can be

interpreted that the viability of using social technology at Muhammadiyah and 'Aisyiyah universities is high. It seems that the average responses were not as high as the Fit variable, possibly because Social Technology Viability measures the conditions of economic, infrastructure, and organizational support provided by these universities. These results might therefore indicate that a higher level of support would increase the Viability of Social Technology Use.

### 3. Social Technology Use Variable

This section reports a descriptive analysis of the respondent's perspective on Social Technology Use. The results of this analysis could be seen in Table 5.16. Respondents suggested that the use of social technology for strategy planning had a very high rating. The benefits of information and social technology are that it can assist users in providing information with coverage throughout the region very quickly and precisely. Respondents rate the level of finding new ideas using social technology in the university at a very high level. With the sophistication of social technology, anyone can obtain information from various regions and perspectives. This information may help faculty members to come up with new ideas. The more points of view and information obtained, the more ideas a person can put forward for the organization. By using social technology, an organization can support the implementation of plans to realize organizational goals.

**Table 5.16. Social Technology Use**

<b>Symbol</b>	<b>Indicator</b>	<b>Question Item</b>	<b>Questions</b>	<b>Mean</b>	<b>Category</b>
STU1	Use for Strategy Planning	Scanning external environment	I use social technology to scan (search for information about) the external environment.	4.44	Very High
STU2		Finding new ideas	I use social technology to find new ideas.	4.43	Very High
STU3		Developing strategic plan	I use social technology to do strategic planning.	4.25	Very High
STU4		Managing projects	I use social technology to manage Work Programs.	4.33	Very High
STU5	Use for Strategy Implementation	Allocating resources	I use social technology to manage organizational resources.	4.31	Very High
STU6		Matching employees to tasks	I use social technology to distribute tasks.	4.36	Very High
<b>TOTAL</b>				<b>4.35</b>	<b>Very High</b>

Respondents highly agreed that they used social technology to manage work programs in their units. The strategy implementation indicator received a very high rating from respondents because they considered using social technology very helpful for an organization in managing its resources. The respondents very heavily used social technology to participate in various activities for strategy implementation. The presence of social technology was also used to facilitate the study program to appropriately assign tasks to faculty members and staff. Based on the mean value of 4.35, it can be interpreted that

Social Technology Use at Muhammadiyah and Aisyiyah universities is at a very high level, both in terms of strategy planning and strategy implementation.

#### 4. Collaboration Capability Variable

This analysis is used to determine the Collaboration Capability of participating study programs. The results of the descriptive analysis can be seen in Table 5.17. To support the indicator of culture of openness, respondents rated the level of ease of communication using social technology in the university to be at a very high level. This result suggests that there are not many barriers in communication between faculty members as well as with study program decision makers, and it is also consistent with the collegial culture in universities. Respondents rated the level of accessibility between units in the university as high, suggesting that low communication barriers exist not only in the study program but also extends to other entities. It is thus not surprising that collaboration with other work units is also rated as very high.

All the above statements show that the culture of Muhammadiyah and 'Aisyiyah universities are very open. In the structure of decentralization indicator, respondents assessed the level of vertical decentralization in using social technology as high. In a university, there needs to be a clear division of tasks or jobs to minimize overlap. With a clear and firm division of tasks, each unit, from the smallest to the highest, will perform different jobs and produce tasks that can support one unit with another. Each unit clearly has its own

**Table 5.17. Collaboration Capability**

<b>Symbol</b>	<b>Indicator</b>	<b>Question Item</b>	<b>Questions</b>	<b>Mean</b>	<b>Category</b>
COC1	Culture of Openness	Ease of communication within organization (work unit)	I find it easy to communicate with anyone in my work unit.	4.46	Very High
COC2		Inter-unit cooperation	Collaboration between Work Units (other study programs, bureaus, divisions, etc.) in my organization has been routinely carried out.	4.24	Very High
COC3		Inter-unit accessibility	I can easily access people in other Work Units.	4.04	High
COC4	Structure of Decentralization	Vertical decentralization	In my organization, the division of authority to the lowest working unit has been done well (Note: the study program has sufficient authority).	4.01	High
COC5		Horizontal decentralization	In my organization, the division of authority between parallel work units has been done well.	4.03	High
COC6		Physical dispersion	Users (students) can easily access services from various work units in my organization.	4.21	Very High
COC7	Breadth of Collaboration	Breadth of strategic planning collaboration	My organization has collaborated extensively on strategic planning activities.	4.04	High
COC8		Breadth of strategy implementation collaboration	My organization has collaborated extensively on strategy implementation activities.	4.07	High
<b>TOTAL</b>				<b>4.14</b>	<b>High</b>

rights and authorities, which results in very good inter-unit collaboration. Respondents also assessed that the level of horizontal decentralization using social technology in the university was at a high level. This assessment implies that parallel working units have well-established functional roles that do not overlap. In addition, respondents rated the level of physical dispersion by using social technology in the university to be at a very high level. The measure for physical dispersion was how easily students could access services from the various work units in the university, and thus indicates that the use of information and communication technology in the university strongly supports administrative and academic activities. Overall, the level of decentralization in participating universities are high and supports the notion that each working unit has a significant level of autonomy to perform its duties. Such a level of autonomy would enable study programs to develop and implement their own strategies.

The Breadth of Collaboration indicator received a high score from the heads and secretaries of study programs. Respondents reported that their organization had collaborated extensively in strategic planning activities. Respondents also considered that the organization had collaborated extensively in strategy implementation activities. These two indicators show evidence of an extensive and wide-scoped collaboration in strategy development and implementation. In summary, the analysis shows that Muhammadiyah and 'Aisyiyah universities possess a high level of Collaboration Capability due to having a very high culture of openness, a high level of decentralization, and an

extensive breadth of collaboration. This condition is expected to affect Collaboration Quality, which would be inspected in the next section.

#### 5. Collaboration Quality Variable

This analysis is used to determine the Collaborative Quality of participating study programs. The results of the descriptive analysis can be seen in Table 5.18.

**Table 5.18. Collaboration Quality**

<b>Symbol</b>	<b>Indicator</b>	<b>Question Item</b>	<b>Questions</b>	<b>Mean</b>	<b>Category</b>
COQ1	Communication	Information exchange	In my Work Unit, the exchange of information needed to collaborate has been carried out well.	4.13	High
COQ2	Coordination	Mutual understanding	Within my Work Unit, a common understanding has been formed about the goals of the work unit and the activities that need to be carried out to achieve these goals.	4.17	High
COQ3	Mutual support	Willingness to achieve common goals	My Work Unit members help each other to achieve common goals.	4.34	Very High
COQ4	Aligned efforts	Alignment of contributions	Contributions given by members of my Work Unit are in line with expectations.	4.05	High
COQ5	Cohesion	Collaborative spirit	There has been a spirit of collaboration among members of my Work Unit.	4.18	High
<b>TOTAL</b>				<b>4.17</b>	<b>High</b>

To measure communication, respondents agreed that the exchange of information needed for collaboration has been well carried out. Presumably,

information technology has been appropriately used to support this exchange. Respondents also considered that the work unit had formed a common understanding of its goals and the activities that need to be carried out to achieve these goals. In this aspect, a mutual understanding between members of the study program has been established as a pathway for coordination. Respondents also reported that there was a very high willingness among study program members to help each other achieve common goals. Each member of the unit had contributed to these goals by aligning their efforts. In addition, a high spirit of collaboration among members has resulted in the cohesion of the study program. All these factors have contributed to the high quality of collaboration at Muhammadiyah and 'Aisyiyah universities.

#### 6. Decision-Making Performance Variables

As the dependent variable in the research model, Decision-Making Performance has been descriptively analyzed as well. The results of this analysis can be seen in Table 5.19. The table shows that respondents strongly agreed that the use of social technology in the work unit resulted in quick decisions making, contributing to the efficiency of the decision-making process in the study program. A large amount of feedback was also generated by the use of social technology, which also contributed to highly efficient decision-making processes. In terms of decision outcome effectiveness, the heads and

**Table 5.19. Decision-Making Performance**

<b>Symbol</b>	<b>Indicator</b>	<b>Question Item</b>	<b>Questions</b>	<b>Mean</b>	<b>Category</b>
DMP1	Process efficiency	Speed of decision process	The use of Social Technology in my work unit has allowed to make decisions quickly.	4.24	Very High
DMP2		Amount of feedback	Social Technology in my work unit generates a lot of feedback in the decision-making process.	4.17	High
DMP3	Outcome effectiveness	Decision outcome quality	The use of Social Technology in my work unit results in quality decisions.	4.08	High
DMP4		Decision outcome usefulness	The use of Social Technology in my work unit resulted in useful decisions.	4.20	Very High
<b>TOTAL</b>				<b>4.17</b>	<b>High</b>

secretaries of study programs agreed that the use of Social Technology had resulted in high quality and very useful decisions. In general, the analysis shows that the Decision-Making Performance of Muhammadiyah and 'Aisyiyah universities are high due to the efficiency of the decision process and the effectiveness of its outcome.

#### D. Results of Open-Ended Questions

**Table 5.20. Social Technology Use Problems in Study Programs**

No.	Problems	Frequency	Percentage
1	Limited skills and knowledge in utilizing media	63	31.03
2	Internet network or signal interference	43	21.18
3	Coordination and communication are not optimal	31	15.27
4	It takes time and sufficient memory to install and integrate the application	17	8.37
5	Unbudgeted software or information technology payments	6	2.96
6	No problems stated	43	21.18
<b>Total</b>		<b>203</b>	<b>100</b>

Table 5.20 shows the problems respondents had in using social technology. The most dominant problem respondents faced was the limited ability and knowledge in using social technology. This problem may partly be due to age because age affects a person's ability to adapt to the digital world. The next problem is internet network interference. Faculty members might live in different locations where the quality of the internet is also very diverse, thus hampering the process of utilizing technology. In such cases, faculty members must rely on campus internet infrastructure to support work.

Technological developments that continue to progress have a tremendous impact on everyone. People use social technology to channel ideas, socialize, and express opinions. However, even though technological developments are increasingly sophisticated, it can make coordination and communication less than optimal, due to previous habits of face-to-face coordination and

communication. Discussions and decision-making might not be carried out optimally due to obstacles such as length of response time, network quality differences, shorter meeting durations, and the potential for misperceptions.

The next problem is about time and memory in installing and integrating applications. The use of social technology must be supported by the technology's capacity. For instance, adequate computer and mobile phone memory and speed is required to smoothly install and utilize social technology applications. The next problem faced by respondents is the lack of legitimate software support. There are several other obstacles, such as premium access. Many applications require paid premium access to be able to use. Unfortunately, not all study programs provide a sufficient budget to pay for premium access and out-of-campus Internet fees.

**Table 5.21. Collaboration Problems in Study Programs**

<b>No.</b>	<b>Problems</b>	<b>Frequency</b>	<b>Percentage</b>
1	Miscommunication and discoordination	51	25.50
2	Technological constraints	23	11.50
3	Selfishness and seniority	20	10.00
4	Unit members are often busy	17	8.50
5	Differences in opinion	15	7.50
6	Time management of each individual	14	7.00
7	Limited of human resources	4	2.00
8	Lack of funding	3	1.50
9	No problems stated	53	26.50
<b>Total</b>		<b>200</b>	<b>100.00</b>

The data in Table 5.21 shows that the most dominant problems faced by respondents in terms of collaboration are miscommunication and

discoordination. Advances in technology also greatly support the ease of communication. With social technology, we can easily communicate with other people anywhere and anytime. In communicating, a person does not only speak to convey the intent and purpose but must be able to convey the message's meaning clearly and precisely, otherwise miscommunication and discoordination may occur. According to respondents, miscommunication and discoordination can occur due to several factors. The first factor is differences in perception between the sender and recipients of the information. The next is differences in knowledge and experience, the slow response of group conversations, and differences in the language style used significantly affect how a person receives information.

Furthermore, using social technology in the work process cannot avoid technical problems. The first problem is limited access to applications and the inability to use the software or applications outside of the campus. Another problem is the need for premium access for certain social technology applications. Also, some faculty members and staff may not be proficient in using information technology. In addition, the problems that many respondents encounter are selfishness and seniority. Some faculty members tend to prefer to work individually, while others might only care about their own career needs. Several respondents also reported difficulties in collaboration due to some lecturers who are difficult to manage and want to know the benefits they will receive. Some also reported the lack of mutual understanding and the existence of sectoral egos. Seniority was also reported to be a problem, with

senior faculty members handing over management work to junior members. There was also a gap between lecturers and study programs being reported.

Then the next problem is that faculty members and staff are often busy. Respondents assessed that each lecturer's many assignments and workloads made it difficult to hold meetings and discussions. This problem may also be why some respondents complained about limited response and feedback during group discussions and private chats. The impact of the busy schedule also makes it challenging to manage the time management of each lecturer. According to respondents, the number of different activities for each lecturer makes it challenging to manage discussions.

The next problem is the difference of opinion. According to respondents, there are frequent differences in opinion and perception because of differences in perspectives, goals, preferences, goals, age, and personal characteristics. In addition, according to respondents, there is a lack of human resources, which makes the workload excessive and results in slow response time. The last problem mentioned by respondents is the problem of funding, particularly for research and service financing.

In regards to problems in decision-making shown in Table 5.22, the most dominant problem faced by respondents is a lack of coordination and collaboration. According to respondents, the factors that caused these problems were that not all active members provided input for decision-making. It was difficult to determine the time for offline meetings, so the resulting decisions were not able to involve all lecturers. There were reports that many individuals

were difficult to collaborate with and had different opinions in determining decisions. The above decision-making problems align with the collaboration problems reported previously. An interesting statement is mentioned by some respondents regarding the speed and abundance of information channeled through social technology, resulting in decisions that were taken too quickly and spontaneously without careful consideration.

**Table 5.22. Decisions Making Problems in Study Programs**

<b>No.</b>	<b>Problems</b>	<b>Frequency</b>	<b>Percentage</b>
1	Lack of coordination and collaboration	92	46.00
2	Applicable policies and regulations	12	6.00
3	Suboptimal use of technology	11	5.50
4	Limited of human resources	7	3.50
5	Short deadlines	3	1.50
6	Budget	3	1.50
7	No problems stated	72	36.00
<b>Total</b>		<b>200</b>	<b>100</b>

The next problem is related to uncertain policies. Several respondents reported frequent policy changes, causing confusion and chaos on the authority to make urgent decisions. . Some respondents observe that offline meetings are more optimal than meetings using social technology. Several respondents also reported that internal correspondence in study programs is still being done manually, while it should be managed effectively and efficiently. Another problem mentioned is the lack of data access rights on data needed by the study program, which might be the reason that some respondents felt Iso reported the need to develop better information systems.

Aside from not all lecturers and staff understand the use of technology, respondents also felt the lack of human resources which makes it difficult to implement their programs. Another problem is the lack of coordination and budget support from superiors, with respondents stating that funding is needed for instance to support zoom and other premium accounts. The last problem respondents mentioned in making decisions is having short deadlines, which makes it challenging to reach consensus.

**Table 5.23. Suggestions for Improvement of Social Technology Use, Collaboration, and Decision-Making**

<b>No.</b>	<b>Problems</b>	<b>Frequency</b>	<b>Percentage</b>
1	Technology use training	67	33.50
2	Technology and network upgrades	57	28.50
3	Collaboration	21	10.50
4	Written and clear rules	10	5.00
5	Add human resources and expert staff	10	5.00
6	Offline meetings are preferred	7	3.50
7	No suggestions stated	28	14.00
<b>Total</b>		<b>200</b>	<b>100.00</b>

Based on Table 5.23, the suggestion given by the most respondents is to conduct training on the use of social technology. The next dominant suggestion is the need for technology and network upgrades to ensure that devices and systems run well. which is necessary to optimize collaboration between work units. Respondents also consider it necessary to regularly monitor, update, and evaluate activities using social technology. Respondents also suggested using

shared calendars to minimize the need for invitations, using technology as a promotion media, and using digital signatures.

The next popular suggestion is to improve cooperation between work units. According to respondents, to create good teamwork, it is necessary to develop a common perception from the beginning, especially in understanding the organization's vision and mission. Respondents also cited the need for top management support to create close collaboration between work units.

The next suggestion is the need for clear written policies and rules which are accessible to all units. In addition, respondents also felt that there should be policies regarding personal social media use. A reward and punishment scheme is also recommended to increase collaboration. Several respondents suggested adding expert staff to manage social technology to ensure the smooth use of social technology and achieve better work unit collaboration. It is interesting to note that only 3.5% of respondents suggested face-to-face meetings be held more frequently than online meetings, especially in discussing strategic matters.

## **E. Instrument Quality Test**

### **3. Validity test**

Validity shows how well an instrument measures the particular concept it is designed to measure (Sekaran and Bougie, 2016). More specifically, this test is intended to measure construct validity to show how well the collected data fit the theories around which the test is designed

(Sekaran and Bougie, 2016) and thus tests the validity of a theoretical construct (Ghozali, 2018). In testing the validity, the indicator is said to be valid if the loading factor is  $\geq 0.50$ . In social studies, a loading factor between 0.50 - 0.70 can still be tolerated (Hair, et. al. 2006; Ghozali, 2018). In this study, a loading factor of  $\geq 0.50$  is used.

a. Exogenous Construct Validity Test

**Table 5.24. Exogenous Construct Validity Test Results**

<b>Question Items</b>	<b><i>Estimates</i></b>	<b>Results</b>
FIT1	.659	Valid
FIT2	.632	Valid
FIT3	.766	Valid
FIT4	.684	Valid
FIT5	.616	Valid
VIB1	.687	Valid
<b>VIB2</b>	<b>.421</b>	<b>Not Valid</b>
<b>VIB3</b>	<b>.489</b>	<b>Not Valid</b>
VIB4	.827	Valid
VIB5	.834	Valid
VIB6	.752	Valid
VIB7	.560	Valid
VIB8	.578	Valid
VIB9	.611	Valid
COC1	.604	Valid
COC2	.706	Valid
COC3	.643	Valid
COC4	.753	Valid
COC5	.862	Valid
COC6	.757	Valid
COC7	.832	Valid
COC8	.604	Valid

Source: Processed Data, 2022 (Appendix 2)

The results in Table 5.24. show that all of the exogenous construct indicators used in the study have a loading factor value of  $\geq 0.5$  (Hair, *et. al.* 2006; Ghazali, 2018), with the exception of VIB 2 and VIB3 which were Not Valid. The exogenous construct indicators that were Not Valid were then taken out, and the new dataset was run again.

**Table 5.25. Exogenous Construct Validity Test Results (2<sup>nd</sup> Run)**

<b>Question Items</b>	<b><i>Estimates</i></b>	<b>Results</b>
FIT1	.660	Valid
FIT2	.683	Valid
FIT3	.772	Valid
FIT4	.708	Valid
FIT5	.657	Valid
VIB1	.638	Valid
VIB4	.867	Valid
VIB5	.859	Valid
VIB6	.761	Valid
VIB7	.525	Valid
VIB8	.559	Valid
VIB9	.601	Valid
COC1	.676	Valid
COC2	.726	Valid
COC3	.666	Valid
COC4	.748	Valid
COC5	.851	Valid
COC6	.750	Valid
COC7	.840	Valid
COC8	.829	Valid

Source: Data processed 2022, Appendix 2.

Table 5.25. shows that all of the exogenous construct indicators in the second running of the data have a loading factor value of  $\geq 0.5$  (Hair, *et. al.* 2006; Ghozali, 2018) and are thus all Valid.

b. Endogenous Construct Validity Test

**Table 5.26. Endogenous Construct Validity Test Results**

<b>Question Items</b>	<b>Estimates</b>	<b>Results</b>
STU1	.723	Valid
STU2	.756	Valid
STU3	.757	Valid
STU4	.889	Valid
STU5	.878	Valid
STU6	.762	Valid
COQ1	.841	Valid
COQ2	.851	Valid
COQ3	.805	Valid
COQ4	.795	Valid
COQ5	.788	Valid
DMP1	.854	Valid
DMP2	.872	Valid
DMP3	.881	Valid
DMP4	.852	Valid

Source: Data processed 2022, Appendix 2.

From Table 5.26. it is shown that all endogenous construct indicators used in the study have a loading factor value of  $\geq 0.5$  (Hair, *et. al.* 2006; Ghozali, 2018). Based on these results, all endogenous construct indicators in the study were declared as Valid.

#### 4. Reliability Test

Reliability indicates the stability and consistency in which the instrument measures the intended concept and in this case supports the assessment of the “goodness” of a measure (Sekaran and Bougie, 2016). Reliability is an index that shows how much a measuring instrument can be trusted or reliable. If a measuring instrument is used repeatedly to measure the same symptoms and the results obtained are relatively consistent, then the measuring instrument is said to be reliable. In other words, reliability shows the consistency of a measuring instrument in measuring the same phenomenon.

The reliability of a measuring instrument could be assessed from its CR (Construct Reliability), VE (Variance Extracted), and A.V.E (Average Variance Extracted) values (Hair, et. al. 2006; Ghozali, 2018). If the obtained CR value from the calculation is  $\geq 0.70$ , the VE value from the calculation is  $\geq 0.50$ , and the AVE value from the calculation is  $\geq 0.70$  then the measuring instrument of the variable is declared as Reliable.

**Table 5.27. Reliability Test Results**

<b>Variables</b>	<b>CR</b>	<b>VE</b>	<b>AVE</b>	<b>Results</b>
FIT	0.8582	0.6350	0.7968	Reliable
VIB	0.9382	0.7594	0.8714	Reliable
COC	0.9364	0.7555	0.8692	Reliable
STU	0.9485	0.7515	0.8669	Reliable
COQ	0.9476	0.8159	0.9033	Reliable
DMP	0.9223	0.7743	0.8799	Reliable

Source: Data processed 2022, Appendix 3.

From Table 5.27. above, the CR values for all research variables had a value of  $\geq 0.70$ , the VE values were  $\geq 0.5$ , and the AVE values were  $\geq 0.70$ . Thus, from these results, it can be concluded that the measuring instrument used in all exogenous and endogenous constructs of the study are regarded as Reliable.

## **F. SEM Assumption Test**

### **1. Sample Size Sufficiency Test**

Data had been collected from 218 respondents. There were a total of 18 outlier data from the collection, thus the data used in this study amounted to 200 respondents. This amount has met the criteria for testing using the SEM method, as mentioned by Sekaran and Bougie (2016) which requires the minimum number of samples needed for SEM testing to be between 100-200 samples or equal the number of indicators multiplied by 5 - 10. The number of respondents have also met the criteria from Hair et al. (2019) which mentions that models with seven constructs or less has a minimum sample size of 150; and the sample size table for a given population developed by created Krejcie and Morgan (1970, in Sekaran and Bougie, 2016) considering that the total population is 403 study programs.

### **2. Outlier Test**

*Outliers* can be detected from the Mahalanobis distance output using AMOS. The criteria used to assess the presence or absence of multivariate outliers in the study is if the p value  $< 0.001$ . The distance is evaluated using  $X^2$  at degrees of freedom equal to the number of measured

variables (Hair, et. al. 2006; Ghozali, 2018). After the elimination of VIB 2 and VIB 3, the number of measured variables were 35. Then the CHIINV function was calculated and resulted in the number 66.618. This means that all data that has a value exceeding 66.618 are outliers and must be removed from the initial data input before being re-run on AMOS.

**Table 5.28. Outlier Test Results > CHIINV**

<i>Observation Number</i>	<i>Mahalanobis Distance</i>
<b>111</b>	<b>103.332</b>
<b>32</b>	<b>99.784</b>
<b>214</b>	<b>99.474</b>
<b>61</b>	<b>92.221</b>
<b>148</b>	<b>91.002</b>
<b>19</b>	<b>84.412</b>
<b>110</b>	<b>76.915</b>
<b>134</b>	<b>74.089</b>
<b>211</b>	<b>73.510</b>
<b>35</b>	<b>72.819</b>
<b>217</b>	<b>71.149</b>
<b>62</b>	<b>70.782</b>
<b>185</b>	<b>68.043</b>
<b>191</b>	<b>66.871</b>
<b>12</b>	<b>66.826</b>
216	66.517
.....	.....

Source: Processed data 2022 (Appendix 4).

Table 5.28. shows that there are 15 data that exceeds 66.618 in the Mahalanobis distance value, thus these data are dropped and then the resulting data is processed again.

**Table 5.29. Outlier Test Results > CHIINV (2<sup>nd</sup> Run)**

<i>Observation Number</i>	<i>Mahalanobis Distance</i>
<b>202</b>	<b>78.128</b>
<b>114</b>	<b>70.404</b>
<b>159</b>	<b>68.458</b>
91	65.291
.....	.....

Source: Processed data 2022 (Appendix 4).

In Table 5.29, it can be seen that there are 3 data that exceeds 66,618 in the Mahalanobis distance value, which are then excluded from the new dataset.

**Table 5.30. Outlier Test Results > CHIINV (3<sup>rd</sup> Run)**

<i>Observation Number</i>	<i>Mahalanobis Distance</i>
128	66.613
139	65.435
91	64.674
134	64.100
.....	.....

Source: Processed data 2022 (Appendix 4).

Table 5.30. shows that no data exceeds 66.618 in the Mahalanobis distance value, so it can be concluded that the data in this study are now free from outliers.

### 3. Data Normality Test

Normality reflects whether the shape of a data distribution is normal or not. If the data distribution does not form a normal distribution, the

analysis results are feared to be biased. The data distribution is said to be normal at a significance level of 0.01 if the critical ratio (cr) for skewenes or for curtosis is not more than  $\pm 2.58$  (Hair, et. al. 2006; Ghozali, 2018).

**Table 5.31. Normality Test Results**

Variable	min	max	skew	c.r.	kurtosis	c.r.
DMP4	2.000	5.000	-.289	-1.667	-.051	-.146
DMP3	2.000	5.000	-.176	-1.014	-.454	-1.310
DMP2	2.000	5.000	-.265	-1.531	-.121	-.348
DMP1	2.000	5.000	-.452	-2.611	.295	.851
COQ5	2.000	5.000	-.424	-2.448	-.113	-.325
COQ4	2.000	5.000	-.559	-3.229	.920	2.657
COQ3	3.000	5.000	-.339	-1.957	-.663	-1.913
COQ2	2.000	5.000	-.316	-1.825	-.377	-1.088
COQ1	2.000	5.000	-.252	-1.456	-.277	-.800
COC8	3.000	5.000	-.058	-.333	-.769	-2.220
COC7	2.000	5.000	-.294	-1.696	-.204	-.589
COC6	2.000	5.000	-.480	-2.774	-.083	-.240
COC5	1.000	5.000	-.670	-3.867	1.177	3.397
COC4	2.000	5.000	-.346	-1.997	-.246	-.709
COC3	2.000	5.000	-.538	-3.109	-.248	-.717
COC2	2.000	5.000	-.710	-4.098	.537	1.549
COC1	3.000	5.000	-.567	-3.273	-.633	-1.826
STU6	3.000	5.000	-.370	-2.134	-.666	-1.923
STU5	3.000	5.000	-.320	-1.849	-.667	-1.925
STU4	3.000	5.000	-.257	-1.485	-.652	-1.883
STU3	2.000	5.000	-.497	-2.872	.144	.416
STU2	2.000	5.000	-.784	-4.525	.870	2.512
STU1	3.000	5.000	-.317	-1.827	-.859	-2.481
VIB9	3.000	5.000	-.649	-3.747	-.596	-1.721
VIB8	2.000	5.000	-.446	-2.572	.584	1.685
VIB7	2.000	5.000	-.310	-1.791	-.372	-1.073
VIB6	2.000	5.000	-.703	-4.059	-.278	-.802
VIB5	2.000	5.000	-.690	-3.985	-.215	-.622
VIB4	1.000	5.000	-.725	-4.186	.120	.346
VIB1	1.000	5.000	-.612	-3.536	-.179	-.517
FIT5	3.000	5.000	-.864	-4.987	-.247	-.714

Variable	min	max	skew	c.r.	kurtosis	c.r.
FIT4	3.000	5.000	-.574	-3.316	-.609	-1.757
FIT3	2.000	5.000	-1.351	-7.799	1.594	4.603
FIT2	2.000	5.000	-.821	-4.740	.076	.219
FIT1	3.000	5.000	-.623	-3.599	-.578	-1.668
Multivariate					203.276	28.244

Source: Processed data 2022 (Appendix 5).

Table 5.31. list the results of the data normality test in which the majority of the data are not normally distributed because the resulting cr value is greater than 2.58. This study refers to Hair, et. al. (2006) which states that if the data has exceeds 100 then it can be assumed to have a normal distribution. Thus based on this reference, it can be concluded that the data in the study were normally distributed.

#### 4. Multicollinearity Test

The multicollinearity test requires that there is no perfect or large correlation between exogenous constructs. Indications of multicollinearity could be detected if the determinant value of the sample covariance matrix is very small or close to zero (Hair, et. al. 2006; Ghazali, 2018). In addition, the existence of multicollinearity could also be indicated if the value of the correlation coefficient between exogenous constructs is  $< 0.90$ . Such a value indicates that the model in a study does not meet the multicollinearity assumption. The results of the multicollinearity test can be seen in Table 5.32.

**Table 5.32. Exogenous Construct Correlation Coefficient**

			Estimates
FIT	<-->	COC	.520
VIB	<-->	COC	.859
FIT	<-->	VIB	.559

Source: Processed data 2022 (Appendix 6).

Based on Table 5.32, the correlation coefficient between exogenous constructs is < 0.90 (Hair, *et. al.* 2006; Ghozali, 2018). Thus it can be concluded that there is no perfect correlation between exogenous constructs. Thus, further processing can be carried out.

5. Goodness of Fit Test

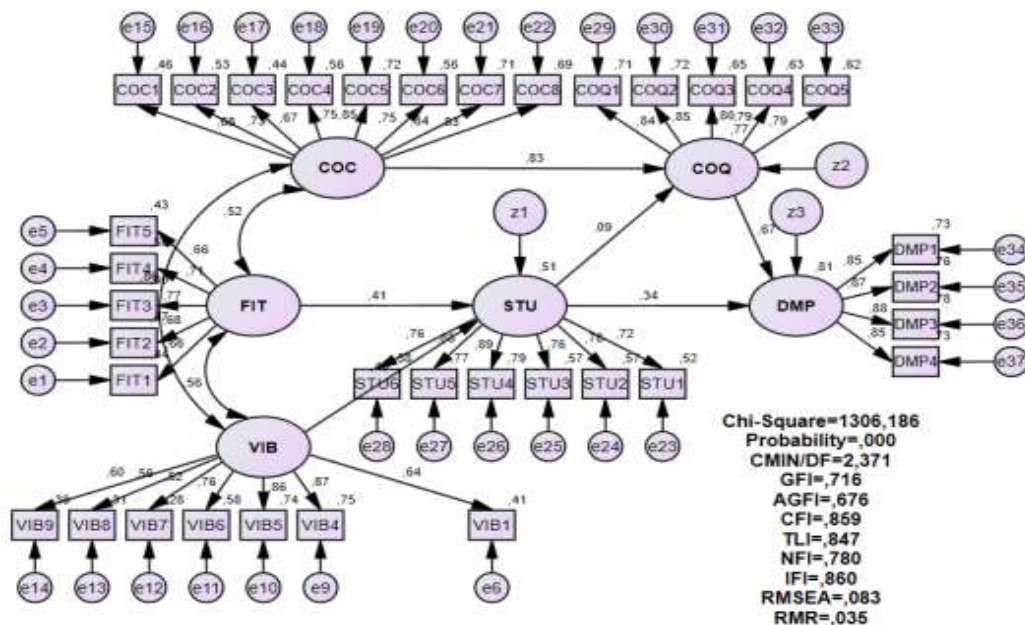


Figure 5.1. Initial Full Model from Structural Equation Modeling

Source: Processed data 2022 (Appendix 7).

After the SEM assumptions are met, the next step is testing using several conformity indices to measure how well the data sample fits the proposed model. This test is known as the *goodness of fit* test.

**Table 5.33. Initial Goodness of Fit Test Results**

Type of Goodness of Fit Index	Cut Off Value	GoF Index	Results
<i>X<sup>2</sup> – Chi Square</i>	< 606.716	1306.185	Unfit
<i>Significancy Probability</i>	≥ 0.05	0.000	Unfit
CMIN/DF	≤ 2.00	2.2371	Unfit
GFI	≥ 0.90	0.716	Unfit
AGFI	≥ 0.90	0.676	Unfit
CFI	≥ 0.95	0.859	Marginal Fit
TLI	≥ 0.90	0.847	Marginal Fit
NFI	≥ 0.90	0.780	Unfit
IFI	≥ 0.90	0.860	Marginal Fit
RMSEA	≤ 0.08	0.083	Unfit
<b>RMR</b>	<b>≤ 0.05</b>	<b>0.035</b>	<b>Good Fit</b>

Source: Processed data 2022 (Appendix 7).

Table 5.33. shows that in the goodness of fit test the model is Fit based on the acceptance of the model indicated by RMR that is in the Good Fit category. In addition, the CFI, TLI, and IFI indices are in the Marginal Fit category. Alterations would be done through modification indices to improve the model's fit (Collier, 2020).

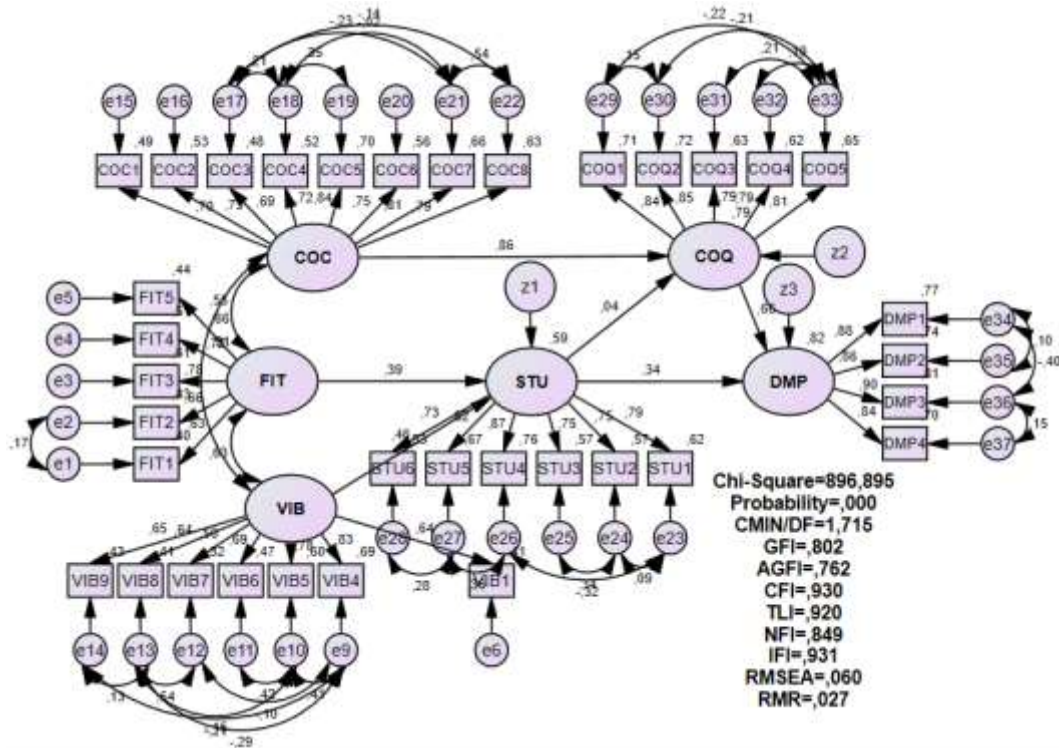


Figure 5.2. Full Model of Structural Equation Modeling after Changes through Modification Indices

Source: Processed data 2022 (Appendix 7).

The Goodness-of-Fit test results after changes through modification indices are shown in Table 5.34. Before the changes, there were only one index having Good Fit and three indices having Marginal Fit, while after the changes six indices were found to have Good Fit and two indices were found to have Marginal Fit. Hair et al (2019) describes three types of Goodness-of-Fit indices: 1) absolute fit, 2) incremental fit, and 3) parsimony fit. Absolute fit indices directly measure of how

well the research model reproduces the observed data. The results of this research shows that absolute fit indices of CMIN/DF (Chi-square/degree of Freedom), RMSEA (Root Mean Square Error of Approximation), and RMR (Root Mean Square Residual) have Good Fit, thus these indices confirm that the proposed model matches the observed data. Meanwhile, Goodness-of-Fit Index (GFI) was found to have Marginal Fit and the  $X^2$  - Chi-square was found to be Unfit.

**Table 5.34. Goodness of Fit Test Results after Modification Indices**

Type of Goodness of Fit Index	Cut Off Value	GoF Index	Results
$X^2$ – Chi Square	< 577.310	896.895	Unfit
Significancy Probability	$\geq 0.05$	0.000	Unfit
<b>CMIN/DF</b>	<b><math>\leq 2.00</math></b>	<b>1.715</b>	<b>Good Fit</b>
GFI	$\geq 0.90$	0.802	Marginal Fit
AGFI	$\geq 0.90$	0.762	Unfit
<b>CFI</b>	<b><math>\geq 0.95</math></b>	<b>0.930</b>	<b>Good Fit</b>
<b>TLI</b>	<b><math>\geq 0.90</math></b>	<b>0.920</b>	<b>Good Fit</b>
NFI	$\geq 0.90$	0.849	Marginal Fit
<b>IFI</b>	<b><math>\geq 0.90</math></b>	<b>0.931</b>	<b>Good Fit</b>
<b>RMSEA</b>	<b><math>\leq 0.08</math></b>	<b>0.060</b>	<b>Good Fit</b>
<b>RMR</b>	<b><math>\leq 0.05</math></b>	<b>0.027</b>	<b>Good Fit</b>

Source: Processed data 2022 (Appendix 7).

Having  $X^2$  - Chi-square to be found Unfit is not a concern, since according to Hair et al. (2019) and Collier (2020) the  $X^2$  GOF statistic has two problematic mathematical properties which would result in two tradeoffs faced by the researcher: 1) larger sample sizes would make a model more difficult to achieve a statistically insignificant GOF, and 2)

more indicators in a model would also make the model more difficult to obtain an insignificant  $X^2$ . Haryono (2012) and Collier (2020) explains that the CMIN/DF index solves chi-square's problems by dividing chi-square with the degree of freedom, and further mentions that this index is recommended by several experts (Wheaton et al., 1977 and Byrne, 1988 in Haryono, 2012). The CMIN/DF index was found to have Good Fit in this research.

Furthermore, Hair et al. (2019) explains that GFI was the result of an early attempt to resolve  $X^2$ 's shortcomings to produce an index which is less sensitive to sample size. However, the problem model complexity still exists. RMSEA is mentioned by Hair et al. to be one of the most widely used measures of Goodness-of-Fit since it better represents how well a model fits a population by correcting both model complexity and sample size. RMSEA could thus be regarded as a better measure of absolute fit, and the proposed model of this research has found RMSEA to have Good Fit. In addition, the RMR index, which shows the 'overall' residual value of covariance in a model, is also found to have Good Fit.

Incremental fit indices measures how well the estimated model fits in relation to an alternative baseline model, most often with a null model (Hair, et al., 2019). Included in incremental fit indices are the Normed Fit Index (NFI), Tucker Lewis Index (TLI), and Comparative

Fit Index (CFI), which this research has confirmed that the Goodness-of-Fit indices of the proposed model to have Marginal Fit, Good Fit, and Good Fit respectively. It should be noted the TLI and CFI are the most widely reported indices to be used (Hair et al., 2019).

Meanwhile, parsimony indices shows the best model among a set of competing models based on its fit relative to its complexity, but has a tendency to favor more parsimonious or simpler models. Parsimony indices are stated by Hair et al. (2019) to be somewhat controversial, and should not be relied upon as the only fit measure, and are often not used. Thus it is not a concern that the AGFI index of the proposed model is Unfit. In conclusion, the proposed model in this study is feasible and further analysis could be carried out.

## **G. Hypothesis Testing**

The results of hypothesis testing to test the effect of endogenous variables on exogenous variables is shown in Table 5.34.

### **1. Effect of Social Technology Fit on Social Technology Use**

Based on the results of hypothesis testing shown in Table 5.34, the significance value between Fit and Social Technology Use is “\*\*\*” ( $<0.001$ ). The first hypothesis is accepted, because the significance value is  $\leq 0.05$  which meets the requirement of a hypothesis to be accepted (Hair, et.

al. 2006; Ghozali, 2018). Thus it can be concluded that Fit has a positive and significant influence on Social Technology Use.

**Table 5.35. Hypothesis Test Results**

	<b>Estimates</b>	<b>S.E.</b>	<b>C.R.</b>	<b>P</b>	<b>Results</b>
FIT → STU	,461	,120	3,838	***	<b>Significant</b>
VIB → STU	,352	,072	4,913	***	<b>Significant</b>
COC → COQ	1,165	,130	8,986	***	<b>Significant</b>
STU → COQ	,047	,081	,582	,561	<b>Not Significant</b>
STU → DMP	,433	,077	5,641	***	<b>Significant</b>
COQ → DMP	,680	,070	9,673	***	<b>Significant</b>

Source: Data processed 2022 (Appendix 8).

## 2. Effect of Social Technology Viability on Social Technology Use

Table 5.35 shows that the significance value between Social Technology Viability and Social Technology Use is \*\*\* (<0.001) (Table 5.11) which is  $\leq 0.05$ . Based on this criteria, the second hypothesis is accepted, and it can be concluded that Social Technology Viability has a positive and significant influence on Social Technology Use.

## 3. Effect of Social Technology Use on Collaboration Quality

The hypothesis testing in Table 5.34 reports that the significance value between Social Technology Use and Collaborative Quality is 0.561. This value significance value exceeds the requirement of an accepted hypothesis to be  $\leq 0.05$ , and based on this the third hypothesis is rejected. Thus it can be concluded that Social Technology Use does not have a significant effect on Collaborative Quality.

#### 4. Effect of Social Technology Use on Decision-Making Performance

Table 5.34 shows that the significance value between Social Technology Use on Decision-Making Performance is \*\*\* ( $<0.001$ ). Based on this result, the fourth hypothesis is accepted since it meets the requirements of a hypothesis to be  $\leq 0.05$  in order to be accepted. It can be concluded that Social Technology Use has a significant effect on Decision-Making Performance.

#### 5. The Role of Collaboration Quality as Mediating Variable on the Effect of Social Technology Use on Decision-Making Performance

A mediating effect occurs when “a third variable/ construct intervenes between two other related constructs” (Hair et al., 2019). In this research, the two related constructs are Social Technology Use and Decision-Making Performance, while the intervening construct is Collaboration Quality. Hair et al. (2019) further explains that for a construct to have a mediating effect, each relationship between the three constructs has to have statistically significant relationships.

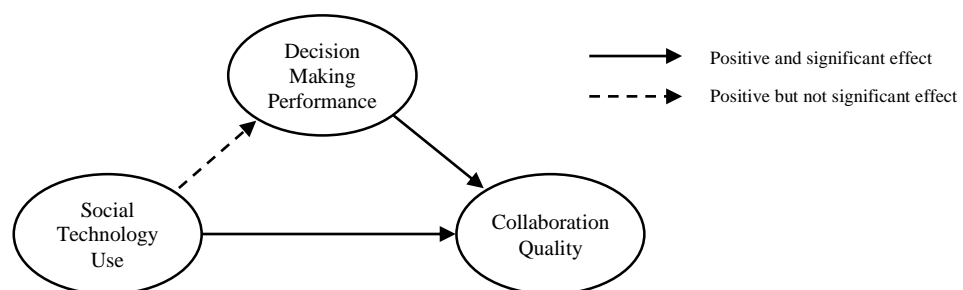


Figure 5.3. Statistical significance between variables.

In this case, there has to be statistically significant relationships between 1) Social Technology Use and Decision-Making Performance, 2) Social Technology Use and Collaboration Quality, and 3) Collaboration Quality and Decision-Making Performance. However, it has been found that the relations between Social Technology Use and Collaboration Quality is not significant (Figure 5.3 and Table 5.35), and this indicates the probability that Collaboration Quality does not intervene the relationship between Social Technology Use and Decision-Making Performance.

**Table 5.36. Standardized Direct Effect Test Results**

Variable	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,464	,387	,000	,000	,000
COQ	,863	,000	,000	,038	,000	,000
DMP	,000	,000	,000	,338	,663	,000

Source: Data processed 2022 (Appendix 8).

**Table 5.37. Standardized Indirect Effect Test Results**

Variable	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,000	,000	,000	,000	,000
COQ	,000	,017	,015	,000	,000	,000
DMP	,572	,168	,140	,025	,000	,000

Source: Data processed 2022 (Appendix 8).

Additional testing has been conducted to confirm this assertion. The hypothesis testing in Table 5.36 shows that the Standardized Direct Effects value between Social Technology Use and Decision-Making Performance

is 0.338 and while the results of hypothesis testing in Table 5.37 shows that the Standardized Indirect Effects value is 0.025. Figure 5.4 provides a path

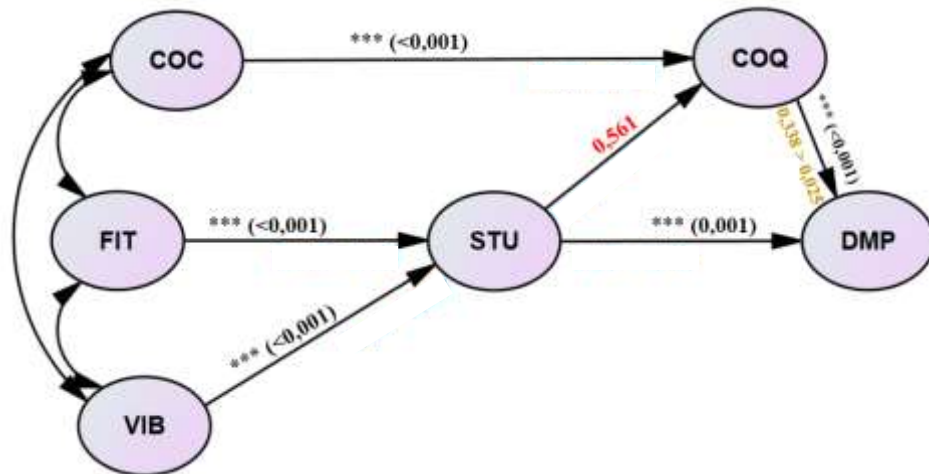


Figure 5.4. Path Analysis showing total effect and mediation.

Source: Data processed 2022 (Appendix 8).

analysis to represent these results. The results shows that the seventh hypothesis is rejected, due to the calculation that the value of Standardized Direct Effects is larger than the value of the Standardized Indirect Effects. Thus it can be concluded that Collaborative Quality does not act as a mediator on the influence of Social Technology Use on Decision-Making Performance.

#### 6. The Effect of Collaboration Capability on Collaboration Quality

Based on the results of hypothesis testing in Table 5.35, the significance value between Collaborative Capability and Collaborative Quality is \*\*\* (<0.001). The fifth hypothesis is accepted due to the fact that

its significance value of \*\*\* ( $<0.001$ ) meets the requirements of being  $\leq 0.05$ . It can thus be concluded that Collaboration Capability has a significant effect on Collaboration Quality.

#### 7. The Effect of Collaboration Quality on Decision-Making Performance

The hypothesis testing in Table 5.34 shows that the significance value between Collaboration Quality and Decision-Making is \*\*\* ( $<0.001$ ). This value is  $\leq 0.05$  and so the sixth hypothesis is accepted, In this case, it can be concluded that Collaboration Quality has a significant effect on Decision-Making Performance.

### H. Other Findings

Table 5.38 and Figure 5.5 show the total effect test results to determine the strongest effect of all relationships in the research model.

**Tabel 5.38. Total Effect Test Results**

Variable	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,464	,387	,000	,000	,000
COQ	,863	,017	,015	,038	,000	,000
DMP	,572	,168	,140	,363	,663	,000

Source: Data processed 2022 (Appendix 8).

The results show that the effect of Collaboration Capability (COC) on Collaboration Quality (COQ) with a value of 0.863 has the strongest direct effect in the model, followed by Collaboration Quality on Decision-Making Performance (DMP) with a value of 0.663. This indicates that the improvement of Collaboration Capability (COC) should be prioritized to enhance

Collaboration Quality (COQ), which in turn would strongly improve Decision Making Performance in higher education institutions. The third strongest effect

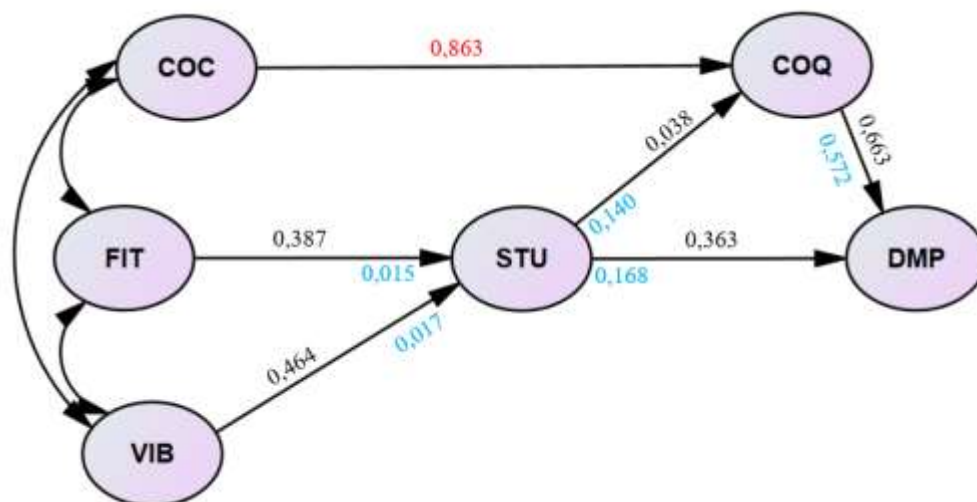


Figure 5.5. Path Analysis of total direct effect and mediation between variables.

Source: Data processed 2022 (Appendix 8).

is Social Technology Viability (VIB) on Social Technology Use (STU) with a value of 0.464 followed by Social Technology Fit (FIT) on Social Technology Use (STU) with a value of 0.387 and Social Technology Use on Decision-Making Performance with a value of 0.363. It could be seen that the improvement of both Social Technology Viability and Social Technology Fit would enhance Social Technology Use which in turn would also improve Decision-Making Performance.

While the role of Collaboration Quality on the relationship between Social Technology Use and Decision-Making Performance was not proven, several other mediating roles were found in Table 5.36 and Table 5.37. These mediating roles are: 1) Collaboration Quality mediates the relationship between

Collaboration Capability and Decision-Making Performance (Standardized Direct Effects 0,000 < Standardized Indirect Effects 0,572); 2) Social Technology Use mediates the relationship between Social Technology Fit and Collaboration Quality (0,000 < 0,015); 3) Social Technology Use mediates the relationship between Social Technology Fit and Decision-Making Performance (0,000 < 0,140); 4) Social Technology Use mediates the relationship between Social Technology Viability and Collaboration Quality (0,000 < 0,017); and 5) Social Technology Use mediates the relationship between Social Technology Viability and Decision-Making Performance (0,000 < 0,168).

## **I. Discussions**

The exogenous construct validity test results has shown that VIB2 (physical assets) and VIB3 (human assets) are not valid. Both are question items related to economic feasibility, in which VIB2 assesses respondents' opinions regarding the statement "the use of social technology reduces the physical assets needed for work", while VIB regarding the statement "the use of social technology does not require special training". Descriptive statistic analysis shows that the mean value of VIB3 is 3.46 which is the lowest mean compared to all 37 question items, which might indicate that several respondents felt they needed training to use social technology tools. It should be noted that 32% of respondents are aged 46 and above, and in the open ended section of the questionnaire, 31.5% of respondents stated that limited skills and knowledge in utilizing media is a problem they face in using social technology.

## 1. Social Technology Fit Has a Positive Effect on Social Technology Use

This results of this study proves that Social Technology Fit has a positive and significant effect on Social Technology Use. According to the research results by Goodhue and Thompson (1995) that the degree to which a given technology is suited to a given task depends heavily on the nature of the task itself. According to D'Ambra et al. (2012), when employing information technology, a person who is frequently engaged in non-routine tasks as part of their employment will conduct an assessment to determine whether or not the technology is suitable for the task. This effect has been demonstrated by several other research as well, for instance perceived task technology fit positively effects technology utilization (Lin & Huang, 2008; Larsen, Sørenbø, & Sørenbø, 2009); task technology fit positively effects user adoption of technology (Zhou et al, 2010; Lu & Yang, 2014; Yadegaridehkordi, Iahad, & Ahmad, 2014); and social technology fit positively effects intention to use (Oliveira et al., 2014).

By including technology Utilization in their Technology-to-Performance Chain (TPC) model, Goodhue and Thompson (1995) hypothesized that information technology would boost individual performance if it were employed and if the activities it supported were a good fit for the technology. Task-technology fit is defined as "the extent to which a technology helps an individual complete his or her portfolio of tasks" in the Task Portfolio Construction (TPC) paradigm. Accordingly, it

illustrates the connection between work necessities, person capacities, and the usefulness of technology. Finally, as users become more demanding and aware of the limitations of the social technology they use, this technology will be tailored to the needs of the user and their specific duties.

Liang et al. (2007) defined fit in the Fit-Viability model as “the extent to which new network applications are consistent with the core competence, structure, value, and culture of organization” while Turban et al. (2011) define fit as “the extent to which the feature of a technology matches the needs of the task”. The task-technology fit model proposed by Goodhue and Thompson (1995) examines how users of various information technologies evaluate their own performance. The logic behind this is that if technology is well-suited to the requirements of a given task, it will improve efficiency. A better fit between task characteristics and technology characteristics will lead to higher utilization and improved performance.

Descriptive analysis showed that respondents had a very high opinion regarding social technology Fit in their study programs. Respondents had stated that they found social technology very easy to use and very reliable. They also that social technology provided them with the most current information, and they would easily be able to clarify information which were unclear. Even if they had problems, they could easily obtain assistance in solving these issues. It is thus very apparent that respondents felt the use social technology had a very high fit with their tasks and duties.

On the other hand, respondents also held a very high view of the social technology they used. They reported very intensively using the technology for both strategy planning and strategy implementation. For strategy planning, respondents very much appreciated using social technology to scan their external environment, find new ideas, develop their strategic plans, and manage their work programs. Subsequently, respondents also very highly appreciated using the technology to manage their organizational resources and distribute tasks. These findings strongly confirm that having high fit between social technology and the task at hand would positively and significantly affect the use of social technology.

## 2. Social Technology Viability Has a Positive Effect on *Social Technology Use*

This research confirms that Social Technology Viability has a positive and significant effect on Social Technology Use. Social Technology Viability, in conjunction with the concept of Social Technology Fit, has been demonstrated to be an antecedent of performance by Liang et al. (2007), and it has been proposed by Turban et al. as an antecedent of social software deployment and adoption (2011). According to the findings of these research, the term "viability" refers to "the extent to the value-added potential of new network applications, requirements of human resource, capital demands, etc." (Liang et.al, 2007; Turban et.al, 2011). The Fit and Viability Model (FVM) was established by Liang et al. (2007) in the context

of mobile technology adoption. It was designed to further strengthen studies on the effect of technology on organizational performance. According to the findings of the research, performance is influenced by two factors: fit and viability. Fit refers to the relationship between the activity at hand and the available technology, while viability refers to the relationship between economic conditions, information technology infrastructure, and organizational structure.

By merging Goodhue and Thompson's (1995) Utilization and Fit Model and Liang et al.'s (2007) Fit and Viability Model, Turban, Liang, and Wu (2011) presented a modified fit-viability model for the adoption of social networking software for the purpose of virtual group decision-making. There are two major components: first, the opportunity that emerges from the intended decision-making tasks and available social software tools; and second, the implementation factors and constraints that need to be taken into account in order to assess the viability of the project. Both of these components are important in determining whether or not the project will be successful. It is reasonable to anticipate that the implementation of social software will improve collaboration, quality, and speed of the decision-making process if the fit and viability criteria are satisfied.

Respondents reported having a high viability for using social technology in their study programs. They very strongly believed the use of social technology would cut down on the need for physical assets while

simultaneously reduce the need for special training on its use. It might be because of this that they perceived an adequate budget was provided by the organization to facilitate the use of social technologies. These three factors allowed the use of social technologies in their study programs to be economically feasible. In terms of IT infrastructure, respondents reported that they had good internet network management capabilities, good software management capabilities, and IT staff experienced in system development and maintenance. Meanwhile in terms of Organizational Support, the respondents very highly appreciated the support of their superiors in using social technology, and mentioned that their IT staff had adequate knowledge on its use. In addition, the respondents felt that they were able to use social technology in a highly effective manner. The high viability of social technology use and very intensive use of social technology in Muhammadiyah and 'Aisyiyah universities in the Special Region of Yogyakarta and the Province of Central Java further supports the finding that Social Technology Viability has a positive and significant effect on Social Technology Use.

### 3. *Social Technology Use Does not have an Effect on Collaboration Quality*

Social Technology Use not having an effect on Collaboration Quality is an interesting finding, and warrants further discussion. As previously depicted in Figure 3.9, Laudon and Laudon (2018) explains that a suitable organizational structure and culture along with suitable

collaboration technology is needed for successful collaboration. In their conceptual model which has not yet been tested, Collaboration Capability together with Collaboration Technology effects Collaboration Quality, which in turn effects Firm Performance. This model is a modification of the Global Collaboration Index coined by Frost and Sullivan (2006), which originally combined Culture and Structure together with Collaborative Technology as Collaboration Capability. This research adopted Laudon and Laudon's (2018) separation as two entities, and used the term Social Technology Use rather than Collaborative Technology. This model has not been previously tested, and whether the hypothesis that as separate entity Social Technology Use has a positive and significant effect has not previously been established. This separation is one of the factors that resulted in the hypothesis being rejected. Frost and Sullivan (2006) found that if Collaboration Technology (in this research referred as Social Technology Use) were treated as a separate variable, it would only contribute on total only 21% to a company's Collaboration Quality, compared to Culture and Structure (in this research referred as Collaboration Capability) which would contribute 58%. Meanwhile, the results of this research has shown that the effect of Social Technology Use on Collaboration Quality on contributes 9%, while Collaboration Quality contributes 83%. This finding seems to support the research conducted by Easley, Devaraj, and Crant (2003) found that teamwork quality has a positive relation with technology usage, and not the other way around.

However, Easley, Devaraj, and Crant (2003) admits that their study was correlational, and does not claim any causality.

The difference in the context of the research may also be a large factor in the result. The respondents of Frost and Sullivan's (2006) research were 946 corporate decision makers in Europe, Asia (including Australia), and North America who held President, Vice President, Director, or Manager positions in a Line-of-Business or in an Information Technology department, while the respondents of this research were 218 Heads or Secretary (Deputy) of departments in universities. As have been previously stated, there are huge differences in the organizational goals, culture and decision-making processes between corporations compared to universities. It should also be noted that Frost and Sullivan's (2006) research seemed to engage respondents from relatively higher levels of management with presumably different types of responsibilities and decision-making authority compared to authority compared to this research which engaged decision makers at the lowest echelon of the organization.

Another difference between corporations and higher education institutions lies in the observation that companies are obviously profit-oriented while most universities are non-profit oriented. The non-profit nature of Muhammadiyah universities should also be highlighted due to the idealistic nature its parent organization to serve the community mainly in education and health, and its historical credentials as a not-for-profit organization for over a century. Whether an organization is for-profit or not-

for-profit would certainly have an impact to its organizational goals and objectives.

Being a for-profit entity, corporations tend to adopt the Rational Model based on the economic theory of the firm (Chaffee, 1983), while universities would use the Rational Model only in specific types of decision-making such as budgeting. At the departmental level, which is investigated by this research, the Collegial Model (Chaffee, 1983) would be adopted. This model assumes that the value of shared responsibility is highly regarded, and decisions should sufficiently satisfy all participants in the organization in order to ensure their commitment to the decisions made. In this case, it is imperative that Collaboration Quality should already be high at the departmental level, whether or not Social Technology is used.

Another possible cause of the insignificant relationship between Social Technology Use on Collaboration Quality is the lack of varying perspectives gathered from respondents in the study. The respondents of this research were heads and secretaries of study programs which are the top ranking decision makers of their units. Thus, the research gathered data from the decision makers perspective. There might be differing views of social technology and collaboration quality if the research had included ordinary members of the units as respondents. For instance, the top decision makers might have felt that they had similarly been able to successfully communicate and coordinate (both indicators of Collaboration Quality) with group members with or without the use of social technology, while on

the other hand group members might have felt that communication and coordination had been significantly improved by the use of social technology.

Thus the rejection of the significant effect of Social Technology Use on Collaboration Quality could be explained by 1) the difference in Frost and Sullivan's (2006) and Laudon and Laudon (2018) in terms of separation between Collaboration Capability and Social Technology Use, 2) the difference of the context of the research in which previous studies mostly focused on corporation, while this research is conducted in the context of higher education institutions, 3) the difference in the goals of corporations as for-profit entities as opposed to universities, especially Muhammadiyah and 'Aisyiyah universities, which are not-for-profit, 4) the Collegial nature of most higher education decision-making compared to the Rational model adopted by corporations, 5) the specific level of analysis of this research which studies the dynamics at the departmental level, which might be different if the study focused at university level decision-making which would also involve other type of decision-making such as budgeting, and 6) the exclusion of ordinary group members as respondents of the study.

#### 4. *Social Technology Use Has a Positive Effect on Decision-Making Performance*

This study's results is that social technology has a positive effect on decision-making performance. Research conducted by Goodhue and

Thompson (1995) demonstrates that the utilization of technology in conjunction with a task-technology fit has a beneficial impact on an individual's perception of their own performance. According to the findings, there is a correlation between the positive perceived influence of performance in decision-making and the quality of the data, as well as its timeliness and relationship with information systems. This model is congruent with the findings of DeLone and McLean (1992), who explored the ways in which the use of technology and attitudes about technology affect satisfaction with both the outcome and the process. Research conducted by McGill and Klobas (2009) as well as research conducted by D'Ambra, Wilson, and Akter (2013) has demonstrated that the use of technology on tasks has an effect on the impact that individual performance has on the effective use of information technology.

If the function of information technology that is available in the business has the potential to assist the everyday tasks of users in relation to performance in decision-making, then the use of technology on tasks will have an effect on individual performance. If the function of information technology that is present in the organization is able to support the everyday tasks of users in such a way that it is tied to performance in terms of decision-making, then the use of technology on tasks will have an effect on individual performance.

According to descriptive analysis of respondents' that get a very high level; 4.35, that the advantages of information and social technology is that

it helps users provide information that has coverage throughout the region in a timely and accurate manner. Because an organization's competitive posture, learning quality, and brand image can all be improved with information and communication technology, making use of this technology is extremely crucial if it is to emerge victorious from the increasingly cutthroat competition. The more points of view and information obtained, the more ideas a person can put forward for his company. According to respondents, the information system must be continuously developed. In addition, the need for internal correspondence for study programs is still handled manually, despite the importance of managing this activity effectively and efficiently. The using of technology in submitting data into the system will be processed precisely and allowing for decisions to be made rapidly and with a high degree of accuracy. When decisions are made that will have an effect on the business in the short term as well as in the long term, there will be a number of pieces of information that may be taken into consideration thanks to the utilization of social technology. The process of making decisions that are optimal is carried out in order to avoid a number of dangers that will disrupt the regular operations of an organization or corporation. But, a lack of coordination and collaboration is the most prevalent issue that responders confront. According to respondents, these issues were created by the fact that not all active members participated in decision-making.

## 5. Collaboration Quality Does Not Mediate the Effect of Social Technology Use on Decision-Making Performance

The results of the Structured Equation Modeling have shown that the Standardized Direct Effects between Social Technology Use towards Decision-Making Performance is larger than the value of the Standardized Indirect Effects between these variables through Collaboration Quality. It is thus demonstrated that Collaborative Quality does not mediate the influence of Social Technology Use on Decision-Making Performance. This section will offer explanations to this phenomenon.

The effect of Social Software Adoption on Decision-Making Performance was originally proposed, but not tested, by Turban, Liang, and Wu (2011), and Hypothesis 4 of this research has proven the proposition. However, their model did not include Collaboration as a variable. The model that has been validated is the one reported by Frost and Sullivan (2006) and modified by Laudon and Laudon (2018) which proposed that Collaboration Technology effects Collaboration Quality, and Collaboration Quality effects Firm Performance. There are two consideration that should be noted here: 1) these models designate Firm Performance as dependent variables instead of Decision-Making Performance, and 2) non of these models attempted to introduce Collaboration Quality as a mediating

variable. Thus the rejection of Hypothesis 7 does not contradict with these models.

A previous model reported by Easley, Devaraj, and Crant (2003) demonstrates that while Technology Usage directly effects Decision-Making Performance, Teamwork Quality is interestingly an antecedent to Technology Usage and not the other way around. Easley, Devaraj, and Crant's (2003) findings contradicts Frost and Sullivan's (2006) more recent model possibly due to a difference in context and scope. The former research was much more limited in scope by basing on responses from 24 teams of 122 MBA students in a university, while the latter gathered responses from 946 corporate decision makers in Europe, Asia and North America. At first glance it might seem that Easley, Devaraj, and Crant's (2003) research was similar with this research in the sense that both were conducted in a university setting, it should be emphasized that Easley, Devaraj, and Crant's (2003) research relates to Collaboration in the context of student teaching and learning, while this research is in the context of university governance which would contextually be closer to Frost and Sullivan's (2006) research and thus it would be more appropriate to designate Collaborative Quality as an antecedent to Performance as modeled by Frost and Sullivan (2006).

Even then, there would be several differences between corporations and higher education institutions. Higher education institutions could be regarded as professional bureaucracies where activities are mainly arranged

around experts (Maassen & Potman, 1990). For instance, each lecturer are experts in their own fields and given the autonomy to manage their own courses. This leads to 'pigeonholing' (Perrow, 1970, in Maassen & Potman, 1990) in which lecturers do not need to spend much time coordinating with their peers but would rather work in isolation (Hardy et al., 1988 in Maassen & Potman, 1990). It could be inferred that not all decisions at the department level need to be decided collegially, since there would already be a high level of autonomy for each lecturer. Having such an autonomy might sufficiently satisfy faculty members' need to be actively involved in the department. Reciprocally, heads and secretaries of departments might be able to independently make certain decisions without much collaboration with faculty members. Since the respondents of this research are heads and secretaries of departments, these types of decisions could be the ones that are being referred to when they were filling in the questionnaire. Different results might occur if the respondents were faculty members.

The results of the open-ended questionnaire on the problems the respondents faced in fostering collaboration seems to support this argument. A total of 51 heads or secretaries of departments mentioned miscommunication and miss-coordination, 20 respondents cited selfishness and seniority, and 14 respondents stated time management or time coordination of each individual member to be problems in collaborating with faculty members. In these cases, heads or secretaries of departments might feel it more convenient to make certain decisions on their own

without collaborating with faculty members. On the other hand, faculty members might not mind since they would also have the autonomy to make decisions in their own field of expertise.

In discussing the non-mediating results of Collaboration Quality in the effect of Social Technology Use on Decision-Making Performance, the following deliberations have thus been put forth: 1) this finding does not contradict previous findings since the mediating effect of Collaboration Quality has not yet been studied; 2) Easley, Devaraj, and Crant's (2003) research which showed Teamwork Quality has a positive relation with Technology Usage was conducted in the context of student's experience in teaching and learning and does not apply to this research which was conducted in the context of higher education governance from the perspective of decision makers; 3) the distinct characteristic of higher education institutions as professional bureaucracies which provide faculty members with the autonomy to manage their own courses which may result in more leeway for heads and secretaries of departments to make certain decision without much collaboration with faculty members; and 4) comments in the open ended section of the questionnaire suggest a large number of departmental decision makers experience difficulties in nurturing collaboration with faculty members. The non-mediating nature of Collaboration Quality might be unique to the context used in this research, and further studies are warranted to explore the results of varying context of research.

## 6. Collaboration Capability Has a Positive Effect on Collaboration Quality

This study give results that collaboration capability has a positive effect on collaboration quality. Frost and Sullivan (2006) stated that excellent organizational performance is based on the appropriate collaboration capability and collaboration technology with the fit measurements. The impact of the collaboration quality is to increase the productivity of collaboration also the effectiveness of supporting to achieve the goals and business strategy. Furthermore, recognition of collaboration and coordinated teams drive collaboration in better firm performance. And also, high-quality collaboration affects teamwork and could solve a business problem. The collaboration capability consists of the criteria such as open culture, decentralized structure, and breadth of collaboration. Based on Boughzala and de Vreede (2015) to achieve team collaboration quality is need collaboration capability. According to Blomqvist (2006) that a useful cross-level concept for comprehending and analyzing relational interaction on various levels, including individual, team, intra-organizational, organizational, and inter-organizational, is suggested as collaboration capability. Blomqvist (2006) explained that trust, communication, and commitment for knowledge creation and collaborative innovation in networks are all dimensions of the broader concept of "collaboration capability," which explains and enables much of what goes right when

people work together to create new knowledge and new products. While research from Jin et al.. (2019) explained that although the findings demonstrate that a collaborative capability is an enabler of performance gains for most organizations, the results also indicate that strategic limits have a significant impact on how this critical capability is converted into improved firm performance.

The responders are in complete agreement that the necessary informational exchange for the collaboration has been carried out in an effective manner. This demonstrates that proper use of information technology has been used to support the performance of employees in their jobs. According to the respondents, the work unit has also developed a common knowledge of its goals as well as the activities that need to be carried out in order to attain the goals. Because the work unit situation is fluid and is always evolving, the interactions between organizations are depending on each other. This is the case because the work unit scenario is dynamic.

#### 7. Collaboration *Quality* Has a Positive Effect on *Decision-Making*

This study's results is that collaboration quality has a positive effect on decision-making. Frost and Sullivan (2006) define the quality of collaboration as the kind and scope of cooperation within an organization, which is driven by the infrastructure, processes, and culture that are inherent in the enterprise. Collaboration model which states that motivation, task

structure, process structure, proximity, and IT collaborative support level are indicators of collaboration quality was initially considered. However, this model focuses on motivational cross-organizational and cross-border collaborations, whereas this research would provide more focus on intra-organizational aspects of collaboration. Romano, Pick, and Roztocki's (2010) model of collaboration states that collaboration quality is determined by factors such as motivation, task structure, process structure, proximity, and IT collaborative support level. Decision making performance and creative performance are indicators of team performance; frequency and depth of technology use are indicators of technology adoption; and communication, coordination, balance, support, effort, and cohesion are indicators of teamwork quality, as stated by Easley, Devaraj, and Crant's (2003). Because the decision-making process needs meticulous risk identification, technology also enables upper management to engage with various work units when making judgments. This is an advantage because technology makes it possible to do so. The most significant potential benefits of group decision-making include accelerating and simplifying the process of sharing information, the capacity to collect a greater number of opinions, the acceleration of decision-making activities such as prioritizing and analyzing alternative solutions, and the encouragement of participation from individuals who might not otherwise work together (Turban, 2011). Collaboration within a team makes the many processes that decision makers must navigate easier to understand and more streamlined (Pau, 2008).

According to the respondents, the utilization of social technology results in decisions that are both high-quality and beneficial to the work unit. Utilizing technology to its fullest potential will enable businesses to collect data that can be put toward market research, the enhancement of company value, and the development of more effective planning and marketing strategies. Companies or organizations will have an easier time coming up with fresh ideas for their own improvement if they make use of technology in an appropriate and effective manner.

## J. Confirmed Model

The results of this research have shown most of the hypothesis in the proposed model have been proven, with the exception of two hypotheses and two exogenous constructs. In terms of hypothesis, Social Technology Use has been confirmed to have a positive on Collaboration Quality, but its effect was

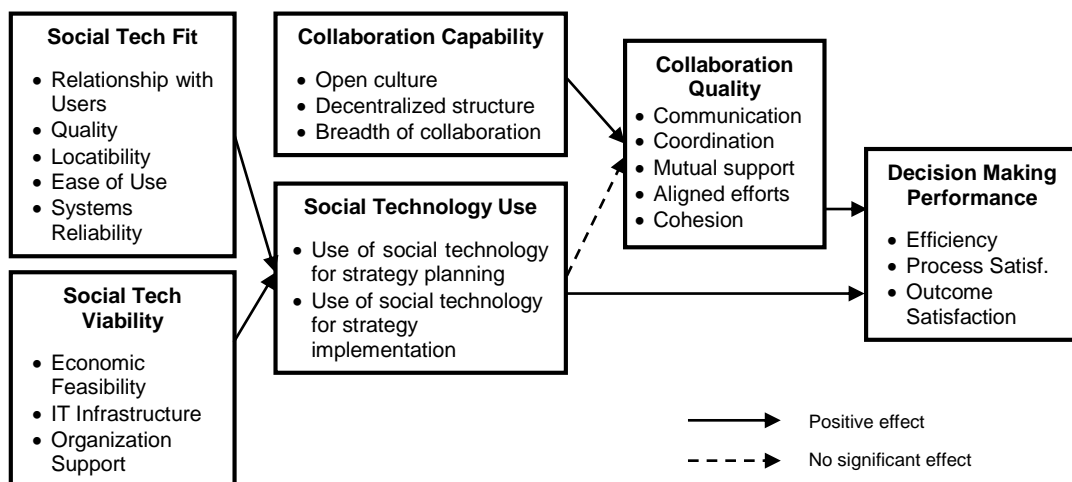


Figure 5.6. Confirmed Model

not significant, while Collaboration Quality has been found to not mediate the effect of Social Technology Use on Decision-Making Performance. Meanwhile, VIB 2 and VIB3 were found to be exogenous constructs that are not valid. Both of these constructs are economic feasibility indicators of Social Technology Viability. However, economic feasibility remains an indicator of Social Technology Viability since project budget as a construct of this indicator was found to be valid. Figure 5.6 depicts the confirmed model based on the results of this research.

## CHAPTER VI

### CONCLUSIONS AND RECOMMENDATIONS

#### A. Conclusions

For the purpose of studying the dynamics between Social Technology Fit, Social Technology Viability, Social Technology Use, Collaboration Capability, Collaboration Quality, and Decision-Making Performance as stated in the research objective, responses have been gathered from 218 departments from 16 Muhammadiyah and 'Aisyiyah universities. Structured Equation Modeling with AMOS had been used to test seven Hypotheses in the proposed model, resulting in the following conclusions:

1. *Social Technology Fit* has a positive effect on *Social Technology Use*.

This research finds that there should be a good fit between the nature of the task and the use of social technology. The need for good task technology fit has also been found by previous research but refers to technology in general terms or focused on various other forms of technology such as Decision Support Systems and e-commerce systems. The finding of this research is unique in the sense that it specifically confirms that task technology fit also applies to the use of social technology.

2. *Social Technology Viability* has a positive effect on *Social Technology Use*.

The results of this study proves that adequate infrastructure is needed to ensure the use of social technology. Thus, organizations should make sure that sufficient Information Technology facilities are provided, a proper budget is available, and organizational support is given to its members.

3. *Social Technology Use* does not have an effect on *Collaboration Quality*.

This finding might strengthen a previous study that found teamwork quality to have a positive relation with technology usage (Easley, Devaraj, and Crant, 2003). The effect of Social Technology Use on Collaboration Quality might depend on the nature of the organization itself. In the case of universities, it is by nature collegial and already have a high level of collaboration quality. It is thus understandable that the use of social technologies does not effect the quality of collaboration in such an environment.

4. *Social Technology Use* has a positive effect on *Decision-Making Performance*.

This finding is one of the main tenets of this research, since previous research studied the effects of technology use on a company's profitability, innovation, growth, and quality. By focusing on decision-making performance, this research's finding has broader scope of compliance which includes non-profit entities as well.

5. *Collaboration Quality* does not mediate the effect of *Social Technology Use* on *Decision-Making Performance*.

This research found that the direct of social technology use on decision-making performance is larger than if it were mediated by collaboration quality. This is also related with the previous finding of this research that social technology use does not significantly effect collaboration quality. It is suspected that the non mediating nature of collaboration quality is due to the characteristic of higher education institutions as professional bureaucracies in which each faculty member has a certain level of autonomy and thus a high level of collaboration is not always needed for coming up with good decisions.

6. *Collaboration Capability* has a positive effect on *Collaboration Quality*.

The results if this research shows that an open culture, decentralization, and a wide scope of collaboration is needed to improve collaboration quality. Even though miscommunication is reported as a common problem in fostering collaboration, it seems that having good collaboration capabilities would still overcome these problems.

7. *Collaboration Quality* has a positive effect on *Decision-Making Performance*.

It is imperative for an organization to provide a suitable environment to nurture collaboration quality in the quest of making good decisions. This environment includes the ability to exchange information, having a mutual

understanding, having a willingness to achieve common goals, aligning contributions of members, and having a high cohesion among members. These condition would increase decision-making performance in terms of the process efficiency and outcome effectiveness of decisions.

Aside from the results of the hypothesis testing above, the research has resulted in several other findings as follows:

8. There were five mediating roles found in this research: Collaboration Quality mediates the relationship between Collaboration Capability and Decision-Making Performance; Social Technology Use mediates the relationship between Social Technology Fit and Collaboration Quality; Social Technology Use mediates the relationship between Social Technology Fit and Decision-Making Performance; Social Technology Use mediates the relationship between Social Technology Viability and Collaboration Quality; and Social Technology Use mediates the relationship between Social Technology Viability and Decision-Making Performance.
9. A path analysis of the total direct effect show that Collaboration Quality together with Social Technology Use affects Decision Making Performance. However, the effect of Collaboration Quality is almost twice as strong.

10. The total direct effect of Collaboration Capability on Collaboration Quality is the strongest compared to the other total direct effect in the path analysis. Meanwhile, Social Technology Fit and Social Technology Viability have approximately similar direct effects on Social Technology Use.
11. Social Technology Fit and Social Technology Use were rated as Very High by the respondents, while Social Technology Viability received the lowest score among the six variables included in this research. This suggest that Muhammadiyah and 'Aisyiyah universities intensively used Social Technology for both strategy planning and Strategy Implementation, and that Social Technology is viewed to easy to use, reliable and responsive, while the data shared through the technology is current and clear. In conjunction with the finding that only 3.5% of respondents suggested to hold online meetings more frequently, this seems to suggest that Social Technology will continue to be used in the future.
12. Respondents rated Social Technology Viability with the lowest score compared to the other five variables. Fortunately top management support was scored as very high by the respondents.
13. Collaboration Capability, Collaboration Quality, and Decision-Making Performance were rated as similarly High by the respondents. The particular strong points were having a culture of openness (Collaboration Capability), mutual support (Collaboration Quality), speed of decision

process, and decision outcome usefulness (Decision Making Performance).

14. All four types of Social Technology discussed in this research (direct messaging, teleconferencing, content distribution, document sharing and collaboration, and social media applications) were used by 51% of the respondents.

## **B. Recommendations for Organizations**

1. Decision-making performance in this research is measured in terms of efficiency, process satisfaction, and outcome satisfaction. It has been found that Collaboration Quality has a strong direct effect on Decision-Making Performance. Thus it is recommended that organizations should increase its ability to communicate and coordinate between group members by providing more opportunities for information exchange and develop a mutual understanding between group members; and establish an atmosphere which nourishes mutual support, effort alignment, and group cohesion.
2. The strongest direct effect in the confirmed research model is Collaboration Capability on Collaboration Quality. For the purpose of strengthening Collaboration Capability, organizations should strive to bring forth a culture of openness to ensure better communication and collaboration within work units as well as between work units. In conjunction with installing a decentralized structure and nurturing wide range of collaboration in both strategy development and implementation, organizations would benefit

from improved collaboration quality which would in turn result in improved decision-making performance.

3. Organizations, both for-profit and not-for profit, would be well served if their decision-making process were expedited and based on abundant feedback which would yield better quality and more fruitful decisions. Such preferable conditions would benefit from the use of social technology for both strategy development and implementation. Thus organizations should encourage the use of social technology such as direct messaging, teleconferencing, and document collaboration applications in their business processes.
4. The use of social technology has numerous other benefits as well, for instance to compensate for the lack of coordination and collaboration often found in the decision-making process. Its use should be supported by management such as through the provision of guidelines, trainings, adequate information technology infrastructure, and funding.
5. Social technology is now widespread and directly accessible to individual members of the organization. However, its use would more beneficial if social technology fit and viability is guaranteed. Social technology viability has the stronger effect between the two. Thus, the organization would benefit by providing an adequate information technology infrastructure and competent information system staff; increasing top management support and user competence, and providing sufficient budget for these purposes.

6. In order to strengthen Social Technology Fit, organizations are recommended to provide business processes, guidelines, and training on the use of social technology to make sure that social technology is used to exchange current and meaningful data; and that the technology is easy to use, reliable, and responsive.
7. Almost half (49%) of the Muhammadiyah and 'Aisyiyah universities involved in this study have not used all the available social technology functions in the decision-making process of their study programs. Since the technical and economic requirements needed to use social technology is relatively low compared to more formal institution-based systems, these universities are urged to further explore and utilize social technology which comprises of direct messaging, teleconferencing, content distribution, document sharing and collaboration, and social media applications.
8. Having received the lowest score compared to other variables, Muhammadiyah and 'Aisyiyah universities should regard strengthening Social Technology Viability as an opportunity to increase its decision-making performance by providing better IT infrastructure, training its faculty members, faculty staff, and IT staff in the use of social technology, and providing sufficient budget for these efforts. Such efforts also resonate well with the problems identified by the research respondents.
9. The high rate of Social Technology Fit and Social Technology Use in Muhammadiyah and 'Aisyiyah universities in this study should be maintained. Similarly, the strong points of Collaboration Capability,

Collaboration Quality, and Decision-Making Performance should also be maintained. However, certain indicators while having a High score could still be further strengthened, including vertical and horizontal decentralization, breadth of collaboration in strategy planning and implementation (Collaboration Capability); alignment of contribution (Collaboration Quality), and perception of decision outcome quality (Decision-Making Performance).

### **C. Research Limitations**

1. The respondents of this research were heads and secretaries of study programs, with one decision maker representing each unit of analysis. This choice of respondents were intentional for the purpose of obtaining an adequate sample size. However, the data obtained this research were from the perspective of the top decision makers in the units, which may not wholly represent the unit. Thus the diversity of opinions may not have been thoroughly captured in the study. The exclusion of ordinary group members as respondents of the study might have a contributing factor in the finding that Social Technology does not significantly effect Collaboration Quality, and the finding that Collaboration Quality does not mediate the relationship between Social Technology Use and Decision-Making Performance.
2. The context of this study is non-profit higher education institutions. Such a context actually expands previous studies which were mostly conducted in

a for-profit corporations, and would increase our understanding of the dynamics involved in the study. It should be noted that for-profit corporations mostly adopt the Rational Model based on the economic theory of the firm while higher education institutions in most of its processes adopt the Collegial Model which emphasizes the value of shared responsibility (Chaffee, 1983). Thus the choice of context might have effected the results of the study as well, especially in relationship involving Collaboration Quality and Decision-Making constructs such as mentioned in the previous limitation. The perceived quality of collaboration would understandably differ between corporations and universities due to differences initial in communication, coordination, and cohesion, while the perceived performance of decision might differ due to differences in expectations of process and outcome satisfaction.

#### **D. Recommendations for Future Research**

1. Future research could include more than one representative for each unit of analysis, with different weights in proportion to their influence in the unit. The interaction between members and individual opinions of each member could also be further explored through interviews and focus group discussions.
2. Several other types of non-profit organizations could be included in future studies, as well as for-profit higher educations institutions as well as corporations. The use of the research model in different contexts would be

beneficial in developing a rule of thumb for the use of the model in different environments and circumstances.

3. Extending the geographic scope of in future studies would create a stronger ability to generalize the results of this study. It would also be interesting to observe differences in culture, especially if subsequent research are to be held in different regions and countries.
4. The variables used in this study were social technology fit, social technology viability, social technology use, collaboration capability, collaboration quality, and decision-making performance. Introducing additional relevant variables would have the potential to develop a more holistic model.

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# **APPENDICES**

*Appendix 1***Kuesioner Penelitian**

Kepada Yth.  
Bapak/Ibu Ketua / Sekretaris Program Studi  
di Tempat

Assalamualaikum wr. wb.

Dengan hormat,

Saya sedang melakukan penelitian tentang Teknologi Sosial, Kualitas Kolaborasi, dan Pengambilan Keputusan dengan unit analisis tingkat Program Studi pada Universitas Muhammadiyah dalam rangka penyelesaian Disertasi pada Program Doktor Ilmu Ekonomi Universitas Islam Indonesia. Penelitian ini diharapkan dapat memperkuat teori tentang pengambilan keputusan organisasional.

Dalam rangka penelitian di atas, kami mohon kesediaan Bapak / Ibu nya untuk mengisi kuesioner ini sebenar – benarnya. Semua informasi dari hasil penelitian hanya akan digunakan untuk kepentingan penelitian dan data personal akan dijaga kerahasiaannya.

Atas perhatian dan kesediaan Bapak / Ibu menjadi responden saya ucapkan terima kasih.

Hormat saya,

Punang Amaripuja, S.E., S.T., M.IT

### A. Identitas Responden

Sebelum menjawab pertanyaan dalam kuesioner ini, mohon Bapak / Ibu mengisi data berikut terlebih dahulu. Jawaban yang diberikan akan diperlakukan secara rahasia. Silahkan untuk mengisi dan memilih jawaban yang tersedia.

Nama : (Boleh tidak diisi)

Jabatan :  Kaprodi  Sekprodi

Program Studi :

Fakultas :

Universitas :

Umur :

Jenis Kelamin :  Laki – Laki  Perempuan

Masa kerja di universitas:

Masa kerja sebagai Kaprodi / Sekprodi:

### B. Petunjuk Pengisian Kuesioner

Responden diminta untuk memberi tanda pada salah satu jawaban yang tersedia pada kolom di samping pertanyaan untuk menentukan seberapa setuju Bapak / Ibu mengenai hal tersebut. Penilaian tingkat kesetujuan yang digunakan adalah sebagai berikut:

STS = Sangat Tidak Setuju

TS = Tidak Setuju

N = Netral

S = Setuju

SS = Sangat Setuju

Catatan: *Teknologi Sosial* mencakup berbagai macam teknologi digital yang digunakan untuk melakukan interaksi sosial, dan dapat digunakan untuk menciptakan, menguatkan, dan saling bertukar konten dan data/informasi secara bersama-sama. Wujud teknologi sosial misalnya dapat berupa aplikasi *direct messaging* (WhatsApp, Telegram, Line, dll.), telekonferensi (Zoom, Google Meet, MS Teams, dll.), distribusi konten (Youtube, TikTok, dll.), sharing dan kolaborasi dokumen (Google Drive, One Drive, dll.), dan media sosial (Facebook, Instagram, Twitter, dll.).

No.	Pertanyaan Kuesioner	Alternatif Jawaban				
		STS	TS	N	S	SS
1	Saya merasa bahwa penggunaan <i>teknologi sosial</i> mudah dipelajari.					
2	Saya dengan cepat memperoleh bantuan apabila mengalami kesulitan pada saat menggunakan <i>teknologi sosial</i> .					
3	Saya memperoleh informasi terkini (up to date) pada saat menggunakan <i>teknologi sosial</i> .					
4	Saya mudah mencari penjelasan atas informasi yang kurang jelas.					
5	<i>Teknologi sosial</i> selalu siap digunakan pada saat diperlukan.					
6	Organisasi saya menyediakan anggaran yang memadai untuk memfasilitasi penggunaan <i>teknologi sosial</i> .					
7	Penggunaan <i>teknologi sosial</i> mengurangi kebutuhan aset fisik yang diperlukan untuk bekerja.					
8	Penggunaan <i>teknologi sosial</i> <b>tidak</b> memerlukan pelatihan khusus.					
9	Organisasi saya memiliki kemampuan mengelola jaringan internet yang baik.					
10	Organisasi saya memiliki kemampuan mengelola perangkat lunak (software, sistem informasi) yang baik.					
11	Organisasi saya memiliki staf IT yang berpengalaman dalam pengembangan dan perawatan sistem.					
12	Saya mempunyai pengetahuan yang memadai dalam penggunaan <i>teknologi sosial</i> .					
13	Saya mampu menggunakan <i>teknologi sosial</i> dengan efektif.					
14	Pejabat di atas saya mendukung penggunaan <i>teknologi sosial</i> .					
15	Saya menggunakan <i>teknologi sosial</i> untuk memindai (mencari informasi tentang) lingkungan eksternal.					
16	Saya menggunakan <i>teknologi sosial</i> untuk mencari ide baru.					
17	Saya menggunakan <i>teknologi sosial</i> untuk melakukan perencanaan strategi.					

18	Saya menggunakan teknologi sosial untuk mengelola Program Kerja.					
19	Saya menggunakan teknologi sosial untuk mengelola sumberdaya organisasi.					
20	Saya menggunakan <i>teknologi sosial</i> untuk melakukan pembagian tugas.					
21	Saya merasa mudah untuk berkomunikasi dengan siapapun dalam unit kerja saya.					
22	Kerjasama antar Unit Kerja (Prodi, Biro, Badan, Lembaga, dsb.) dalam organisasi saya telah secara rutin dilakukan.					
23	Saya dengan mudah dapat mengakses orang dalam Unit Kerja yang lain.					
24	Dalam organisasi saya, pembagian otoritas hingga unit kerja yang paling bawah (Program Studi) telah dilakukan dengan baik.					
25	Dalam organisasi saya, pembagian otoritas antar unit kerja yang sejajar telah dilakukan dengan baik.					
26	Pelanggan (mahasiswa) dapat dengan mudah mengakses layanan dari berbagai unit kerja dalam organisasi saya.					
27	Organisasi saya telah melakukan kolaborasi secara luas dalam kegiatan <i>perencanaan</i> strategi.					
28	Organisasi saya telah melakukan kolaborasi secara luas dalam kegiatan <i>implementasi</i> strategi.					
29	Dalam Unit Kerja saya, pertukaran informasi yang diperlukan untuk berkolaborasi (bekerjasama) telah dilakukan dengan baik.					
30	Dalam Unit Kerja saya telah terbentuk pemahaman yang sama tentang tujuan unit kerja dan aktivitas yang perlu dilakukan untuk mencapai tujuan.					
31	Anggota Unit Kerja saya saling membantu untuk mencapai tujuan bersama.					
32	Kontribusi yang diberikan oleh anggota Unit Kerja saya sudah sesuai dengan harapan.					
33	Telah terbentuk semangat berkolaborasi antar anggota Unit Kerja saya.					
34	Penggunaan Teknologi Sosial dalam unit kerja saya menghasilkan keputusan dengan cepat.					

35	Penggunaan Teknologi Sosial dalam unit kerja saya menghasilkan banyak feedback (masukan) dalam proses pengambilan keputusan.					
36	Penggunaan Teknologi Sosial dalam unit kerja saya menghasilkan keputusan yang berkualitas.					
37	Penggunaan Teknologi Sosial dalam unit kerja saya menghasilkan keputusan yang bermanfaat.					

*APPENDIX 2***VALIDITY TEST RESULTS****RUNNING DATA 1 (VIB 2 AND VIB 3 NOT VALID)****Standardized Regression Weights: (Group number 1 - Default model)**

	Estimate
FIT1 <--- FIT	,659
FIT2 <--- FIT	,632
FIT3 <--- FIT	,766
FIT4 <--- FIT	,684
FIT5 <--- FIT	,616
VIB1 <--- VIB	,687
<b><u>VIB2</u></b> <--- <b><u>VIB</u></b>	<b><u>,421</u></b>
<b><u>VIB3</u></b> <--- <b><u>VIB</u></b>	<b><u>,489</u></b>
VIB4 <--- VIB	,827
VIB5 <--- VIB	,834
VIB6 <--- VIB	,752
VIB7 <--- VIB	,560
VIB8 <--- VIB	,578
VIB9 <--- VIB	,611
STU1 <--- STU	,702
STU2 <--- STU	,742
STU3 <--- STU	,776
STU4 <--- STU	,870
STU5 <--- STU	,843
STU6 <--- STU	,737
COC1 <--- COC	,604
COC2 <--- COC	,706
COC3 <--- COC	,643
COC4 <--- COC	,753
COC5 <--- COC	,862
COC6 <--- COC	,757
COC7 <--- COC	,832
COC8 <--- COC	,837
COQ1 <--- COQ	,842
COQ2 <--- COQ	,863

	Estimate
COQ3 <--- COQ	,790
COQ4 <--- COQ	,747
COQ5 <--- COQ	,797
DMP1 <--- DMP	,841
DMP2 <--- DMP	,848
DMP3 <--- DMP	,882
DMP4 <--- DMP	,845

### **RUNNING DATA 2 (ALL DATA VALID)**

#### **Standardized Regression Weights: (Group number 1 - Default model)**

	Estimate
FIT1 <--- FIT	,660
FIT2 <--- FIT	,683
FIT3 <--- FIT	,772
FIT4 <--- FIT	,708
FIT5 <--- FIT	,657
VIB1 <--- VIB	,638
VIB4 <--- VIB	,867
VIB5 <--- VIB	,859
VIB6 <--- VIB	,761
VIB7 <--- VIB	,525
VIB8 <--- VIB	,559
VIB9 <--- VIB	,601
STU1 <--- STU	,723
STU2 <--- STU	,756
STU3 <--- STU	,757
STU4 <--- STU	,889
STU5 <--- STU	,878
STU6 <--- STU	,762
COC1 <--- COC	,676
COC2 <--- COC	,726
COC3 <--- COC	,666
COC4 <--- COC	,748
COC5 <--- COC	,851
COC6 <--- COC	,750
COC7 <--- COC	,840
COC8 <--- COC	,829

	Estimate
COQ1 <--- COQ	,841
COQ2 <--- COQ	,851
COQ3 <--- COQ	,805
COQ4 <--- COQ	,795
COQ5 <--- COQ	,788
DMP1 <--- DMP	,854
DMP2 <--- DMP	,872
DMP3 <--- DMP	,881
DMP4 <--- DMP	,852

*APPENDIX 3***RELIABILITY TEST RESULTS****Standardized Regression Weights: (Group number 1 - Default model)**

	Estimate
FIT1 <--- FIT	,660
FIT2 <--- FIT	,683
FIT3 <--- FIT	,772
FIT4 <--- FIT	,708
FIT5 <--- FIT	,657
VIB1 <--- VIB	,638
VIB4 <--- VIB	,867
VIB5 <--- VIB	,859
VIB6 <--- VIB	,761
VIB7 <--- VIB	,525
VIB8 <--- VIB	,559
VIB9 <--- VIB	,601
STU1 <--- STU	,723
STU2 <--- STU	,756
STU3 <--- STU	,757
STU4 <--- STU	,889
STU5 <--- STU	,878
STU6 <--- STU	,762
COC1 <--- COC	,676
COC2 <--- COC	,726
COC3 <--- COC	,666
COC4 <--- COC	,748
COC5 <--- COC	,851
COC6 <--- COC	,750
COC7 <--- COC	,840
COC8 <--- COC	,829
COQ1 <--- COQ	,841
COQ2 <--- COQ	,851
COQ3 <--- COQ	,805
COQ4 <--- COQ	,795
COQ5 <--- COQ	,788
DMP1 <--- DMP	,854
DMP2 <--- DMP	,872
DMP3 <--- DMP	,881

	Estimate
DMP4 <--- DMP	,852

#### Calculations of CR, VE and AVE

Variabel	CR	VE	AVE	Keterangan
FIT	0,8582	0,6350	0,7968	Reliabel
VIB	0,9382	0,7594	0,8714	Reliabel
COC	0,9364	0,7555	0,8692	Reliabel
STU	0,9485	0,7515	0,8669	Reliabel
COQ	0,9476	0,8159	0,9033	Reliabel
DMP	0,9223	0,7743	0,8799	Reliabel

*APPENDIX 4***RUNNING DATA 1 (OUTLIERS STILL INCLUDED)**

$$\text{CHIINV} = (0.001 \times 35) = 66,618$$

Observations farthest from the centroid (Mahalanobis distance) (Group number 1)

Observation number	Mahalanobis d-squared	p1	p2
<u>111</u>	<u>103,332</u>	,000	,000
<u>32</u>	<u>99,784</u>	,000	,000
<u>214</u>	<u>99,474</u>	,000	,000
<u>61</u>	<u>92,221</u>	,000	,000
<u>148</u>	<u>91,002</u>	,000	,000
<u>19</u>	<u>84,412</u>	,000	,000
<u>110</u>	<u>76,915</u>	,000	,000
<u>134</u>	<u>74,089</u>	,000	,000
<u>211</u>	<u>73,510</u>	,000	,000
<u>35</u>	<u>72,819</u>	,000	,000
<u>217</u>	<u>71,149</u>	,000	,000
<u>62</u>	<u>70,782</u>	,000	,000
<u>185</u>	<u>68,043</u>	,001	,000
<u>191</u>	<u>66,871</u>	,001	,000
<u>12</u>	<u>66,826</u>	,001	,000
216	66,517	,001	,000
97	64,265	,002	,000
169	63,352	,002	,000
138	62,950	,003	,000
144	60,913	,004	,000
173	60,575	,005	,000
122	59,396	,006	,000
119	58,993	,007	,000
57	57,368	,010	,000
20	56,936	,011	,000
179	56,181	,013	,000
1	55,971	,014	,000
84	55,405	,016	,000
150	54,796	,018	,000
178	54,698	,018	,000
117	54,024	,021	,000
58	53,367	,024	,000

Observation number	Mahalanobis d-squared	p1	p2
190	53,197	,025	,000
151	52,896	,027	,000
156	51,070	,039	,000
91	49,902	,049	,000
154	49,885	,049	,000
2	49,587	,052	,000
197	49,484	,053	,000
174	49,456	,053	,000
208	49,235	,056	,000
87	49,205	,056	,000
139	48,818	,060	,000
145	48,726	,062	,000
100	48,521	,064	,000
203	48,116	,069	,000
21	47,624	,076	,000
27	47,572	,076	,000
140	47,144	,082	,000
158	46,997	,085	,000
106	46,767	,088	,000
90	46,715	,089	,000
201	46,193	,098	,000
146	46,113	,099	,000
127	46,018	,101	,000
207	45,166	,117	,000
202	45,155	,117	,000
115	44,860	,123	,000
48	44,267	,135	,000
188	44,247	,136	,000
30	44,211	,137	,000
34	43,854	,145	,000
206	43,572	,152	,000
31	43,135	,163	,000
200	43,044	,165	,000
120	42,815	,171	,000
166	42,203	,188	,000
175	41,486	,209	,000
80	41,258	,216	,000
28	41,073	,222	,000
76	40,952	,226	,000
142	40,826	,230	,000

Observation number	Mahalanobis d-squared	p1	p2
85	40,628	,236	,001
155	40,433	,243	,001
112	40,304	,247	,001
165	40,260	,249	,001
77	39,739	,267	,003
164	39,732	,267	,002
73	39,162	,288	,011
109	39,057	,292	,011
9	38,940	,297	,011
64	38,840	,301	,010
157	38,819	,302	,008
108	38,510	,314	,015
141	38,078	,331	,039
69	37,817	,342	,060
14	37,521	,354	,096
56	37,420	,359	,095
83	37,382	,360	,081
170	37,250	,366	,086
196	37,112	,372	,094
215	36,182	,413	,421
33	36,054	,419	,436
162	35,755	,433	,545
113	35,517	,444	,620
43	35,367	,451	,648
198	35,023	,467	,765
192	34,830	,476	,805
81	34,793	,478	,781
131	34,598	,487	,820

**RUNNING DATA 2 (OUTLIERS STILL INCLUDED)**

$$\text{CHIINV} = (0.001 \times 35) = 66,618$$

Observations farthest from the centroid (Mahalanobis distance) (Group number 1)

Observation number	Mahalanobis d-squared	p1	p2
<b><u>202</u></b>	<b><u>78,128</u></b>	,000	,008
<b><u>114</u></b>	<b><u>70,404</u></b>	,000	,003
<b><u>159</u></b>	<b><u>68,458</u></b>	,001	,000
91	65,291	,001	,000
129	64,313	,002	,000
135	63,266	,002	,000
140	62,126	,003	,000
18	61,887	,003	,000
163	61,431	,004	,000
1	61,326	,004	,000
111	61,004	,004	,000
169	60,751	,004	,000
109	60,736	,004	,000
53	60,285	,005	,000
179	60,001	,005	,000
164	59,738	,006	,000
168	59,669	,006	,000
78	57,909	,009	,000
54	57,675	,009	,000
141	56,542	,012	,000
107	56,026	,013	,000
185	54,886	,017	,000
144	54,862	,017	,000
131	54,637	,018	,000
191	54,556	,019	,000
19	53,940	,021	,000
85	53,869	,022	,000
25	53,848	,022	,000
136	53,782	,022	,000
148	53,592	,023	,000
44	53,501	,023	,000
189	53,385	,024	,000
146	53,149	,025	,000
130	52,964	,026	,000
196	52,846	,027	,000

Observation number	Mahalanobis d-squared	p1	p2
195	51,834	,033	,000
31	51,345	,037	,000
70	50,975	,040	,000
119	50,969	,040	,000
137	50,898	,040	,000
58	50,593	,043	,000
94	50,235	,046	,000
26	49,655	,051	,000
2	49,585	,052	,000
81	49,441	,054	,000
100	49,393	,054	,000
103	49,177	,056	,000
190	49,078	,058	,000
29	48,951	,059	,000
84	48,636	,063	,000
177	48,471	,065	,000
74	48,207	,068	,000
194	47,606	,076	,000
28	47,290	,080	,000
188	47,171	,082	,000
165	46,557	,092	,000
30	46,444	,093	,000
145	46,380	,095	,000
154	46,059	,100	,000
67	44,626	,128	,000
133	44,487	,131	,000
104	44,029	,141	,000
147	43,987	,142	,000
77	43,271	,159	,000
102	43,106	,163	,000
112	42,878	,169	,000
9	42,866	,169	,000
156	42,852	,170	,000
160	42,627	,176	,000
155	42,543	,178	,000
105	41,949	,195	,000
13	41,634	,204	,000
79	41,218	,217	,000
71	40,824	,230	,000
184	40,370	,245	,000

Observation number	Mahalanobis d-squared	p1	p2
132	40,111	,254	,000
152	40,082	,255	,000
39	39,456	,277	,001
166	39,154	,289	,001
122	39,123	,290	,001
139	38,628	,309	,004
115	38,190	,327	,012
180	38,012	,334	,015
52	38,007	,334	,011
75	37,965	,336	,008
63	37,946	,337	,006
108	37,739	,345	,008
186	37,698	,347	,006
73	37,536	,354	,008
150	37,348	,362	,010
68	37,320	,363	,008
143	36,814	,385	,028
201	36,757	,387	,024
64	36,291	,408	,065
65	36,144	,415	,072
60	35,699	,435	,157
23	35,540	,443	,175
167	34,910	,472	,411
176	34,722	,481	,457
51	34,660	,484	,435

**RUNNING DATA 3 (FREE OF OUTLIERS)**

$$\text{CHIINV} = (0.001 \times 35) = 66,618$$

**Observations farthest from the centroid (Mahalanobis distance) (Group number 1)**

Observation number	Mahalanobis d-squared	p1	p2
128	66,613	,001	,182
139	65,435	,001	,031
91	64,674	,002	,005
134	64,100	,002	,001
166	62,758	,003	,000
111	61,860	,003	,000
18	61,656	,004	,000
177	61,572	,004	,000
161	61,425	,004	,000
1	61,247	,004	,000
54	60,711	,004	,000
162	60,593	,005	,000
53	60,520	,005	,000
167	60,207	,005	,000
109	60,037	,005	,000
78	58,065	,008	,000
130	57,607	,009	,000
143	56,341	,013	,000
187	56,311	,013	,000
140	56,076	,013	,000
107	55,688	,015	,000
147	55,686	,015	,000
44	55,396	,016	,000
19	55,022	,017	,000
85	54,762	,018	,000
183	54,250	,020	,000
189	53,942	,021	,000
129	53,654	,023	,000
31	53,552	,023	,000
135	53,474	,024	,000
136	53,434	,024	,000
25	53,159	,025	,000
145	52,660	,028	,000
94	52,194	,031	,000
194	52,093	,032	,000

Observation number	Mahalanobis d-squared	p1	p2
30	51,584	,035	,000
193	51,460	,036	,000
26	51,374	,037	,000
118	51,226	,038	,000
58	50,989	,040	,000
70	50,963	,040	,000
175	50,724	,042	,000
81	50,202	,046	,000
186	49,986	,048	,000
2	49,750	,051	,000
188	49,531	,053	,000
100	49,322	,055	,000
104	49,067	,058	,000
103	48,968	,059	,000
29	48,629	,063	,000
84	48,480	,064	,000
74	47,998	,070	,000
28	47,693	,075	,000
163	47,674	,075	,000
192	47,367	,079	,000
144	47,114	,083	,000
153	46,226	,097	,000
132	46,082	,100	,000
67	45,944	,102	,000
146	44,945	,121	,000
112	44,944	,121	,000
102	44,887	,122	,000
9	44,022	,141	,000
155	43,551	,152	,000
77	43,121	,163	,000
158	42,944	,167	,000
154	42,464	,180	,000
13	42,306	,185	,000
71	42,039	,192	,000
182	42,012	,193	,000
131	41,999	,194	,000
79	41,707	,202	,000
105	41,460	,210	,000
164	41,152	,219	,000
151	40,664	,235	,000

Observation number	Mahalanobis d-squared	p1	p2
138	39,420	,279	,001
39	39,308	,283	,001
114	39,214	,286	,001
121	39,035	,293	,001
52	38,861	,300	,002
65	38,796	,302	,001
149	38,586	,311	,002
178	38,495	,314	,002
75	38,368	,319	,002
108	38,271	,323	,002
63	37,824	,342	,006
199	37,756	,344	,005
184	37,718	,346	,004
64	37,598	,351	,004
142	37,471	,356	,004
73	37,160	,370	,008
68	37,082	,373	,007
60	35,755	,433	,198
23	35,676	,436	,188
191	35,529	,443	,203
174	35,295	,454	,254
35	35,247	,457	,230
200	35,190	,459	,211
165	35,154	,461	,185
122	35,136	,462	,155

## APPENDIX 5

## NORMALITY TEST RESULTS

## Assessment of normality (Group number 1)

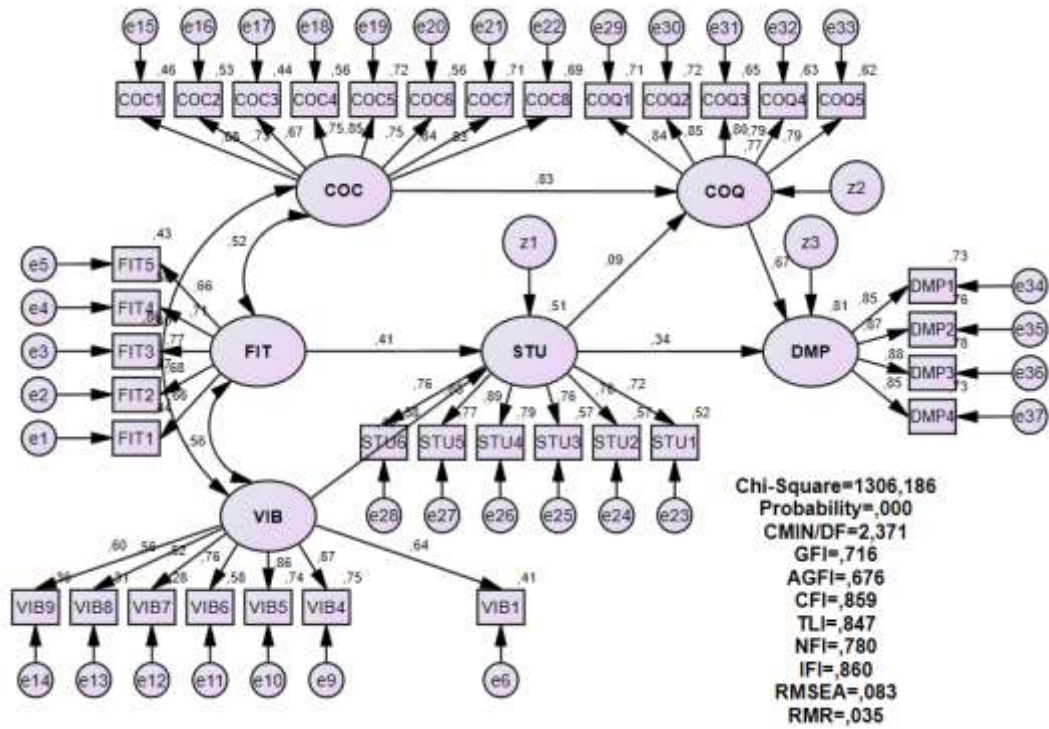
Variable	min	max	skew	c.r.	kurtosis	c.r.
DMP4	2,000	5,000	-,289	-1,667	-,051	-,146
DMP3	2,000	5,000	-,176	-1,014	-,454	-1,310
DMP2	2,000	5,000	-,265	-1,531	-,121	-,348
DMP1	2,000	5,000	-,452	-2,611	,295	,851
COQ5	2,000	5,000	-,424	-2,448	-,113	-,325
COQ4	2,000	5,000	-,559	-3,229	,920	2,657
COQ3	3,000	5,000	-,339	-1,957	-,663	-1,913
COQ2	2,000	5,000	-,316	-1,825	-,377	-1,088
COQ1	2,000	5,000	-,252	-1,456	-,277	-,800
COC8	3,000	5,000	-,058	-,333	-,769	-2,220
COC7	2,000	5,000	-,294	-1,696	-,204	-,589
COC6	2,000	5,000	-,480	-2,774	-,083	-,240
COC5	1,000	5,000	-,670	-3,867	1,177	3,397
COC4	2,000	5,000	-,346	-1,997	-,246	-,709
COC3	2,000	5,000	-,538	-3,109	-,248	-,717
COC2	2,000	5,000	-,710	-4,098	,537	1,549
COC1	3,000	5,000	-,567	-3,273	-,633	-1,826
STU6	3,000	5,000	-,370	-2,134	-,666	-1,923
STU5	3,000	5,000	-,320	-1,849	-,667	-1,925
STU4	3,000	5,000	-,257	-1,485	-,652	-1,883
STU3	2,000	5,000	-,497	-2,872	,144	,416
STU2	2,000	5,000	-,784	-4,525	,870	2,512
STU1	3,000	5,000	-,317	-1,827	-,859	-2,481
VIB9	3,000	5,000	-,649	-3,747	-,596	-1,721
VIB8	2,000	5,000	-,446	-2,572	,584	1,685
VIB7	2,000	5,000	-,310	-1,791	-,372	-1,073
VIB6	2,000	5,000	-,703	-4,059	-,278	-,802
VIB5	2,000	5,000	-,690	-3,985	-,215	-,622
VIB4	1,000	5,000	-,725	-4,186	,120	,346
VIB1	1,000	5,000	-,612	-3,536	-,179	-,517
FIT5	3,000	5,000	-,864	-4,987	-,247	-,714
FIT4	3,000	5,000	-,574	-3,316	-,609	-1,757
FIT3	2,000	5,000	-1,351	-7,799	1,594	4,603
FIT2	2,000	5,000	-,821	-4,740	,076	,219

Variable	min	max	skew	c.r.	kurtosis	c.r.
FIT1	3,000	5,000	-,623	-3,599	-,578	-1,668
Multivariate					203,276	28,244

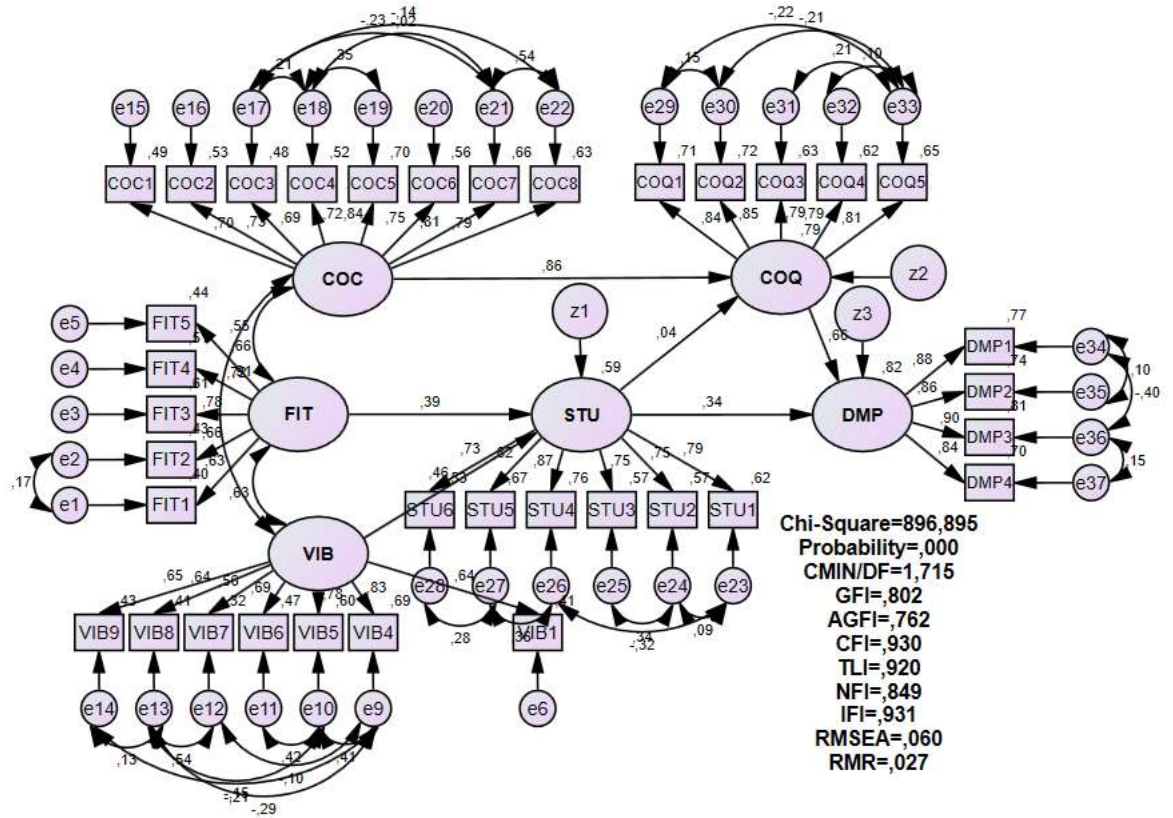
*APPENDIX 6***MUTICOLLINIERITY TEST RESULTS****Correlations: (Group number 1 - Default model)**

	Estimate
FIT <--> COC	,520
VIB <--> COC	,859
FIT <--> VIB	,559

**INITIAL FULL MODEL  
FROM STRUCTURAL EQUATION MODELLING**



**FULL MODEL FROM STRUCTURAL EQUATION MODELLING  
AFTER CHANGES IN MODIFICATION INDICES**



*APPENDIX 8***INITIAL HYPOTHESIS TEST RESULTS****Regression Weights: (Group number 1 - Default model)**

	Estimate	S.E.	C.R.	P	Label
STU <--- FIT	,428	,102	4,215	***	par_30
STU <--- VIB	,282	,062	4,553	***	par_31
COQ <--- COC	1,151	,130	8,838	***	par_33
COQ <--- STU	,115	,082	1,411	,158	par_35
DMP <--- STU	,452	,081	5,596	***	par_32
DMP <--- COQ	,670	,068	9,878	***	par_34

**Standardized Direct Effects (Group number 1 - Default model)**

	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,404	,406	,000	,000	,000
COQ	,827	,000	,000	,085	,000	,000
<b>DMP</b>	,000	,000	,000	<b>,336</b>	,673	,000

**Standardized Indirect Effects (Group number 1 - Default model)**

	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,000	,000	,000	,000	,000
COQ	,000	,034	,035	,000	,000	,000
<b>DMP</b>	,556	,159	,160	<b>,057</b>	,000	,000

**HYPOTHESIS TEST RESULTS**  
**AFTER CHANGES IN MODIFICATION INDICES**

**Regression Weights: (Group number 1 - Default model)**

	Estimate	S.E.	C.R.	P	Label
STU <--- FIT	,461	,120	3,838	***	par_30
STU <--- VIB	,352	,072	4,913	***	par_31
COQ <--- COC	1,165	,130	8,986	***	par_33
COQ <--- STU	,047	,081	,582	,561	par_35
DMP <--- STU	,433	,077	5,641	***	par_32
DMP <--- COQ	,680	,070	9,673	***	par_34

**Standardized Direct Effects (Group number 1 - Default model)**

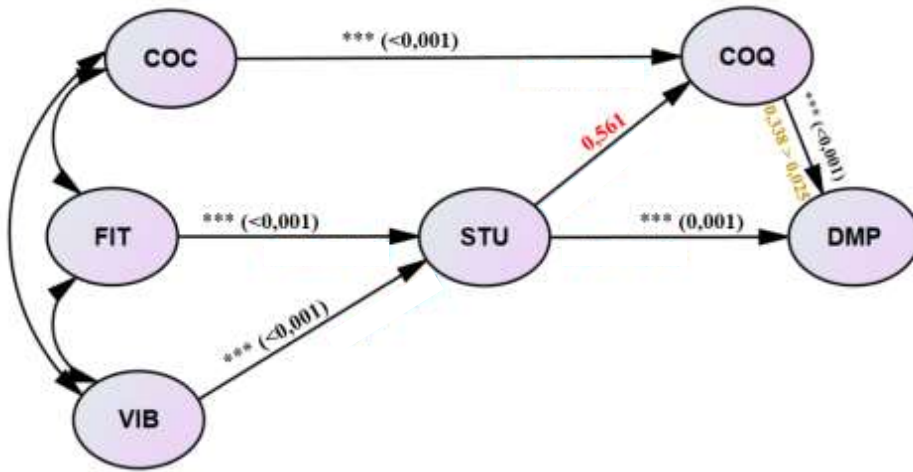
	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,464	,387	,000	,000	,000
COQ	,863	,000	,000	,038	,000	,000
<b>DMP</b>	,000	,000	,000	<b>,338</b>	,663	,000

**Standardized Indirect Effects (Group number 1 - Default model)**

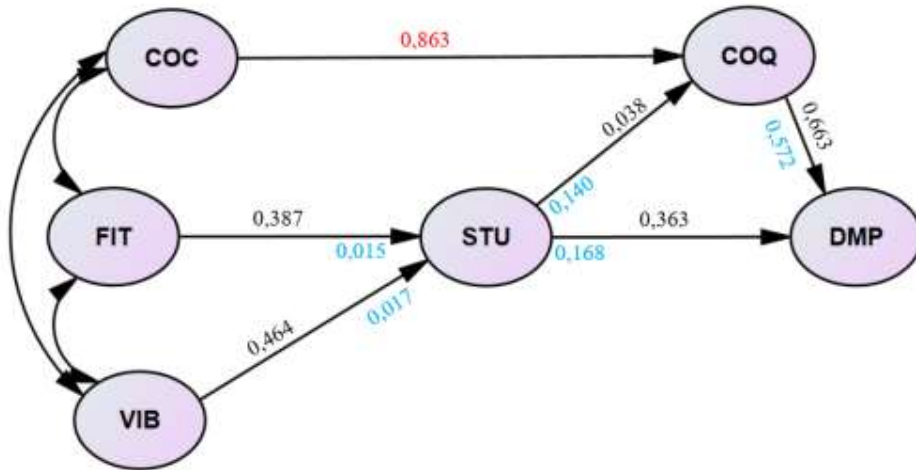
	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,000	,000	,000	,000	,000
COQ	,000	,017	,015	,000	,000	,000
<b>DMP</b>	,572	,168	,140	<b>,025</b>	,000	,000

**Standardized Total Effects (Group number 1 - Default model)**

	COC	VIB	FIT	STU	COQ	DMP
STU	,000	,464	,387	,000	,000	,000
COQ	<b>,863</b>	,017	,015	<b>,038</b>	,000	,000
<b>DMP</b>	,572	,168	,140	<b>,363</b>	<b>,663</b>	,000



Path Analysis showing total effect and mediation



Path Analysis of total direct effect and mediation between variables

*APPENDIX 9***MODIFICATION INDICES****Modification Indices (Group number 1 - Default model)****Covariances: (Group number 1 - Default model)**

	M.I.	Par Change
z1 <--> COC	10,174	,018
z1 <--> VIB	7,021	-,022
<b>e36 &lt;--&gt; e37</b>	<b>5,593</b>	<b>,021</b>
<b>e34 &lt;--&gt; e36</b>	<b>12,365</b>	<b>-,031</b>
<b>e34 &lt;--&gt; e35</b>	<b>5,183</b>	<b>,020</b>
e33 <--> z3	7,820	,027
e32 <--> e37	9,833	-,034
<b>e32 &lt;--&gt; e33</b>	<b>6,417</b>	<b>,034</b>
e31 <--> z2	4,932	,020
<b>e31 &lt;--&gt; e33</b>	<b>10,368</b>	<b>,039</b>
e30 <--> FIT	5,043	-,022
<b>e30 &lt;--&gt; e33</b>	<b>5,451</b>	<b>-,028</b>
e29 <--> z2	4,321	-,018
<b>e29 &lt;--&gt; e33</b>	<b>7,148</b>	<b>-,032</b>
<b>e29 &lt;--&gt; e30</b>	<b>6,505</b>	<b>,026</b>
e22 <--> COC	5,610	,016
e22 <--> FIT	9,486	-,032
e22 <--> e34	4,468	-,022
e22 <--> e33	19,764	-,056
e22 <--> e29	6,460	,028
e21 <--> FIT	7,615	-,029
e21 <--> e34	5,342	-,024
e21 <--> e33	8,425	-,037
e21 <--> e30	16,166	,045
<b>e21 &lt;--&gt; e22</b>	<b>55,129</b>	<b>,085</b>
e20 <--> e32	4,831	-,031
e19 <--> z1	4,129	-,019
e19 <--> e34	6,382	,027
e18 <--> z2	7,885	-,033
e18 <--> e32	4,154	,031

	M.I.	Par Change
<b>e18 &lt;--&gt; e21</b>	<b>4,010</b>	<b>-,029</b>
<b>e18 &lt;--&gt; e19</b>	<b>19,992</b>	,065
e17 <--> FIT	10,777	,054
<b>e17 &lt;--&gt; e22</b>	<b>5,764</b>	<b>-,043</b>
<b>e17 &lt;--&gt; e21</b>	<b>13,367</b>	<b>-,067</b>
<b>e17 &lt;--&gt; e18</b>	<b>10,022</b>	,071
e16 <--> e33	4,515	,033
e16 <--> e30	6,019	-,033
e15 <--> FIT	8,984	,034
e15 <--> z1	8,789	,029
e15 <--> e31	7,069	,032
e15 <--> e22	4,346	-,026
e15 <--> e21	7,564	-,035
e15 <--> e16	4,546	,033
e28 <--> e17	5,121	,042
e27 <--> FIT	10,829	-,029
e27 <--> e17	6,974	-,040
<b>e27 &lt;--&gt; e28</b>	<b>8,237</b>	<b>,029</b>
e26 <--> e19	7,342	-,025
<b>e26 &lt;--&gt; e27</b>	<b>14,348</b>	,027
e25 <--> VIB	4,432	-,025
e25 <--> FIT	5,408	,027
e25 <--> e28	6,427	-,034
e25 <--> e27	5,532	-,025
e24 <--> FIT	4,466	,023
e24 <--> e20	5,032	-,032
e24 <--> e27	14,001	-,038
<b>e24 &lt;--&gt; e25</b>	<b>26,653</b>	,070
e23 <--> FIT	6,090	,026
e23 <--> z1	10,086	-,029
e23 <--> e17	4,059	,036
<b>e23 &lt;--&gt; e26</b>	<b>10,952</b>	<b>-,029</b>
e23 <--> e25	4,398	,027
<b>e23 &lt;--&gt; e24</b>	<b>9,446</b>	<b>,037</b>
e14 <--> VIB	5,711	-,033
e14 <--> FIT	7,916	,039
e14 <--> z1	4,882	,026
e14 <--> e15	15,832	,066
e14 <--> e24	6,808	,042
e14 <--> e23	6,883	,040

	M.I.	Par Change
e13 <--> COC	11,476	,032
e13 <--> VIB	20,220	-,063
e13 <--> FIT	18,519	,061
e13 <--> z1	5,612	,029
e13 <--> e29	5,374	,035
e13 <--> e25	8,616	,052
<b>e13 &lt;--&gt; e14</b>	<b>12,024</b>	,071
e12 <--> VIB	9,908	-,052
e12 <--> FIT	19,656	,073
e12 <--> e37	7,032	-,043
e12 <--> e35	4,153	,032
e12 <--> e33	4,690	,044
e12 <--> e32	8,777	,057
e12 <--> e17	5,173	,065
e12 <--> e27	4,374	-,032
e12 <--> e25	4,589	,044
<b>e12 &lt;--&gt; e13</b>	<b>75,328</b>	,216
e11 <--> VIB	5,082	,035
e11 <--> FIT	4,854	-,035
e11 <--> z1	5,628	-,032
e11 <--> e31	5,197	-,038
e11 <--> e17	4,261	-,056
e11 <--> e25	4,012	-,039
e10 <--> COC	5,696	-,020
e10 <--> VIB	9,263	,037
e10 <--> FIT	8,471	-,037
e10 <--> z1	9,163	-,034
e10 <--> e37	6,061	,031
e10 <--> e35	5,346	-,028
<b>e10 &lt;--&gt; e13</b>	<b>21,926</b>	<b>-,090</b>
e10 <--> e12	13,537	-,083
<b>e10 &lt;--&gt; e11</b>	<b>29,165</b>	,114
e9 <--> z2	7,426	,031
e9 <--> z3	4,646	-,023
e9 <--> e31	11,551	,046
e9 <--> e22	6,087	-,034
e9 <--> e21	5,786	-,034
e9 <--> e27	10,016	,038
e9 <--> e25	5,143	-,036
<b>e9 &lt;--&gt; e14</b>	<b>8,576</b>	<b>-,054</b>

		M.I.	Par Change
<b>e9</b>	<b>&lt;--&gt; e13</b>	<b>15,091</b>	<b>-,074</b>
<b>e9</b>	<b>&lt;--&gt; e12</b>	<b>6,595</b>	<b>-,057</b>
<b>e9</b>	<b>&lt;--&gt; e10</b>	<b>23,713</b>	<b>,081</b>
e6	<--> VIB	4,069	-,037
e6	<--> e34	5,989	-,045
e6	<--> e18	5,149	,058
e5	<--> e28	4,383	-,029
e5	<--> e25	7,280	,041
e5	<--> e24	5,448	,033
e5	<--> e13	4,897	,041
e5	<--> e12	4,129	,044
e5	<--> e6	7,609	-,067
e4	<--> e29	6,421	-,031
e4	<--> e25	4,260	,030
e3	<--> e34	6,099	,027
e3	<--> e23	4,373	,025
e2	<--> e21	6,779	-,044
e2	<--> e17	7,889	,072
e2	<--> e11	5,043	-,056
e2	<--> e9	4,377	,042
e2	<--> e6	15,810	,117
e1	<--> z1	5,120	-,024
e1	<--> e32	7,324	-,038
e1	<--> e15	5,374	-,034
e1	<--> e13	11,378	,061
e1	<--> e12	10,705	,069
e1	<--> e2	4,005	,038

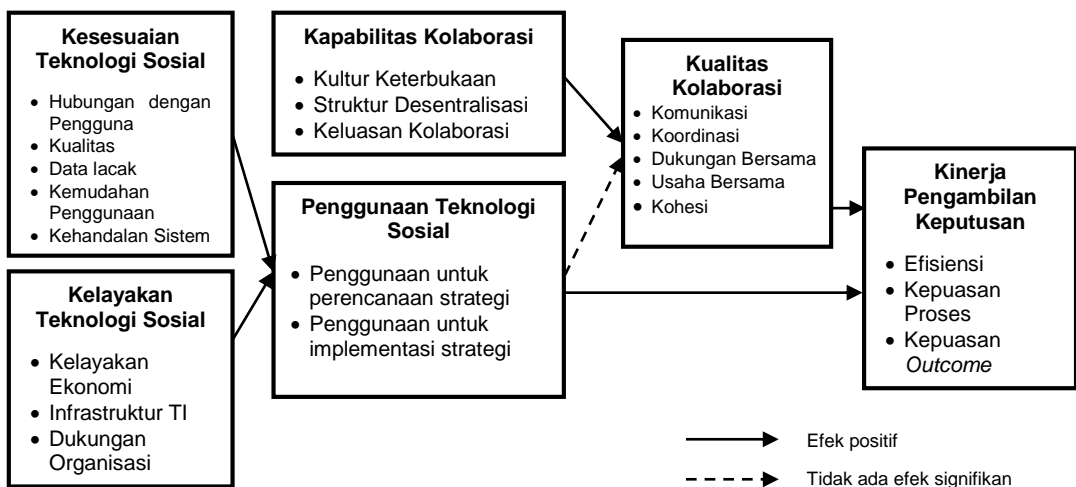
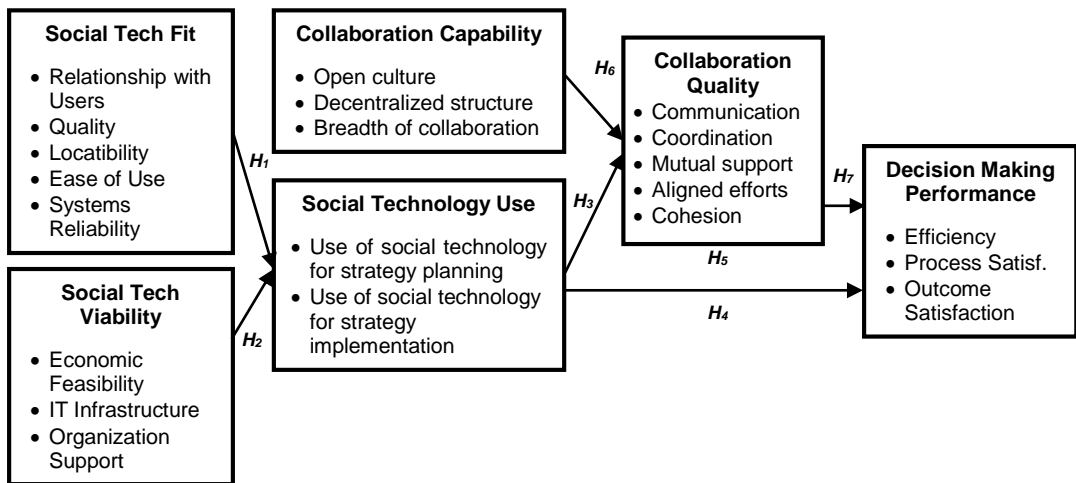


Figure 5.6. Confirmed Model