FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

THE EFFECT OF CROSS-FUNCTIONAL INTEGRATION ON ORGANIZATIONAL PERFORMANCE: A LOOK AT COLLABORATION, COORDINATION, AND COMMUNICATION

A Dissertation submitted in partial fulfillment of the requirements for the degree of

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By

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To: Interim Dean William Hardin
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This dissertation, written by Loraine A. Jackson and entitled the effect of cross-functional integration on organizational performance: a look at collaboration, coordination and communication, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it be approved.

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Florida International University, 2021

DEDICATION

I dedicate this dissertation to my husband and family. The completion of work would not be possible without their understanding, patience, love, and support

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I was very fortunate to work with brilliant professors through the program who motivated and encourage my creativity. The DBA program coursework provided me with the tools to explore both past and present issues and ideas.

ABSTRACT OF THE DISSERTATION

The Effect of Cross-Functional Integration on Organizational Performance:

A look at Collaboration, Coordination, and Communication

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Cross-functional integration (CFI) in organizations involves a sequence of integrated tasks and activities across multiple departments and units. Modern organizations are hierarchical and have separated functional departments. This may lead to limited reciprocal communication, and poor coordination. Work is often divided, categorized, and poses a challenge for CFI personnel to be practical. This challenge continues as technology, and organizational structures change.

This study is to investigate the effect of CFI on organization performance. The study also looked at CFI from a triadic level of analysis, a broader perspective involving several functional units and processes within the organization. Specifically, this study examines how collaboration, coordination, and communication as the three core processes of CFI impact organization performance and develops a research model based on Tushman & Nadler's (1978) information processing framework. The study also incorporates the organizational structure (OS) by testing the moderated effect between CFI and performance. We tested the model via a survey that included 325 completed survey responses from online participants. The results showed a strong positive impact of

collaboration, coordination, and communication on performance. Also, the study revealed that OS partially moderates the relationships between CFI and performance. There was a strong interaction effect on the relationship between coordination and performance, and communication and performance. No relationship was found between collaboration and performance when OS was included. Implications of these findings are discussed, along with suggestions for future research.

Keywords: Cross-functional Integration, inter-functional collaboration; interdepartmental integration, information processing, collaboration, coordination, communication, OS

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ABBREVIATIONS AND ACRONYMS

CFI	Cross-Functional Integration
IPT	Information Processing Theory
OS	Organizational Structure

1. INTRODUCTION

Today's business environment is a process of constant change and has become the norm. As a result, companies are modifying their strategies to focus on organizational flexibility and continuous improvement, but not without challenges (Weick & Quinn 1999; Merschmann & Thonemann 2011). Many organizations are faced with circumstances where quick decision making becomes necessary for a stronger and easier flow of knowledge to improve their structures (Hietajarvi, Aaltonen, & Haapasalo, 2017). One such area is the CFI of functions within an organization for better firm performance (Turkulainen & Ketokivi, 2012).

Throughout time, companies have adapted the process of grouping people, activities, and resources into processes, creating cross-functional relationships that, through coordination and collaboration, they can meet their company's needs and demand. (Harris, 2005; Galpin, Hilpirt, & Evans, 2007). According to Tesone (2006), many companies are experiencing the inability to carry out integration processes among departments and individuals effectively (Tesone, 2006). If one department's communication or processes breaks down, this affects another and will ultimately impact the organization's complete performance experience (Reddock, 2017).

Looking at CFI as a potential problem stems from the fact that a company I work for within the financial industry faced several challenges in streamlining its cross-functional activities. Departments such as sales/marketing, operations, R & D, guest services, accounting, and engineering do not work well to achieve their goals. Several efforts to fix the problem have failed as there is a lack of coordination and communication among departments and their functions. Management wants to find a

way to increase this communication among the departments and believes that improving cross-functional collaboration will play a significant role in achieving a successful firm performance. So, the emphasis is on looking at cross-functional processes and how they affect performances to help solve this issue for organizations.

The need to facilitate coordination between departments within a company has developed CFI, which has become necessary to succeed in today's market. (Rho, Hahm & Yu, 1994; Griffin & Hauser, 1996; Krohmer, Homburg, & Workman, 2002; Daugherty, Chen, Mattioda & Grave, 2009; Pimenta, 2016). Prior research focused on the relationship between integration and performance, and many researchers have found that better integration levels improve performance (Gimenez & Ventura, 2003; Stock, Greis, & Kasarda, 1998). Prior research focus on integration relationships from a dyadic analysis level, such as marketing & logistics (Ellinger, Daugherty, & Keller, 2000; Stank, Daugherty, & Ellinger, 1999), manufacturing & marketing (O'Leary-Kelly & Flores, 2002; Prabhaker, Goldhar, & Lei, 1995; Verma , Thompson, Moore, & Louviere, 2001), and R & D and marketing (Griffin & Hauser, 1996).

Purpose Statement

The purpose of this survey research study is to examine the relationship between CFI (as it relates to collaboration, coordination, and communication) and performance. This study extended the CFI research by shifting the focus to looked at CFI integration from a triadic analysis level to include a wider based integration that encompasses several different functional units and processes within the organization. Input from a variety of operating units could facilitate greater cooperation, develop mutual understanding, support collective goals and planning that may enhance and resolve operational problems

(Chen, Mattioda, & Daugherty, 2007; Stank et al., 1999). Also, to add to the literature, a look at the organizational structure is considered an interaction effect. That is, how can OS facilitate integration and improve CFI. I believe that elaborating on the relationship between CFI work processes and performance will explain why these are important.

Significance of the Study

Cross-functional activities are challenging (Turkulainen, & Ketokivi, 2012; Hietajärvi, et. al., 2017). From a micro-level, this study's significance will be to provide quantitative evidence of the impact and effectiveness of CFI processes, mainly collaboration, coordination, and communication, on a firm's performance. The population of cross-functional teams has increased over time due to the need for increased coordination and integration and improved organizational boundaries and production (Shams, Vrontis, Weber & Tsoukatos, 2018). At the macro level, the aim is to contribute to literature as this is not just a one organization problem, but national as well. Also, to provide information for applied business leaders who might experience integration problems and find this helpful information. Bringing people together from various skill sets and departments can improve problem-solving and thorough decision-making (Turkulainen, & Ketokivi, 2012; Bendoly, Bharadwaj, & Bharadwaj, 2012). Finally, to ultimately improve practices and policies in general in the area of achieved CFI. Therefore, the main research question is, "what is the effect of CFI on performance regarding collaboration, coordination, and communication?"

II. LITERATURE REVIEW

2.1 Introduction

The topic under study is "what is the effect of CFI on performance as it relates to collaboration, coordination, and communication? " CFI is also referred to as inter-departmental integration, internal integration (Kahn, 1996) and inter-departmental collaboration (Danaoski, 2010; Lee, 2020. Kwan (2019) also refers to CFI as cross-group collaboration.

While there has been much research on CFI, only a few studies have looked at the problems from a triadic approach, including all aspects of a firm processes and departments (Chen et al., 2007). Appendix C gives a list of some empirical studies on CFI. For the most part, they were from a dyadic view between two functions, such as R & D and marketing. Besides, minimal research has considered the OS a potential player in the relationship between CFI and performance (Chen et al., 2007). This section summarizes the various literature explored that may be applicable in addressing some of the work processes and factors affecting organizations to achieve CFI successfully. The first part looks at the different definitions of CFI and integration in general.

2.2 Integration Definition

There are varied definitions from several publications about the nature and clarity of concepts relating to CFI. The description of organizational integration dates to pioneers Lawrence & Lorsch's (1967, 1986, p. 11) and Barki & Pinsonneault (2005), who defined work process integration as "a state of interdepartmental relations to achieved integration" (Lawrence & Lorsch, 1986, p. 11). The focus is on achieving integration, which seems to be a problem. When there is high "achieved integration," the

organization operates a one unit. Functional sub-unit do not pursue their agenda but focus on the goal of the organizations. When there is low integration, everyone is on their schedule (March & Simon, 1993; Boyer & McDermott, 1999; Ketokivi & Castaner, 2004; Turkulainen, & Ketokivi, 2012). Barki & Pinsonneault (2005) used a similar definition.

A universally accepted integration definition is that of Kahn & Metzer (1998), which stated that integration involves interdepartmental collaboration and interaction that unite departments together into a cohesive organization (Kahn & Metzner, 1998; Chen et al., 2007). Another definition was created by O'Leary-Kelly & Flores (2002), defining integration as different units working together cooperatively to arrive at a mutually acceptable outcome (O'Leary-Kelly & Flores, 2002).

Pellathy, et al. (2019) provided the latest comprehensive overview of essential concepts and definitions around CFI. According to Pellathy et al. (2019)," cross-functionality is an ongoing process of collaboration, coordination, and communication where internal units must work together to maximize organizational outcomes" (Pellathy et al., 2019, p. 85). For this study, we adopted the latest definition by Pellathy et al. (2019), since they break down the primary three constructs mentioned above that identified CFI processes. They also make a clear differentiation among the dimensions and attributes of each construct.

2.3 Cross-functional Integration

In organizational management research, integration typically refers to various practices to integrate efforts and cooperation through cross-functional teams (Ettlie & Reza, 1992; Swink & Nair, 2006; Swink et al., 2007; Gattiker & Goodhue, 2005). As

mentioned earlier, previous research focused on the dyadic level of analysis between two departments. There is no indication; however, that integration was achieved (Gerwin & Barrowman, 2002). According to Turkulainen & Ketokivi (2012), using cross-functional teams may not automatically obtain a state of organizational integration (Turkulainen & Ketokivi, 2012).

There are quite a few definitions notable for clarity and precise nature of the various concepts related to cross-functionality. Pellathy et al. (2019) definition mentioned in the previous section incorporates collaboration, coordination, and communication as ongoing processes working together (Pellathy et al., 2019). Early scholars have suggested an approach for CFI separated as formal and informal initiatives to generate cooperation between departments and sub-unites (Kahn, 1996; Sabath & Whipple 2004; DeLuca & Atuahene-Gima 2007). However, this has been an ongoing process as technology improves and processes increase. There is a need for more focus in arriving at a successful cross-functional initiative to achieve integration.

Due to the variations of CFI definition and measures, Pellathy et al. (2019) developed a mid-range CFI construct representing three foundational notions of integration concept within organization literature. Leenders & Wierenga (2002) conceptualized integration as "the degree to which there is communication, collaboration, and cooperative relationships among the functional units" (Leenders & Wierenga, 2002, p. 306). These foundational notions provide a solid theoretical background and encompass the three fundamental dimensions: collaboration of goals, coordination of activities, and knowledge communication (Pellathy et al., 2019). The following sections

look at the three CFI dimensions for this study (collaboration, coordination, and communication).

Literature on CFI suggests that collaboration establishes common goals and work together to achieve those goals (Stank, Keller, & Daugherty, 2001; Ellinger, Keller, & Hansen, 2006; Oliver & Watson, 2011; Hausman, Montgomery, & Roth, 2002; Pagell, 2004). “Cross-functional collaboration is an ongoing process in which the different internal functions that manage a company processes establish common goal and objectives and work together to achieve them” (Pellathy et al., 2019, p. 85). The goal of the group must be important. However, group collaboration of different skill sets can be challenging as individuals focus on their own department’s goals. Some individuals may compromise the shared vision of the group.

Research has also emphasized the cross-functional coordination of CFI, linking internally performed activities into a seamless process to support business requirements. Coordination requires functional managers to adopt a process perspective (Pellathy et al. 2019) to focus on achieving its overall objective rather than within its operational areas (Oliver & Watson, 2011).

Research has also conceptualized cross-functional communication as a means of information exchange, information sharing, and information processing (Flynn, Huo, & Zhao, 2010; Bretel, Heinemann, Engelen, & Neubauer, 2011; Song & Montoya-Weiss, 2001; Schoenherr & Swink, 2012). Myers & Myers (1982) originally defined organizational communication as "the central binding force that permits coordination among people and thus allows for organized behavior" (Myers & Myers, 1982, p. 5).

Therefore, understanding CFI communication deals with the support of the exchange of information.

2.4 Theories used in CFI

Cross-functional studies have included many theories as indicated by Jeske & Calvard (2020). Based on the literature, researchers have applied a range of approaches from social independence theory (Deutsch, 1949), cooperative model of knowledge sharing (Loebecke, VanFenema & Powell, 1999), motivation-ability-opportunity (MAO) framework (Maclnnis, Moorman, & Jaworski, 1991), configuration theory (Ordanini, Parasuraman, & Rubera, 2014), competing values framework for corporate communication (Cameron, Quinn, Degraff, & Thakor, 2006), and disconfirmation theory by (Oliver 1980; 2010). Other known approaches include Galbraith (1974). organizational information processing theory applied by (Cuijpers, Guenter, & Hussinger, 2011; Engelen, Brettel & Wiest, 2012; and Rosado Feger, 2014) and well as Pferre & Salancik (1978) resource dependency theory (Jeske & Calvard, 2020).

For this study, we applied the organizational information processing theory (IPT). Even though known approaches are used in CFI, there has not been an explicit agreement regarding the dominant approach to use (Jeske & Calvard, 2020). Swink & Schoenherr (2015), in their study on CFI and process, efficiently found significant implications for applying IPT to explaining the impact of internal integration. According to Oliver & Watson (2011), the quality of information and engagement based on how data is processed is vital to successful cross-functional communication. These are characteristics of the IPT approach and one of the dimensions of this study's variables mentioned by Pellathy et al. (2019). CFI and sharing of information in team meetings can help

departments learn about other functional unit characteristics and reduce biases for all involved (Enz, Schwieterman, & Lambert, 2019; Le Meunier-Fitzbugh & Massey, 2019).

2.5 Organizational Structure

Ghani, Jayabalan, & Sugumar (2002) and Robbins (2012) define organizational structure (OS) as formal distribution of work rules and administrative mechanisms for controlling and integrating of activities (Ghani, et al., 2002; Robbins, 2012). OS is a set of authority hierarchy for coordination between departments and communication channels based on the organizational chart lines (Mintzberg, 1979; Daft, 2004). Therefore, work transfers between departments can be accomplished using hierarchical coordination implied by the OS. For this reason, I believe the OS will affect work transfer in the business processes.

An increasing amount of literature on organizational design economics investigates OS, such as delegation, hierarchies, and the interactional process. Ozbas (2005); Harris & Raviv (2002) investigated the effects of a complete delegation process. This work builds upon Crawford & Sobel (1982) strategic communication model. Delegating some of the work processes may contribute to a smoother flow based on the environment. Strauss (1988) stated that interactional functions are essential to the operation of these work processes in his work on the interaction of processes. For instance, if resources are needed, there may be negotiating for funds and manipulation or coercion to obtain the most skilled workforce. Sroufe (2017) broadly analyzes different organization processes and structures in a multi-period setting including reputation and internal competition to sustain change. Van Looy & Shafagatova (2016) conducted a structured literature review on process performance measurement and made a list of process-related indicators that

managers could refer to regularly. All this research emphasized the organization's structure as a vital component.

Finally, Bai et al. (2017), in their study on OS and CFI, used the exact definition of OS as stated by Ghani et al. (2002) and continued to break down OS into two main areas: mechanical and organic. They defined mechanical OS (bureaucratic) as having a strict control level on specialized work with procedures, norms, and standards. Organic OS is defined as adaptive with no permanently fixed position or boundaries (Bai et al., 2017). Their finding concluded that mechanical organization has a significant negative correlation on performance, and organic organizations have a significant positive correlation on performance. This research will utilize OS in the study to support the fact that OS has a moderating effect on CFI and organizational performance.

2.6 Cross-functional teams

Cross-functionality at the team level may be subject to having a variety of integration mechanisms in place (Le Muenier-Fitzbugh & Massey, 2019; Rosado Feger, 2014). According to Lee (2020), when organizations promote collaborations across functional units, hidden costs are based on norms, cultures, and how they work in each department. So, integration depends on team boundary spanning activities and the high levels of team integration and relationships. Several authors have mentioned the importance of establishing effective cross-functional relationships to lead processes and manage boundaries between functional areas (Piercy & Lane, 2007; Le Meunier-Fitzhugh & Massey, 2019; Stahle, Ahola, & Martinsuo, 2019). In the work of Le Meunier-Fitzhugh & Massery (2019) and Stipp, Pimenta, & Jugend (2018), they stated that cross-functional teams need top management support, trust, and inter-functional meetings along

a clear communication line. They also need help with the attitudes and behaviors of team members to make the team work effectively.

The organization's size may be a factor as smaller organizations might achieve CFI more effectively than larger ones. They may have more flexible structures (Rowe, Amrani, Bidan, Marciniak, & Geffroy-Maronnat, 2005), and according to Lee (2020), CFI may also depend on the section or organizational characteristics. Regulatory processes may need to adopt additional cross-functional roles (Lohmann & Zur Muehlen, 2019). If units are geographically separated, this can be negative for CFI efforts because of a broader barrier to communication and distance. Cross-functional interaction and team collaboration are vital in companies closely connected with a greater sense of unity (Coradi, Heizen, & Boutellier, 2015; Engelen et al., 2012).

Conclusion

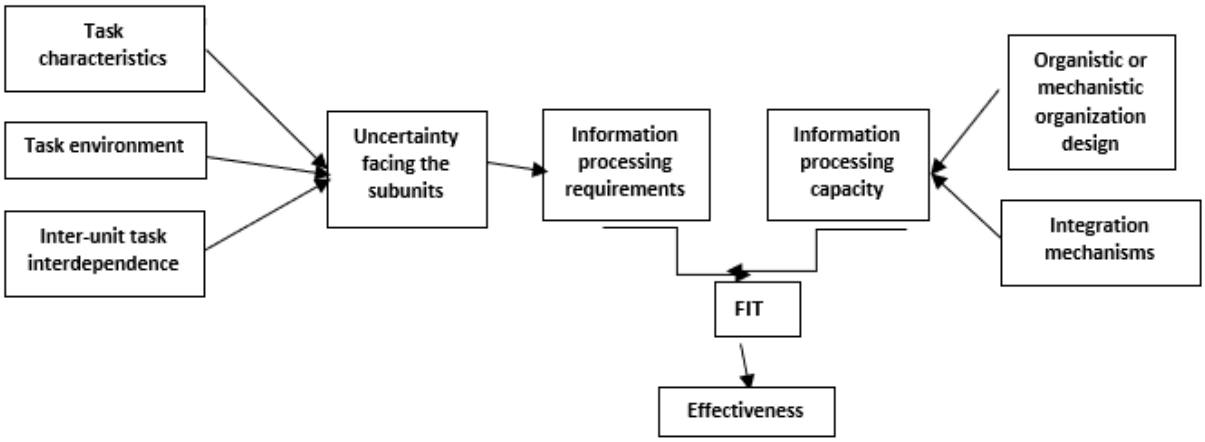
CFI problems in organizations are a fact in today's workplace. People and resources must coordinate and collaborate to accomplish the organization's mission. An increasing reliance on communication and the OS and the prominence of multi-national companies have increased the need for managers, employees, and departments to work together in a cross-functional manner to deal with the challenges they face daily (Turkulainen, & Ketokivi, 2012; Hietajärvi, et al., 2017). The literature reviewed suggested that CFI is essential, and collaboration, coordination, and communication are the most common processes. Also, OS will play a vital role in this relationship between CFI and performance.

III. THEORETICAL BACKGROUND

3.1 Information Processing Theory and CFI

For this research, we approached integration as an information processing phenomenon. This study's information processing approach is to look at how organizations process information and see the complexities that may affect an achieved CFI. Information processing theory is one tool used to measure the organizational work process. Multiple researchers have successfully applied this theory (Mani, Barua, & Whinston, 2010; Flynn & Flynn 1999; Graupner, Schewer, & Maedche 2015) as a foundation to conceptualize organizational process differences. For example, Mani et al. (2010) built upon the firm's information processing view that performance heterogeneity throughout business process exchanges is a function of how information capabilities are designed to fit the exchange's specific information requirements. They do this by comparing the performance effects of the fit between information requirements and capabilities. Results showed that relationships must be designed and managed for maximum performance gains by proper processing of information. Graupner et al. (2016) also build upon the information processing approach by applying a framework that determines the best-suited level of process visibility in the financial sector. A better understanding of how companies may determine how and where to establish process visibility was the result. This theory explains the reason various tasks require different management approaches. Figure 1 illustrates the components of this theory.

Tushman and Nadler Information Processing Framework



(Figure 1: Information processing framework from Tushman and Nadler 1978)

IPT views organizations as bodies that effectively collect, interpret, and coordinate information. Based on Tushman & Nadler (1978) framework, different organizations face different obligations for information processing dependent on the task, task environment, and inter-unit task interdependence. Addressing the integration performance relationship, effectiveness means a fit between information processing requirement and the capacity to process this information (Turkulainen, 2008). The ability to process information in a company depends on its overall OS. This framework includes the notion that integration mechanisms are not equally crucial for all organizations. They may differ in terms of requirements for information processing. Based on the framework,

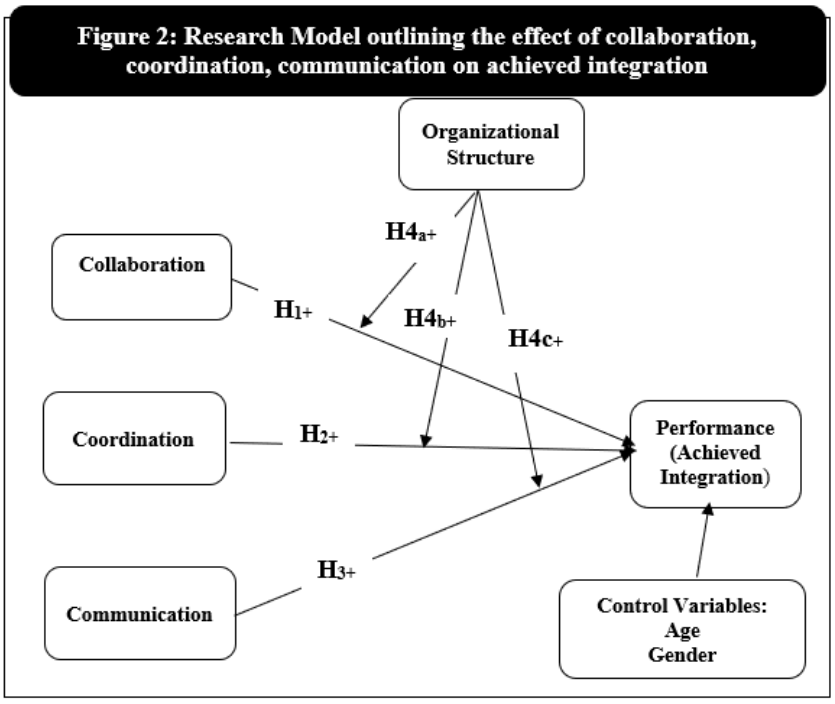
Drawing on this IPT approach, we develop a conceptual model for this study using Tushmann & Nadler's (1978) framework. The information processing theory provides a valuable lens to investigate the link between CFI and performance

(organizational achieved integration). The theory explains the reason various tasks require different management approaches. Organizations need internal information processing capabilities to understand information collected externally (Shoenherr & Swink 2012). Divisional OS can create uncertainties within while integrative OS (cross-functional teams) clarify interdependences and build information processing capabilities (Tushmann & Nadler, 1978). Figure 1 illustrates the components of this theory.

IV. RESEARCH MODEL AND HYPOTHESES

4.1 Research Model

Based on IPT, we proposed the research model. Cross-functional collaboration, coordination, and communication processes are complementary factors whose joint efforts contribute to CFI and performance success. Figure 2 shows the research model outlining CFI constructs and the impact on performance. With the OS as an essential function, the model also proposes that the OS serves as a crucial moderating construct in CFI paths to successful business performance. The model guides the hypotheses developed in the next section.



4.2 Hypotheses Development

Collaboration is about integrating goals. Cross-functional collaboration is the extent to which a firm work-processes or group of individuals involved in collaborative tasks are working together for a common goal (Gardner, 2005). It is the degree of cooperation, representation, and contribution of functional units (such as marketing, R & D, etc.) to achieving the team's or the organization's goal (Kahn, 1996; Li & Calantone, 1998). Cross-functional collaboration ensures that functional capabilities integrate well to provide product development (Griffin & Hauser 1996; Luo, Stotegraff & Pan 2006).

CFI literature indicates that cross-functional collaboration has two core elements: establishing common goals and working together to achieve them (Pellathy et al., 2019). Setting common goals required functional units to agree on a shared understanding of

group objectives and the role each function plays in achieving those objectives (Stank et al., 2001; Ellinger et al., 2006). The literature also implies an ongoing process of evaluating and adjusting common goals to ensure mutual alignment is maintained (Oliver & Watson, 2011).

In addition to establishing a common goal, collaborative activity involves working in unity to accomplish those goals (Hausman et al., 2002; Pagell 2004). Working together would require that the different functional units consider any unique constraints faced by other areas and share resources necessary to overcome those constraints (Barratt, 2004). To achieve collaboration, some level of cooperation is required. Researchers have used this term to characterize CFI (Song et al., 1997; Calantone, Droge, & Vickery, 2002; Wong & Boon, 2008). According to Pellathy et al. (2019), cooperation refers to prioritizing individual and group goals. Collaboration jointly establishes those goals and actively supports others in accomplishing them (Ellinger et al., 2006).

"IPT offers a theoretical base for cross-functional collaboration to predict organizational performance through increase resource dependency among functional units "(Swink & Shoenherr, 2015, p. 70). Therefore, there is a great need for improved information processing capabilities to coordinate knowledge. With this increase in knowledge sharing, inter-dependences and coordination among functional units also increase (Walker et al., 1995). The increased collaboration represents an "essential strategic contingency for creating coordinating mechanisms" (Galbraith 1973; Kumar & Seth 1998, p 581). According to Kahn & Mentzer (1998), collaborative activities reflect

different functional units' willingness to cooperate, but managers need mechanisms to take action (Kahn & Mentzer, 1998).

Prior research shows that the impact of collaboration on business performance is through a complex information processing process. Research has found that greater collaboration between functional units such as sales & marketing and manufacturing have significant benefits on performance, while the effect may vary based on the type of business or firm. (Frosh & Sullivan, 2009; Muenier-Fitzhugh & Piercy, 2007; Sanders & Premus, 2005; Hansen & Nohria, 2004). Fitzhugh & Piercy (2007) examined the importance of collaboration and found a direct and positive relationship between the functional units' collaboration and performance. They pointed out that effective collaboration reduces interdepartmental conflict and improves communication and learning environment, impacting organizational performance. Also, Frosh & Sullivan (2006, 2009) conducted two studies on whether collaboration directly impacts performance. They broke down the effectiveness of collaboration among functional units such as HR, R&D, Sales, Marketing, Investor Relations, and PR and how each area's effective collaborative activities impacted the company's performance. They found that collaboration impacted every aspect of business performance (Frosh & Sullivan, 2006; 2009). Similarly, Sanders & Premus (2005) studied cross-functional collaboration and firm performance and found that collaboration is positively associated with firm performance.

Collaboration is a process of inter-department decision-making. It involves shared decisions and collective responsibility for outcomes. For example, Stank, et al. (2001) looked at collaboration with supply chain and logistic units and found that internal

collaboration among units improves performance. Based on these studies, we argue that the more there is a collaboration of group goals and mutual alignment, the higher the degree to which CFI is achieved. Therefore, this research proposes the following hypotheses:

H_1: Cross-functional collaboration has a positive effect on performance

Organizational research views integration as coordinating functional units' activities (McCann & Galbraith 1981; Barki & Pinsonneault 2005). Coordination is having a mutual understanding of capabilities and aligning respective goals and activities (Bendoly et al., 2012). From this point of view, an organization becomes a system of interdependent functions. Each carries out a specific set of activities, such that the outputs from one functional process represent inputs for other operating activities (Thomas, 1967). Therefore, the main issue of CFI is managing interdependences across functional activities to enhance the overall flow of inputs and outputs of an entire process (Malone & Crowston, 1994). For this purpose, coordination mechanisms, such as rules, plans, schedules, and periodic reviews that regulate and synchronize functional operations, facilitate effective coordination (Thomas, 1967; Van de Ven, Delbecq, & Koenig, 1976; McCann & Galbraith, 1971).

The integration literature implies that coordination requires functional leaders to practice a process perspective focused on optimizing the entire flow of operational activities' instead of carrying out individual functional areas work (Stadtler 2005; Chen et al., 2007; Handfield, Cousins, Lawson, & Petersen, 2015). Therefore, managers need to rectify conflicts in decision-making so that there is maximum efficiency regarding

sequencing and timing of activities (Simatupand, Wright, & Sridharan, 2002; Lambert, Dastugue, & Croxton, 2005; Brettel et al., 2011).

Several researchers have studied the effects of cross-functional coordination on business or firm performance and have suggested that there is a positive impact of coordination on performance (Le Meunier-Fitzhugh & Massey, 2019; Nguyen, Ngo, Bucic & Phong, 2018; Handfield et al., 2015; Foerst, Hartmann, Wynstra, & Moser, 2013; Carr, Kaynak & Muthusamy, 2008). Carr et al. (2008) conducted a study with 231 firms on coordination capabilities between functional areas, including operations. They looked at numerous relationships among these units concerning cross-functional coordination and performance. Their research showed that firms could benefit from effective cross-functional coordination among operations, marketing, purchasing, and engineering. Another study conducted by Foerstl et al. (2013) looked at functional coordination and firm performance and found a positive effect of coordination on performance. Nguyen et al. (2018) experimented with 224 large firms in a transition economy to determine the relationship of various coordinating mechanisms, knowledge sharing, and firm performance. They concluded that cross-functional coordination, as well as knowledge sharing, helps a firm to improve its performance. Significant improvement in cross-functional coordination mechanisms among several functional units can help facilitate performance levels. Le Muenier-Fitzhugh et al. (2019) revealed that cross-functional coordination was different among functional units and shown to influence business performance positively. They further suggested that creating cross-functional teams can reduce conflict and increase coordination, ultimately improving business performance (Le Muenier-Fitzhugh et al., 2019).

Prior research further shows that cross-functional coordination in marketing, R&D, operations, and supply chain processes significantly increases the integration process's performance. Atuahene-Gima & Evangelista (2000) found that more effective CFI can speed up time and enhance the collaborating and coordinating degree of a product line, thus increasing product development team performance.

According to Lambert (2004), successful coordination of business processes across members determines an enterprise's overall performance success (Lambert, 2004). In other research, evidence showed that increased operational and organizational performance often occurs in firms where two or more procedures are well coordinated (Narasimhan & Kim, 2001; Pagell et al., 2000). Based on these studies, we argue that coordination has a positive effect on a firm's ability to successfully achieved integration performance. Therefore, this research proposes the following hypotheses:

H2: Cross-functional coordination has a positive effect on performance

Communication is about integrating knowledge across organizational units. This knowledge represents the most fundamental corporate resource. It allows organizations to overcome value creation operational problems. However, knowledge required to tackle specific issues is frequently lacking or spread across specified groups or individuals (Grant 1996). Thus, most organization's core tasks are to create, share, and combine knowledge so that relevant and timely information is exchanged effectively (Pellathy et al., 2019; Tushman & Nadler, 1978; Nonaka, 1994). From this view, integration effectively becomes a communication process that flows back and forth across functional areas (Pellathy, et al., 2019).

Research has stressed an understanding of CFI as a communication process focused on information exchange needed to support operations (Calantone et al., 2002; Sanders & Premus, 2002; Williams et al., 2013). Research in this area operationalized cross-functional communication as information exchange (Narasimhan & Kim 2002; Flynn et al. 2010; Brettel et al. 2011), information sharing (Song & Montoya-Weiss 2001), information processing (Schoenherr & Swink 2012), and interaction (Kahn & Mentzer 1996). This literature's central theme is the critical role that cross-functional communication plays in joint decision-making and action within the organization (Barratt & Barratt 2011).

Cross-functional communication of functional areas involves sending and interpreting information through formal and informal channels (Andrea, Arnaldo, & Romano, 2011). It requires sharing information kept in one functional area but applicable to operations in other functions (Mollenkopf, Gibson, & Ozanne, 2000; Sherman, Berkowitz, & Souder, 2005). Communication, therefore, implies that departmental units have a clear understanding of different functional areas' information needs (Calantone et al., 2002). Communication also requires that the receiver understands the information they are receiving (Dougherty, 1992). Functions are required to work together to ensure that the information is communicated, understood, and support a collective response to the business environment (Fugate, Stank, & Mentzer, 2009; Ellegaard & Koch, 2012).

The effect of communication on performance aligns with the success of cross-functional teams working together. Cross-functional teams usually come from different departments and units within an organization and may even be geographically dispersed.

Each person has their respective ideas and communication style that sometimes differs. To achieve a high level of performance, they must find ways to communicate frequently. Patrashkova-Volzdoska, McComb, Green, & Compton, (2003) explored the relationship between cross-functional teams and performance. They conducted an exploratory study with 60 cross-functional project teams and concluded that high team communication levels could improve performance, and low levels of team communication can impede performance. The study of Barczak, Siltan & Hulink (2007) finds that low frequency of communication among R & D, marketing, and manufacturing departments has a high association with product development failure.

In contrast, close communication and information sharing among team members contributed to the success of product development. Mohammed, Stankosky & Murray (2004) proposed a systematic approach, which is, applying the principles of knowledge sharing and cross-functional team in ways that will directly enhance knowledge flow and significantly improve organizational performance. Based on these discussions, this research proposes the following hypotheses:

H_3: Cross-functional communication has a positive effect on performance

4.3 Moderating Effect of Organizational Structure

OS refers to the formal arrangement of work roles in a company that involves managing and integrating inter-organizational activities. It is a means to achieve business goals (Bai, Feng, & Feng, 2017). Theorists have defined OS in several ways. Donaldson (1996) described OS as "the recurrent set of relationships between organizations members" (Donaldson, 1996, p. 57). It involves attitudes and communication among its

members that can be formal or informal relationships (Clegg & Hardy, 1996). Miner (2002) defined OS as capturing centralization of authority, complexity, formalization, and integration (Miner, 2002). Griffin & Moorhead (2011) claimed that OS represents the company's reporting of tasks and other relationships within the organization. According to Ambrose & Schminke (2003), the most noticeable description of OS differences is based not only on formal and informal but also on mechanic and organic structures. Mechanic OS is rigid and tight. Power is centralized, and there is a hierarchical communication channel with formal rules and regulations. On the other hand, organic OS is more informal, flexible, loose, decentralized, and communication is more open and adaptable to help employees accomplish their goals (Ambrose & Schminke, 2003; Lawrence & Lorsch, 1967). From this point forward, OS refers to Mechanical OS.

Mechanical OS is of interest for this research because of the complexity of its structure that is still being used in many organizations today. These organizations also look for ways to improve their CFI within their current structure while adhering to hierarchical communication, regulations, and control. Some researchers have argued that mechanical OS is tight and rigid (Abdullah & Siam, 2014; Ambrose & Schminke, 2003), still others have said that it is necessary to facilitate cross-functionality in a stable environment because decision-making has a system formally in place that is efficient in increasing benefits and reducing costs (Bai et. al. 2017). Cummings & Worley (2019) stated that leaders can maximize their organization's potential long-term by ensuring they have a good understanding of the concepts of this kind of structure. This will further help managers to implement a better CFI system (Cummings & Worley, 2019).

Collaboration and OS: Collaboration establishes group goals, proactively supports authors in achieving goals, and maintains mutual alignment. Because OS is categorized in several ways to include formal and informal, mechanic, and organic, these descriptions' characteristics can affect collaboration relationship on performance. For example, Abdullah & Siam (2014) confirmed that OS could inhibit or promote performance depending on the relationships and workflows that influence productivity. They continued to say that these OS and reporting hierarchy affects performance management in goal-setting activities (Abdullah & Siam, 2014).

Coordination and OS: Coordination focus is on managing interdependencies and unified process control, jointly managing the flow of operational activities. Building a good OS is essential for employees to effectively manage these interdependencies and maintain a suitable control process to increase their performance levels. According to Bernd (2007), OS's structural dimension is a tool for integrating and coordinating. Managers should focus on addressing key elements when designing OS for effectively managing the flow of operational activities and performance (Daft, 2010; Bernd, 2007). Additionally, Carter & Pucker (2010) suggested a relationship between coordination, good OS, and organizational performance.

Communication and OS: Communication seeks to maintain the reciprocal flow of information, ensuring clarity of intent when sharing relevant information to support collective decision-making. According to Islam, Ahmed, Hasan & Ahmed (2011), OS consists of centralization, complexity, and formality, which involves rules, procedures, and instructions in writing. They stated that less formal OS usually leads to better or more excellent communication among the organization members. A more flexible OS helps

lower the barriers during communication flow (Islam et al., 2011; Willem, Buelens, & Jonghe, 2007).

Because the OS serves as a framework and offers a boundary for managers in decision-making, Abumandila & Hassana (2016) argued that it impacts whether information received by managers is of excellent quality. For example, in a mechanical organization, individuals may not receive information on time because it must flow through a proper channel. The information's accuracy could also be affected and may get filtered down as it reaches its destination. Due to the nature of integration and collaboration processes in CFI, quality information, knowledge sharing, and coordination are vital. Access to such information is likely to be compromised. Formal or more structured mechanical organizations knowledge sharing may be limited (Abumandila & Hassana, 2016; Gonzalez-Cruz, Huguet-Roig, & Cruz-Ros, 2010).

Other research has indicated that OS interacts with various factors that influence organizational performance. Some of these factors include organizational size (Pugh, Hickson, Hinings & Turner, 1969), environmental change (Lawrence & Lorsch, 1967), organizational strategy (Chander, 1962), supply chain technology (Bai et al., 2017). Research has proved that OS affects organizational performance (Covin & Slevin, 1989; Jennings & Seaman, 1990; Ambrose & Schminke, 2003; Bai et al., (2017). Also, no organization is perfectly organic or mechanic, and some display both. Thus, the OS provides a clear choice to consider in exploring moderating effect. Based on the above, this research proposes that it will affect the relationship when the OS is included in the relationship between CFI and performance. This nature of this effect can either

strengthen, weaken, or change the direction of the relationship. Based on these discussions, the study proposed the following hypotheses:

H_{4a}: OS has a positive moderating role on the relationship between cross-functional collaboration and performance.

H_{4b}: OS has a positive moderating role on the relationship between cross-functional coordination and performance.

H_{4c}: OS has a positive moderating role on the relationship between cross-functional communication and performance

5. METHODOLOGY

5.1 Research Design

This study follows a quantitative cross-sectional survey approach to test the research model. This survey method was suitable to "capture the experiences and determine the meaning the participants hold about the problem" (Creswell, 2014 p. 186). Using surveys as a data collection method was more appropriate for this study as it enables a broader set of data collection from the individual unit of analysis. Since the technique helps explain individuals' attitudes about CFI, it is instrumental in describing a large population's characteristics. Our survey questions are closed-ended, where individuals select from a list of choices. It is also a popular research method because of the uniformity of responses and can be more easily processed (Babble, 2015).

5.2 Variable Measurement

In order to maintain measurement validity and reliability, survey instruments were adopted from existing validated scales from literature with minimal modification for this

research study. Collaboration, coordination, and communication are three important reflective constructs for CFI. CFI was measured using scales items taken from Pellathy et al. (2019) and MaKenzie et al. (2011). According to the study from Pellathy et al. (2019), all CFI constructs were reflective and determined based on theoretical considerations (Pellathy et al., 2019; Jarvis et al., 2003).

Collaboration was measured with 7 items of the CFI scale adopted from Pellathy et al. (2019) and MaKenzie et al. (2011). The scale of collaboration includes: ***In my organization, different areas of the functional units work across functional boundaries to***… (A1) jointly establish the overarching goals that direct our individual functional activities (A4) Ensure an open and transparent process for establishing common goals (A5) Establish a regular process for reviewing joint functional units' goals (A6) Support other functions in achieving common goals. Out of the 7 items, A2, A3, and A7 were dropped due to lower factor loadings. The items dropped were:

- (A2) Make sure there is sure there is joint agreement on functional unit goals
- (A3) Engage constructively in debates about goals of the functional units
- (A7) Adjust goals and objectives to reflect constraints faced by different functions

Coordination was measured with 6 items from the CFI adopted from Pellathy et al. (2019) and MaKenzie et al. (2011). The scale of coordination includes: ***In my organization, different areas of the functional units work across functional boundaries to***… (B1) actively manage leads times across functions, (B2) ensure that functional activities are synchronized across the different areas, (B3) jointly manage interdependences across functional areas, (B6) make sure functional areas see themselves

as part of a larger overall process. Out of the 6 items, B4 and B5 were dropped due to lower factor loadings. The items dropped were:

- (B4) Make sure everyone is focused on process optimization rather than achieving separate functional goals
- (B5) Make sure functional decisions do not conflict with each other

Communication was measured with 6 items from the CFI scale adopted from Pellathy et al. (2019) and MaKenzie et al. (2011). The scale of communication includes**:** ***In my organization, different areas of the functional units work across functional boundaries to***… (C1) make sure relevant information gets to the right people in different functional area, (C3) make sure everyone understands what information needs to be communicated out to the different functional areas, (C5) make sure everyone understands how information is used in different functional areas, (C6) make sure those on the receiving end understands why they are getting the information they are receiving. Out of the 6 items, C2 and C4 were dropped due to lower factor loadings. The items dropped were:

- (C2) Keep key players in different functions informed about what is going on
- (C4) Make sure the information that is being communicated is useful to those on the receiving end.

The dependent variable performance was measured using 6 items adopted from Kahn & Mentzer (1998) and Turkulainen & Ketokivi (2011 "achieved integration" scale to measure CFI performance. The performance scale includes ***evaluate your organization based on the following….*** (D1) the functions in our organization are well integrated, (D3) functional coordination works well in our organization, (D5) our

organization functions coordinate their activities, (D6) our organization functions work interactively with each other. Out of the 6 items, D2 and D4 were dropped due to lower factor loadings. The items dropped were:

- (D2) Problems between functions are solved easily in the organization
- (D4) The functional units in our organization work well together

The moderating variable OS was measured using 5 items from the study of Bai et al. (2017) adopted from Miller & Drogel (1996). OS scale includes ***evaluate your organization based on the following***….. (E1) the views of staff can be quickly transferred to business leaders (E2) market information of product/services can be quickly feedback to the organization decision-making (E3) our organization is able to break departmental boundaries to collaborate and respond to changes quickly (E4) our organization can rapidly respond to market integration of resources required (E5) our organization promotes team collaboration in order to enhance the ability to cope with change. The instruments were operationalized using reflective constructs. Adjustments were made to eliminate weaker loading variables using acceptable measures. All the construct items were measured by a 5-point Likert from "1-strongly disagree" to "5-strongly agree." Appendix A lists all construct items**.**

The survey also includes demographic and other questions about the participants, including (a) age, (b) gender, (c) educational level, (d) industry employed in (e) length of employment (f) CFI functional area involved in (g) company size (h) occupation, and time spent on CFI activities. Table 1 shows more detailed information about the sample demographics.

5.3 Sampling Design, Participants, and Procedures

Pilot Study: An initial pilot study was conducted with a small group of executives and managers recruited from multiple functional units within their organizations and spread across a few states within the United States. Online survey that allows for quick responses were used. Twenty-one were recruited from the FIU DBA cohort, and five recruited from business colleagues, resulted in a total of 26 fully completed survey responses. Among the 26 responses, 24 of them live and work in South Florida, and 2 live and work in other states.

One of the advantages of conducting a pilot-study, also known as a feasibility study, was to do pre-testing of the research instrument (Baker, 1994). The informed pilot helped to gather data and guidance to complete the primary data collection. It provides advance indications of whether the proposed instruments are too complicated, inappropriate, and not worth the risk (De Vaus, 1993). Questions were adjusted, and the necessary changes were made based on results and comments from the pilot study. According to Van Teijlinger & Hundlet (2001, p. 4), "well-designed and well-conducted pilot studies can give insight about the best research process and sometimes the likely outcome." The survey hosed by Qualtrics was then refined based on the pilot results for the primary data collection described in the next section.

Main Study: The primary data collection utilizes participants from Amazon MTurk to reach a wide range of participants and industries. The study targets those who have an understanding and experience of CFI. In prior studies, Amazon MTurk has been used to gather valid data on the cross-functional phenomenon (Pellathy et al., 2019).

The survey reached 400 participants who consent to participate. To ensure data quality, we set up qualifying criteria to reduce dropout rates and any attempt to rush through the survey without paying attention. Eligible participants were required to be over 18, located within the United States, work in a company with multiple functional units, and daily duties must involve working with groups or part of a team. Of this total, 375 participants met the qualifying criteria and continued to complete the survey.

Due to the nature of the survey and the data collection method, I randomly inserted three attention-trap questions into the survey body. Of the 375 qualified responses, the first trap question eliminated 15 participants. The second trap question eliminated 22 participants. Thirteen (13) respondents were removed due to the fast completion rate of a minute or less. The average time taken to complete both the pilot and primary survey was approximately 8 minutes. The final number of valid and completed responses was 325, yielding a response rate of 81%.

As shown in Table 1, which illustrates the sample demographics information, the primary survey included a final sample of 325 participants with a gender breakdown of 215 (66%) male and 110 (34%) females. The average age is 44 years old. Overall, the sample represented many different industries. The largest category represented were from the information technology (IT) industry (28%) followed by manufacturing & construction (21.2%), banking & finance represented (10.5%), healthcare represented (10.2%), hospitality and tourism (8.3%), and food & Beverage (7.1%). The remaining 9.5% made up of other industries such as government and non-profit organizations.

Almost half the population (49.5%) or 161 persons indicated that they have been with their current organizations between 3 to 5 years. 83 persons (25.5%) have worked

with their company for 1 to 2 years, 53 persons (16.3%) have worked with their company for 6 to 10 years, 21 persons (65%) have worked with their company for over 10 years, and 7 persons (2.2%) have worked with their company for less than 1 year.

Responses were obtained from individual holding a range of positions including operational executives (Director, Senior Manager, Executive - 17.8%), managers (operational managers, supervisors - 68%), support staff (line staff, clerical, auxiliary - 12%), and other positions (2.2%). This distribution indicates that many respondents (85.8%) held a position of supervisor or higher, suggesting that they possess the relevant knowledge regarding the survey content.

The sample also shows that participants were from a diverse CFI (CFI) background including Information Technology (24.6%), Marketing (17.5%), Manufacturing (16.6%), Customer Service (8.9%), Admin (8.6%), Human Resources (7.7%), R & D (7.4%), and Logistics & Transportation (6.2%). The average company size for participants was 500 employees and the average time spent on CFI duties was 59% of work hours. Table 1 shows the details of the sample demographics**.**

Table 1: Sample Demographics (n=325)					
Age	**n**	%	Company Size	**n**	%
18-24	13	4%	1-100	76	23.4%
25-34	151	46.5%	101-499	123	37.8%
35-44	92	28.3%	500-999	72	22.2%
45-54	48	14.8%	1000-4999	34	10.5%
55-64	17	5.2%	5000 and above	20	6.2%
Over 65	4	1.2%			
Industry:	**n**	%	**Scope of Duties**	**n**	%
Healthcare	33	10.2%	Director, Snr. Manager,	58	17.8%
Hospitality/tourism	27	8.3%	Exec	221	68%
Food & Beverage	23	7.1%	Manager, Asst, supervisor	39	12%
Education	28	8.6%	Line staff, clerical, auxiliary	7	2.2%
Manufacturing/Construction	69	21.2%	Other responsibility		
Information Technology	91	28%			
Banking/finance/Insurance	34	10.5%			
Government/Non-profit	8	2.5			
Other	12	7			
Length of employment	**n**	%	**Time spent on CFI**	**n**	%
Less than I year	7	2.2%	0-19%	18	5.5%
1 to 2 years	83	25.5%	20-39%	113	34.8%
3 to 5 years	161	49.5%	40-59%	141	43.4%
6 to 10 years	53	16.3%	60-79%	45	13.8%
10 years or more	21	6.5%	80-100%	8	2.8%
CFI functional area	**n**	%	**Gender**	**n**	**%**
Research & Development	24	7.4%	Male	215	66
Manufacturing/Operations	54	16.6%	Female	110	34
Logistics & Transportation	20	6.2%			
Human Resources	25	7.7%			
Customer Service	29	8.9%			
Marketing	57	17.5%			
Admin (finance, acct, legal)	28	8.6%			
Information Technology	80	24.6%			
Other	8	2.5%			

VI. DATA ANALYSIS AND RESULTS

6.1 Data Analysis

Data analysis was conducted using SPSS 26 for statistical analysis and Smart PLS 3.0 for partial least square structural equation modeling (PLS-SEM). PLS-SEM is a component-based structural equation modeling approach. This was to analyze the validity and reliability of the measurement model and test the respective hypotheses, including the moderating interaction of OS. Using Smart PLS was a more suitable approach to handling interaction relationships (Becker, Ringle & Sarstedt, 2018; Chin, Marcolin & Newsted, 2003).

6.2 Descriptive Statistics

Descriptive statistics for all variables were generated in SPSS and shown in Table 4, including mean, standard deviation (SD), skewness, and kurtosis. Descriptive statistics for collaboration revealed an overall mean score of 4.09 - SD of 0.694. The skewness of -1.01 and kurtosis of 3.103. This showed a positive perception of collaboration amongst the participants. Descriptive statistics for coordination revealed an overall mean score of 4.06 - SD of 0.668. The skewness of -0.863 and kurtosis of 2.561. This also showed a positive perception amongst the participants. Descriptive statistics for communication revealed an overall mean score of 4.10 – SD of 0.667. The skewness of -0.856 and kurtosis of 1.696. This shows a positive perception amongst the participants. Descriptive statistics for performance revealed an overall mean score of 4.00 – SD of 0.649. Skewness 0f -1.048 and kurtosis of 2.471. This shows a positive perception amongst the participants. Finally, descriptive statistics for OS revealed an overall mean score of 3.026

- SD of 1.098. The skewness of 0.002 and kurtosis of -1.197. This shows a positive perception amongst the participants.

Skewness and Kurtosis: Skewness suggests the amount and direction of the skew, and Kurtosis indicates how tall and sharp the central peak is. Both are necessary for testing for normality. Bulmer (1979) suggests the rule of thumb that if skewness is < -3 or > 3, the distribution is highly skewed. Based on the descriptive statistics, collaboration, coordination, communication, and performance were all skewed to the left, and OS skewed to the right. However, the skewness values were much less than 3, indicating the skewness was not a concern. In terms of kurtosis, collaboration, coordination, communication, and performance all had positive kurtosis, and OS has a negative kurtosis. However, the kurtosis values were 3 or less, indicating that the kurtosis was not a concern. Table 2 illustrates the components of the descriptive statistics with skewness and kurtosis.

Table 2: Descriptive Statistics of all variables (N=325)

		Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
AGE		1	8	2.76	1.09	1.461	3.842
GNDR		1	2	1.34	0.474	0.686	-1.539
COLLLAB		1	5	4.0892	0.69481	-1.01	3.103
COOR		1	5	4.0646	0.66815	-0.863	2.561
COMM		1	5	4.1015	0.66701	-0.856	1.696
PERF		1	5	4.0077	0.64962	-1.048	2.471
OS		1	5	3.0262	1.09858	0.002	-1.197

Normality was also evaluated using Q-Q scatterplot (Bates, Machler, Bolker, & Walker, 2014; Field, 2013; DeCarlo, 1997). The Q-Q scatterplot compares the distribution of the residuals with a normal distribution (follows a bell curve). In the Q-Q

scatterplot, the solid line represents the theoretical quantile of a normal distribution. Normality is assumed if the points form a straight line. The Q-Q scatterplot for normality is presented in Appendix H1 and H2

6.3 Measurement Model

The measurement quality of all scales is evaluated for reliability, discriminant validity, and convergent validity. We assessed the multi-item scales' reliability and validity using approaches recommended by Anderson & Gerbing (1988). The measurement model was tested with a CFA using Smart PLS 3.0. "Convergent validity is supported when the factor loadings prove that the measurement items significantly load to their respective latent variables" (Anderson, 1987; Chen et al., 2017, p. 12). Gefen & Straub (2005) also pointed out that items must have loadings of 0.6 or higher for convergent validity to be established. Most items loaded favorable to their respective constructs, and the loadings were significant and greater than 0.6. Items with loadings below 0.6 were subsequently dropped for better significant loadings. The remaining items are listed in Table 3, which shows the loading of all variables, and subsequently used to perform the final data analysis.

"Discriminant validity of the measures is established by the average variance extracted (AVE) square root of the construct being greater than the correspondent correlations" (Swink & Schoenherr (2015, p75) and that the items correctly load to the corresponding latent construct. All the items loaded favorably to their respective latent constructs. The correlation shows that the inter-construct correlation among the latent variables is below the AVE's square root. Satisfactory Cronbach's alpha and CR maintained reliability. All CR values were 0.8 or higher, which is above the

recommended 0.7 thresholds and the AVEs were all above 0.5, also within the recommended threshold (Bagozzi et al., 1988; (Swink & Schoenherr, 2015). Table 3 – loadings of variables and Table 4 – discriminant validity, show the details.

Table 3: Loadings of all variables

Measurement instruments Loadings, Composite Reliability (CR), Average Variance extracted (AVE)						
	Items	1	2	3	4	5
1. Collab	Collab_1	**0.769**				
CR = 0.87	Collab_4	**0.815**				
AVE = 0.63	Collab_5	**0.820**				
	Collab_6	**0.768**				
2. Comm	Comm_1		**0.767**			
CR = 0.85	Comm_3		**0.806**			
AVE = 0.60	Comm_5		**0.770**			
	Comm_6		**0.718**			
3. Coord	Coord_1			**0.772**		
CR = 0.86	Coord_2			**0.746**		
AVE = 0.60	Coord_3			**0.791**		
	Coord_6			**0.796**		
4. OS	OS_1				**0.869**	
CR = 0.93	OS_2				**0.857**	
AVE = 0.73	OS_3				**0.816**	
	OS_4				**0.885**	
	OS_5				**0.847**	
5. Perf	Perf_1					**0.803**
CR = 0.84	Perf_3					**0.756**
AVE = 0.60	Perf_5					**0.743**
	Perf_6					**0.711**

Table 4: Discriminant Validity of measurement model						
Measurement model discriminant validity						
		COLLAB	COMM	COORD	OS	Perf
1	COLLAB	**0.793**				
2	COMM	0.678	**0.766**			
3	COORD	0.775	0.710	**0.777**		
4	OS	0.266	0.269	0.225	**0.855**	
5	Perf	0.709	0.754	0.749	0.236	**0.754**

6.3 Structural Model and Hypotheses Tests

Given the measurement model's valid assessment, the next step involves the structural model analysis to test the hypothesized relationships. The structural model resembles a path analysis and specifies regression models for the factors derived in the measurement model (causal relationships among the latent variables (Agresti, 2018). Smart PLS 3.0 was used for the structural equation modeling analysis (SEM). Each hypothesis was assessed by reviewing the direction, significance, and magnitude of each sigma coefficient. A 5000-sample bootstrapping was done, and the t-statistics generated were used to determine the significance level.

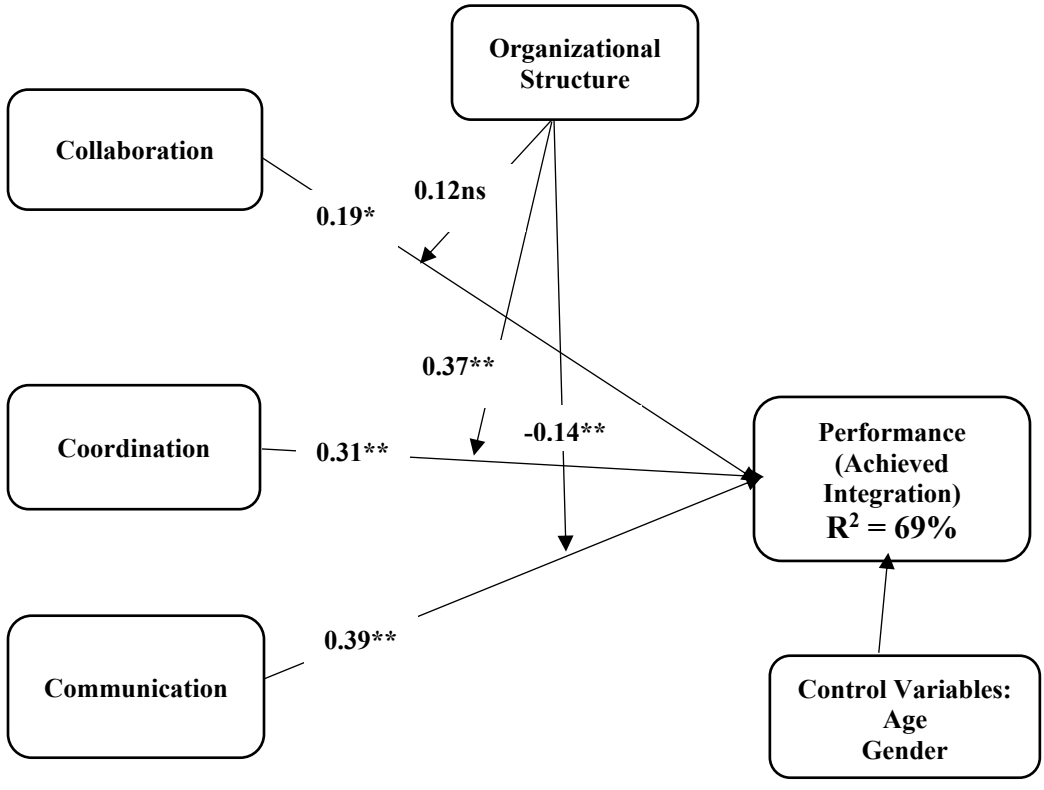
The hypotheses testing results, including the significance levels in the model, are shown in Table 5 summary of results, and illustrated in Figure 3 model with path coefficient. The R^2 value is also provided. Overall, the model explains 69% of the variation in performance. Appendix B shows the variance explained.

Table 5
Summary of results

Hypotheses	Predictors	β	t-value	p-value	Result
H1	Collab -> Perf	0.140	2.505	0.012*	Supported
H2	Coord -> Perf	0.358	5.056	0.000**	Supported
H3	Comm -> Perf	0.411	6.952	0.000**	Supported
H4a	OS*COLLAB -> Perf	0.040	0.594	0.553ns	Not Supported
H4b	OS*COORD -> Perf	0.177	2.601	0.009**	Supported
H4c	OS*COMM -> Perf	-0.169	2.651	0.008**	Supported

***p < 0.05, **p < 0.01, ns, not significant**

Figure 3: Model with path coefficient



Results of testing hypotheses. *p < 0.05, **p < 0.01, ns, not significant

Hypothesis tests

Independent Variables: $\mathbf{H}_1$ examination of the direct relationship between cross-functional collaboration and performance was supported ($\beta = 0.140$, $t = 2.505$; $p < 0.05$). $\mathbf{H}_2$ examination of the direct relationship between cross-functional coordination was supported ($\beta = 0.358$, $t = 5.056$, and $p < 0.01$). $\mathbf{H}_3$ examination of the relationship between cross-functional communication and performance was supported ($\beta = 0.411$, $t = 6.952$, and $p < 0.01$). Table 5 illustrates the summary of these results.

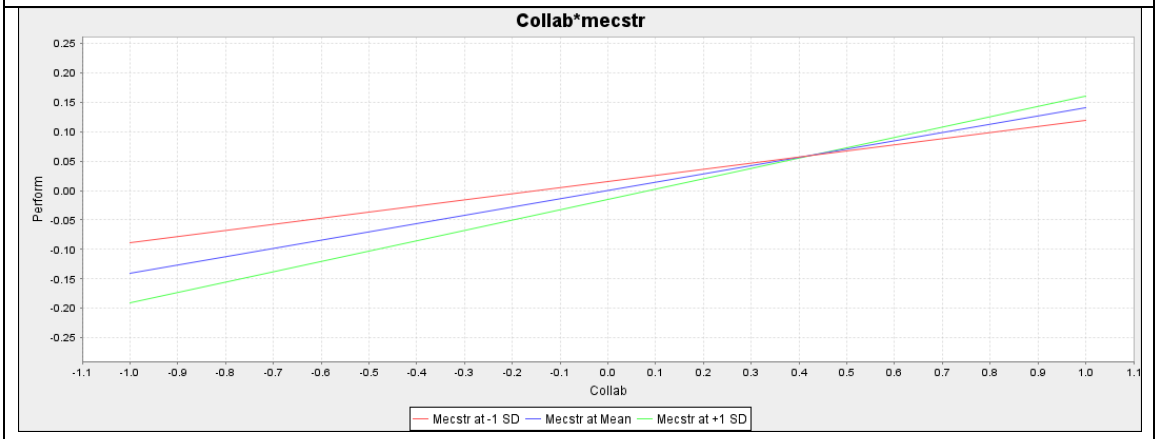
Moderating Variable: Finally, we tested the moderation of mechanical OS on the relationship between CFI and performance. The results revealed that the moderation of OS was significant with coordination and communication. In detail, $\mathbf{H}_{4b}$ was supported with a p-value less than 0.01 ($\beta = 0.177$, $t = 2.601$, $p = 0.009$). $\mathbf{H}_{4c}$ was also supported with a p-value less than 0.01 ($\beta = -0.169$, $t = 2.651$, $p = 0.008$). However, the moderation was not significant with collaboration. Thus, $\mathbf{H}_{4a}$ was not supported, with a p-value that was greater than 0.05. ($\beta = 0.040$, $t = 0.594$, $p = 0.553$). Figure 4, diagrams A, B, and C show the interaction effects. The green line represents a high OS above the mean (+1 SD above the mean) from the diagrams. The blue line represents a low OS below the mean (-1 SD below the mean). The red line represents the mean of OS.

All three interactions are dis-ordinal, which means that the interaction effect occurs within the border at the cross-over point, as shown in interaction diagrams A, B, and C in Figure 4. In diagram A, the slope inverts positively, and the performance increase is more sensitive to the high and low mechanical OS, but the difference is too small to be significant ($\beta = 0.040$, $t = 0.594$, $p = 0.553$). Thus, mechanical structure OS did not change the relationship between collaboration and performance. In diagram B,

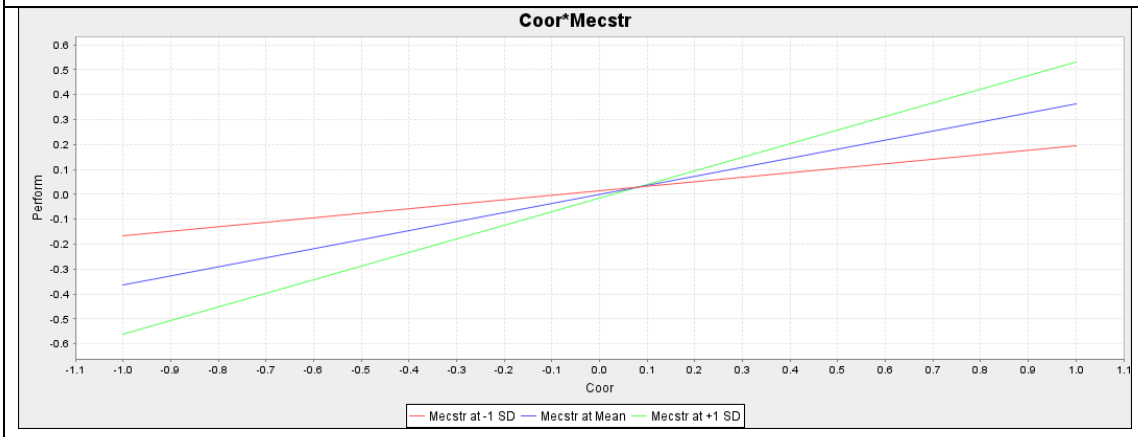
the interaction is positive. Performance change is more sensitive to high than the low mechanical OS, and the difference is significant ($\beta = 0.177$, $t = 2.601$, $p = 0.009$). Thus, mechanical OS enhances the relationship between coordination and performance. In diagram C, the interaction inverts negatively, and the slope is reversed, showing that the increase in performance is much more sensitive to low than the high mechanical OS. The effect was significant ($\beta = -0.169$, $t = 2.651$, $p = 0.008$). Thus, mechanical OS lowers the effect of communication on performance.

Figure 4: Interaction Relationship of OS

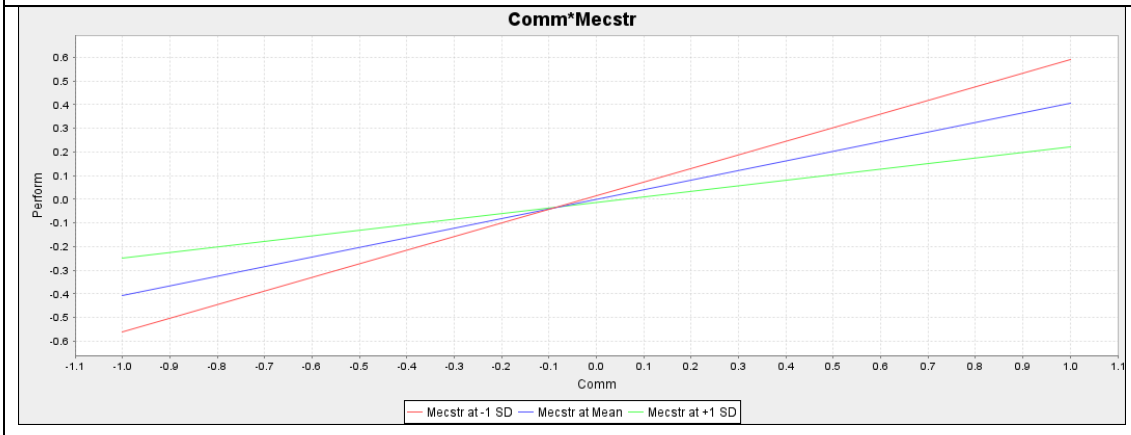
A. Collaboration interaction * Mechanical OS



B. Coordination interaction * Mechanical OS



C. Communication interaction * Mechanical OS



Overall, the results of this study suggest three conclusions. First, cross-functional collaboration influences achieved integration performance, and the OS does not impact the effect. Second, cross-functional coordination positively influences achieved integration performance. When the strong mechanical OS is included, this relationship is enhanced. Third, cross-functional communication positively influenced achieved integration performance. Once the strong mechanical OS is included, this relationship is weakened.

VII. DISCUSSION

7.1 Results Discussion

The purpose of this research was to explore the effects of CFI on organizational performance. Drawing upon the theoretical framework of IPT (Tushman & Nadler, 1978), this study develops a model in which three primary constructs represent CFI, including collaboration, cooperation, and communication, and their effect on performance. (i.e., achieved integration) are examined.

We tested the model using online surveys that collected data from 325 participants employed in cross-functional units in their organizations. SEM was used to analyze data. The model is primarily supported. The insights from the model estimation and its findings are discussed below:

Collaboration has a positive impact on performance

The first hypothesis (H_1), hypothesizing that collaboration has a positive effect on performance was supported. High cross-functional collaboration leads to high achieved integration, thereby improving performance. The findings confirm that cross-functional

collaboration is a necessary component of OS and becomes vital for a firm to enhance performance. The results suggest that organizations may benefit from creating standards and promoting cross-functional lateral relations to facilitate cross-functional collaboration, guided by IPS. The results also suggest that for managers to solve problems, make decisions, and operate effectively, they would leverage collaborative knowledge across all its units in a seamless, integrative, and intuitive manner. The results further indicate that a collaborative team can work together productively to improve organization performance.

Moreover, the findings from this study support the literature that affirms that collaboration may enable adaptability via shared understanding of functions and vision, which can prepare cross-functional units to maintain high performance for circumstances as the changes are happening (Pellathy et al., 2019; Chen et al., 2017). The findings are also in line with literature that collaborative teams working together via integration mechanisms can enable a stimulating discussion of new information and utilize it effectively (Egelen et al., 2012). Based on literature (e.g. Sanders & Premus 2005), to promote cross-functional collaboration and firm performance, managers should prepare their teams and organizations to adapt to change quickly via collaborative and knowledge sharing. To facilitate this, organizations can create a collaborative friendly culture that includes teams and units in every aspect of decision-making regarding goal setting and outcome. If teams and units are knowledgeable about collaborative efforts, they tend to be comfortable to sharing ideas and work together to achieve the company's performance goals.

Coordination has a positive impact on performance

The second hypothesis (H_2), hypothesizing that coordination positively affects performance, was supported. High cross-functional coordination leads to high achieved integration, thereby improving performance. The finding is in line with what previous research have suggested about the relationship between coordination and performance. The finding also confirms that cross-functional coordination is essential in managing interdependencies across activities within the organization and functional units and that the focus should be on process performance (Zhao et al., 2011; Handfield et al., 2015).

The findings also suggest that cross-functional coordination entails ensuring that everyone is focused on process optimization instead of achieving individual functional goals. As the literature suggested (Stadler 2005; Chen et al., 2009; Handfield et al., 2015) and based on our findings, managers need to adopt a process perspective geared towards optimizing the overall activities and executing activities from individual functional areas to improve coordination and then performance.

Communication has a positive impact on performance

The third hypothesis (H_3), hypothesizing that communication has a positive effect on performance, was supported. High cross-functional communication leads to high achieved integration, thereby improving performance. The findings suggest that communication that emphasizes the exchange or reciprocal flow of information is needed for organizations to support functional unit strategies and operations. The results are also in line with previous researchers' assessment of the relationship between communication and performance (Shoenherr & Swink, 2012). Communication is a critical element for

teams because members differ in their thoughts (Dougherty, 1992), resulting in mutual understanding of other areas' functions and objectives.

Giving the importance of cross-functional communication in performance, we believe that it is essential for managers to build internal capacity to facilitate such communication. One critical capacity is to create channels and mechanism that facilitate acquiring, understanding, and transforming knowledge from other units (Akgun, Byrne, Keskin, Lynn & Imamogly, 2005).

Moderating effect of OS

The fourth hypothesis (H_{4a-c}), hypothesizing that mechanical OS has a moderating effect that strengthens the relationship between CFI and performance, was partially supported. First, although we found a positive moderating effect, the effect was too small to be significant. Thus, mechanical OS did not change the relationship between collaboration and performance. This finding is not in line with most literature. One possible explanation is that sometimes mechanical OS can create an atmosphere that is not effective in facilitating collaboration. Specifically, when organizations create a strong mechanical OS with many rules and regulations that collaborative teams must follow, units' collaboration may be restricted by rules and regulations. Some literature confirms this to be true. Wenxiao Bai et al. (2017) demonstrated that when building a collaborative team in a mechanical organization, managers have to take into consideration of some formal roles and responsibilities and a strict unified command chain that deter collaboration. Another possible explanation is that when CFI collaborative teams have own distinct roles and functional focus under a mechanical OS department, support and desire for collaboration tends to be lacking. The significant

finding also implies that the components to make collaboration successful, such as aligning group goals and working collaboratively to achieve those goals, are not affected by the OS. Therefore, managers should ensure that they put the necessary strategies in place to create an organizational structure that facilitates collaboration among their teams during their decision-making.

Second, mechanical OS enhances the relationship between coordination and performance. The finding confirms that coordination combined with a formal OS is essential in achieving integration and performance. The finding further suggests that coordination must be a seamless flow of operation that is fully synchronized, and mechanical OS needs to be designed in a way that facilitates this process through stick rules and policies. The finding is also in line with past research, affirming that to ensure the effect of a mechanical OS, managers need to build mechanical OS that helps fully optimize the complete flow of processes and facilitate resolving any conflicts that impact streamline processes and coordination (Stadtler, 2005; Chen et al., 2009; & Handfield et al., 2002).

Third, we found that mechanical OS weakens the relationship between communication and performance. While this is surprising, the finding reveals that mechanical OS could negatively affect mobility and adaptability of organization members and thus create an adverse effect on communication and performance. Some Literature might help explain such findings. Wenxia Bai et al. (2017) confirmed that mechanical OS could cause information sharing among members to be distorted and slowed down due to solid hierarchy channels and strict chain of command. Their

findings also suggest that managers should make sure their communication lines are conducive to facilitating communication in mechanical OS.

While we have the mixed findings concerning the moderation effect of mechanical OS, our findings revealed that mechanical OS does not always play a stimulus for the relationship between performance and CFI factors (i.e., collaboration, coordination, and communication). So, managers should consider this when they design this kind of OS. Organizations should look at their reporting systems in mechanical OS and make the necessary adjustments to their strategies to ensure the mechanical OS does not become a constraint for CFI. Following the literature suggestion, organizations should include design features in the mechanical OS, such as, reporting structures, incentives, metrics, and information systems that establish formal cross-functional linkages to support CFI (Ford & Ralford, 1992; Ahmad & Schroe, 2003; Neely et al., 2005; Spider et al., 2008).

This research examines CFI among several departments, units, and functions. CFI is not a new topic but still a challenging task for managers as they must quickly adapt to the changes in technology, organizations, and workforces. Among the three CFI, neither collaboration, communication, and coordination showed more performance improvement than the other. This indicates that they are equally important, must be present, and work together to improve performance via a successful integration process.

7.2 Contributions

This study advances the theoretical understanding of CFI and provides insights for organizations dealing with complex operations involving multiple functional units. It makes several significant theoretical and practical contributions that are elaborated below.

7.2.1 Theoretical contributions

From a theoretical perspective, this study provides several contributions. First, consistent with theoretical discussion, this research tapped into a developed construct that suggests modeling collaboration, coordination, and communication as first-order, separate factors to examine their impacts on performance. The research was extended to focus on the multiple areas of CFI and aid in further theoretical understanding of CFI.

Second, direct positive relationships were confirmed between the three distinct, independent variables of CFIs and a firm's ability to achieve a successful integration. This means that when collaboration, coordination, and communication are present and successful, the organization's performance improves. This contributes to the IPT that suggests that information-processing requirements must fit information-processing capacity available within an organization to increase its effectiveness and efficiency (Tushman, & Nadler, 1978; Flynn & Flynn, 1999; Bendoly et al., 2012; Graupner et al., 2015). The study also applies the organizational IPT subunits and processes.

Third, this study contributes to the literature by examining CFI through the lens of information processing and OS. It shows the importance of organizations developing the

capacity to process information to leverage the synergy among groups and individuals as changes in structures, technology, and the environment happen.

Fourth, the study provides an understanding of OS's moderating role, specifically mechanical OS, on the relationship between cross-functional activities and the organization's ability to successfully achieve integration. This study only confirms OS's moderating effect related to communication and coordination, indicating that OS's role concerning CFI is complex.

7.2.2 Managerial implication

This research provides contributions in several ways. First, the study informs organizations and managers a need to have smooth flowing operations to be effective. Executives and senior-level personnel need to encourage team collaboration, coordination, and communication among units to benefit the company. They can do this by giving members greater decision-making authority to make collaboration, coordination, and communication easier. The true value of an organization achieving a successful CFI lies in the fact that grouping efforts and resources to achieve the organization's overall goal are far greater than a single team's power. Also, to facilitate collaboration, coordination, and communication, managers may need to encourage teamwork, promote mutual goals, shared vision, and resources to increase the degree of CFI.

Second, looking at CFI as a core set of interrelated processes that focused on the collaboration of goals, coordination of activities, and communication of information (Pellathy et al. (, 2019) calls for discussion on cross-functional practices in organizations.

The research model can be a practical conceptual framework for decision-making and tackling problems around integration. Managers can use the model as a guide in their implementation efforts and as a diagnostic tool to access internal integration.

Third, the complex effect of the mechanical OS found in this study suggests that managers who intend to facilitate and encourage cross-functional collaboration, coordination, and communication, but do not pay attention to the design of OS may not achieve their intended objective of improving performance. Therefore, managers must be creative and assertive in juggling the needs for CFI, OS, and information processing. Our results suggest that CFI can be complex, and organization needs to adapt to changes quickly.

VIII. LIMITATIONS AND CONCLUSION

8.1 Limitation and future research

While this study makes significant contributions to the CFI literature and has important implications for business practice, there are some limitations that should be considered. First, the study uses a quantitative cross-sectional survey approach. This limits the research just to survey responses. Collecting information or data through other approaches, such as interviews, direct observations, or even documents, might give a broader picture of how respondents really feel about internal integration. A mixed-method approach could also be considered.

Second, CFI or internal integration is ever-changing, especially between customers, suppliers, and manufacturers. Conducting a one-time cross-sectional study

may not be enough to capture all the areas of CFI. Future studies could take on a longitudinal approach to see how changes happen at a future date in time.

Third, the current study focuses on the OS and internal integration, meaning that this study examines CFI within the organization. However, external factors may come into play, such as customers, stakeholders, and partners. Additional studies could explore external integration relationships that might be important in the company's overall CFI and factors affecting such integration.

Fourth, this study focuses on just three factors related to CFI (collaboration, coordination, and communication) and their effect on an organization achieving integration. However, it did not consider conflicts that might occur when different functional units must work together. A significant move would be to look at other factors such as conflicts in an organization or functional departments during CFI. Future research can look at different conflict factors, resolution strategies, and the consequent effect on performance.

Finally, most organizations are very diverse and are multinational enterprises. They may operate in one country but has subsidiaries in other countries. They face conflicts between corporate culture and national culture. Future studies could look at how corporate cultures interact with national cultures and impact CFI. Existing research indicates that corporate culture and national culture characteristics are not independent. Some corporate cultures are more dominant in certain national cultures (Deshpande & Farley, 2004), implying a complex 3-way interface among corporate culture, national culture, and CFI. This is interesting future research.

8.2 Conclusion

CFI – performance relationship is very important to arrive at achieved integration. This research explores the effects of CFI on organizational performance. We looked at three main constructs representing CFI, including collaboration, coordination, communication, and their effect on performance (i.e., achieved integration). Also, the impact of OS was considered and predicted to have a moderating effect on the relationship between CFI constructs and performance.

The study draws on the theoretical framework of IPT (Tushman & Nadler, 1978) and applies it to investigate the direct effects of CFI on performance (achieved integration). According to the IPT, each organization is viewed as a body that collects, interprets, coordinates, and communicates information. The task, environment, and interdependencies during integration stages may create uncertainties for sub-units. To be effective, there must be a fit between information processing requirements and capacity, considering the integration mechanisms and the organization design. A model was consequently developed to examine the conceptual relationships between CFI and performance. In this model, CFI constructs (collaboration, coordination, and communication) are conceptualized as the independent variables that influence performance. The results revealed that collaboration, coordination, and communication directly affect an organization's successfully achieving integration, and OS partially moderated the effect. The study contributes to CFI and information processing theory and provides insight on CFI for business.

References

Abdullah, H. H., & Siam, M. (2014). The influence of organizational structure and organization culture on the organizational performance of higher educational institutions: The moderating role of strategy communication. *Asian social science*, *10*(13), 142-154.

Abumandila, M. S., & Hassana, S. B. (2016). The Moderating Effect of Organizational Structure on Information Quality and Decision-Making Effectiveness Link.

Andrea, F., Arnaldo, C., and Romano, P. 2011. "Understanding How Formal and Informal Communication Affect Purchasing, Manufacturing, and Logistics Integration." *Advances in Management 4(*7):22–32.

Agresti, A (2018), *Statistical methods for the social sciences*. Pearson 5th edition

Akgun, A. E., Byrne, J., Keskin, H., Lynn, G. S., & Imamoglu, S. Z. (2005). Knowledge networks in new product development projects: a transactive memory perspective. *Information and Management,4*2,1105–112

Altschuld, J. W., & Kumar, D. D. (2010). *Needs assessment: An overview* (Vol. 1). Sage.

Ambrose, M. L., & Schminke, M. (2003). Organization structure as a moderator of the relationship between procedural justice, interactional justice, perceived organizational support, and supervisory trust. *Journal of applied psychology*, *88*(2), 295.

Atuahene-Gima, K., & Evangelista, F. (2000). Cross-functional influence in new product development: an exploratory study of marketing and R… D perspectives. *Management science*, *46*(10), 1269-1284.

Bai, W., Feng, Y., Yue, Y., & Feng, L. (2017). Organizational structure, cross-functional integration and performance of a new product development team. *Procedia Engineering*, *174*, 621-629.

Baker, T.L. (1994), Doing Social research (2nd Ed.), New York: McGraw-Hill Inc

Barki, H. and Pinsonneault, A. (2005), "A model of organizational integration, implementation effort, and performance", *Organization Science, Vol. 1*6 No. 2, pp. 165-79

Barczak G, Sultan F, & Hultink E J. (2007). Determinants of IT Usage and New Product Performance. *Journal of Product Innovation Management, 2*4(6):600-613

Barratt, M., & Barratt, R. 2011. “Exploring Internal and External Supply Chain Linkages: Evidence from the Field.” *Journal of Operations Management 29*(5):514–28

Belasen, A. and Rufer, R. (2014), “Innovation communication and inter-functional collaboration: A View from the competing values framework for corporate communication”, in N. Pfeffermann et al. (eds.), *Strategy and Communication for Innovation* (Ch. 14, pp. 227-240), “Berlin Heidelberg: Springer-Verlag

Bendoly, E., Bharadwaj, A., & Bharadwaj, S. (2012). Complementary drivers of new product development performance: Cross-functional coordination, information system capability, and intelligence quality. *Production and Operations Management*, *21*(4), 653-667.

Bigdeli, A.Z., Kamal, M., and de Cesare, S. (2012), “Information sharing in inter-departmental collaboration: A conceptual framework for local government authorities”, in Proceedings of the 6th International Conference on Theory and Practice of Electronic Governance ICEGOV '12 (pp. 485-486), October 22 - 25 2012, Albany, NY, USA.

Boyer, K.K. and McDermott, C. (1999), "Strategic consensus in operations strategy," *Journal of Operations Management, Vol.* 17 No. 3, pp. 289-305

Brettel, M., Heinemann, F., Engelen, A., & Neubauer, S. (2011). Cross-functional integration of R&D, marketing, and manufacturing in radical and incremental product innovations and its effects on project effectiveness and efficiency. *Journal of Product Innovation Management*, *28*(2), 251-269.

Buckley, A. (2015), “Getting IT to work for marketing: Exploring collaboration between marketing and IT functions for the delivery of marketing innovation”, *Journal of Direct, Data and Digital Marketing Practice,* Vol. 16 No. 4, pp. 285–307.

Calantone, R., Droge, C., & Vickery, S. 2002. Investigating the Manufacturing Marketing Interface in New Product Development: Does Context Affect the Strength of Relationships? *Journal of Operations Management, 20*(3): 273- 287

Cameron, K. S., Quinn, R. E., Degraff, J., & Thakor, A. V. (2006), *Competing values framework: Creating value in organizations*. Northampton: Edward Elgar

Canacott, J., Ellis, N. and Tadajewski, M. (2018), “Inter-functional collaboration and interorganizational relationships in communications strategy implementation”, RIMAR – Revista Interdisciplinar de Marketing, Maringá, Vol. 8 No. 1, pp. 1-16.

Carr, A. S., Kaynak, H., & Muthusamy, S. (2008). The cross-functional coordination between operations, marketing, purchasing and engineering and the impact on performance. *International Journal of manufacturing technology and management*, *13*(1), 55-77.

Chen, H., Mattioda, D. D., & Daugherty, P. J. (2007). Firm-wide integration and firm performance. *The International Journal of Logistics Management*.

Coradi, A., Heinzen, M. & Boutellier, R. (2015), "Designing workspaces for cross-functional knowledge-sharing in R & D: the "co-location pilot" of Novartis", *Journal of Knowledge Management,* Vol. 19 No. 2, pp. 236-256.

Crawford, V. P., & Sobel, J. (1982). Strategic information transmission. *Econometrica: Journal of the Econometric Society*, 1431-1451.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed-method approaches* (3rd. ed.). Thousand Oaks, CA: SAGE.

Creswell, J. W. (2014). *Research Design: qualitative, quantitative, and mixed-method approaches* (4th ed.) Thousand Oaks, CA: Sage.

Cuijpers, M., Guenter, H. & Hussinger, K. (2011), "Costs and benefits of inter-departmental innovation collaboration", *Research Policy*, Vol. 40 No. 4, pp. 565-575

Darawong, C. (2015). The impact of cross-functional communication on absorptive capacity of NPD teams at high technology firms in Thailand. *The Journal of High Technology Management Research*, *26*(1), 38-44.

Daugherty, P. J., Chen, H., Mattioda, D. D., & Grawe, S. J. (2009). Marketing/logistics relationships: influence on capabilities and performance. *Journal of business logistics*, *30*(1), 1-18.

De Luca, L. M., & Atuahene-Gima, K. (2007). Market knowledge dimensions and cross-functional collaboration: Examining the different routes to product innovation performance. *Journal of Marketing*, *71*(1), 95-112

Deutsch, M. (1949), "A theory of cooperation and competition", *Human Relations*, Vol. 2 No. 2, pp. 129–152

De Vaus, D.A. (1993), Surveys in Social Research (3rd ed.), London: UCL Press

Donaldson, L. (2001), *The Contingency Theory of Organizations*, Sage, Thousand Oaks, CA

Dougherty, D. (1992). Interpretive barriers to successful product innovation in larger organization. *Organization Science,3,1*79–202

Ellegaard, C., & Koch, C. (2012). "The Effects of Low Internal Integration between Purchasing and Operations on Suppliers' Resource Mobilization." *Journal of Purchasing and Supply Management 18*(3):148–58.

Ellinger, A.E., Keller, S.B., & Hansen, J.D., (2006). "Bridging the Divide Between Logistics and Marketing: Facilitating Collaborative Behavior." *Journal of Business Logistics 27 (*2):1–27

Ellinger, A.E., Daugherty, P.J. & Keller, S.B. (2000), "The relationship between marketing/ logistics interdepartmental integration and performance in US manufacturing firms: an empirical study", *Journal of Business Logistics, Vol*. 21 No. 1, pp. 1-22

Engelen, A., Brettel, M. & Wiest, G. (2012), "Cross-functional integration and new product performance - The impact of national and corporate culture", Journal of International Management, Vol. 18 No. 1, pp. 52–65.

Enz, M. G., Schwieterman, M. A., & Lambert, D. M. (2019), "Stock keeping unit rationalization: a cross-functional, cross-firm perspective", *The International Journal of Logistics Management*, Vol. 30 No. 4, pp. 994-1015 .

Ettlie, J.E. and Reza, E.M. (1992), "Organizational integration and process innovation," Academy of *Management Journal, Vol. 35* No. 4, pp. 795-827

Flynn, B. B., & Flynn, E. J. (1999). Information-processing alternatives for coping with manufacturing environment complexity. *Decision Sciences*, *30*(4), 1021-1052.

Flynn, B., Huo, B., & Zhao, X. (2010). "The Impact of Supply Chain Integration on Performance: A Contingency and Configuration Approach." *Journal of Operations Management 28*(1):58–71

Foerstl, K., Hartmann, E., Wynstra, F. & Moser, R. (2013), "Cross-functional integration and functional coordination in purchasing and supply management", *International Journal of Operations & Production Management,* Vol. 33 No. 6, pp. 689-721

Fugate, B.S., Stank, T.P., & Mentzer, J.T. (2009). "Linking Improved Knowledge Management to Operational and Organizational Performance." *Journal of Operations Management* 27(3):247–64.

Ghani, KA, Jayabalan, V & Sugumar, M (2002). 'Impact of advanced manufacturing technology on organizational structure', *Journal of High Technology Management*

Research, vol. 13, no. 2, pp. 157-75

Galbraith, J. R. 1973. *Designing Complex Organizations*. Reading, MA: Addison Wesley.

Galbraith, J. (1974), "Organization design: an information processing view", *Interfaces, Vol. 4* No. 3, pp. 28-36

Garcia, S., Cintra, Y., Rita de Cássia, S. R., & Lima, F. G. (2016). Corporate sustainability management: a proposed multi-criteria model to support balanced decision-making. *Journal of Cleaner Production*, *136*, 181-196.

Gattiker, T.F. & Goodhue, D.L. (2005). What happens after ERP implementation? understanding the impact of interdependence and differentiation on plant-level outcomes. *MIS Quarterly, Vol. 29* No. 3, pp. 559-85

Galpin, T., Hilpirt, R., & Evans, B. (2007). The connected enterprise: beyond division of labor. *Journal of business strategy*

Gimenez, C. and Ventura, E. (2003), "Supply chain management as a competitive advantage in the Spanish grocery sector," *The International Journal of Logistics Management, Vol. 14* No. 1, pp. 77-88

Graupner, E., Schewer, C., & Maedche, A. (2015, May). Visibility of Business Processes-An Information Processing Perspective in the Financial Services Industry. In *ECIS*.

Graner, M., & Mißler-Behr, M. (2014), "Method application in new product development and the impact on cross-functional collaboration and new product success", *International Journal of Innovation Management,* Vol. 18 No. 1, Article 1450002

Grant, R.M. 1996. "Toward a Knowledge-Based Theory of the Firm." Strategic Management Journal 17(2):109–22.

Griffin, A., & Hauser, J. R. (1996). Integrating R&D and marketing: A review and analysis of the literature. *Journal of Product Innovation Management: An International Publication of the Product Development & Management Association*, *13*(3), 191-215.

Hallstedt, S., Ny, H., Robèrt, K. H., & Broman, G. (2010). An approach to assessing sustainability integration in strategic decision systems for product development. *Journal of Cleaner Production*, *18*(8), 703-712.

Handfield, R.B., Cousins, P.D., Lawson, B., & Petersen, K.J. (2015). "How Can Supply Management Really Improve Performance? A Knowledge-Based Model of

Alignment Capabilities." Journal of Supply Chain Management 51(3):3– 17.

Hansen, M. T., & Nohria, N. (2004). How to build collaborative advantage. *MIT Sloan Management Review*, *46*(1), 22.

Harris, M., & Raviv, A. (2002). Organization design. *Management Science*, *48*(7), 852-865.

Harris, C. L. (2005). *Collaboration for organization success: Linking organization support of collaboration and organization effectiveness*. The University of North Texas.

Hausman, W.H., Montgomery, D.B., & Roth, A.V. (2002), "Why should marketing and manufacturing work together? Some exploratory empirical results", *Journal of Operations Management, Vol. 20 No.* 3, pp. 241-57

Hietajärvi, A. M., Aaltonen, K., & Haapasalo, H. (2017). Managing integration in infrastructure alliance projects: dynamics of integration mechanisms. *International Journal of Managing Projects in Business*, *10*(1), 5-31.

Hirunyawipada, T., Beyerlein, M., & Blankson, C. (2010), "Cross-functional integration as a knowledge transformation mechanism: Implications for new product development", *Industrial Marketing Management,* Vol. 39 No. 4, pp. 650–660

Jeske, D., & Calvard, T. S. (2020). A review of the literature on cross-functional integration (2010–2020): trends and recommendations. *International Journal of Organizational Analysis*.

Kahn, K.B. (1996), Interdepartmental integration: a definition with implications for product development performance. *Journal of Product Innovation Management,* Vol. 13 No. 2, pp. 137-151

Kahn, K. B., & Mentzer, J. T. (1998). Marketing's integration with other departments. *Journal of business research*, *42*(1), 53-62.

Ken Le Meunier-FitzHugh & Nigel F. Piercy (2007) Does Collaboration Between Sales and Marketing Affect Business Performance?, Journal of Personal Selling & Sales Management, 27:3, 207-220, DOI: 10.2753/PSS0885-3134270301

Ketokivi, M. & Castaner, X. (2004), "Strategic planning as an integrative device," *Administrative Science Quarterly, Vol. 49* No. 3, pp. 337-65

Khanuja, A., & Jain, R. K. (2019), "Supply chain integration: a review of enablers, dimensions and performance", *Benchmarking*: *An International Journal,* Vol. 27 No. 1, pp. 264-301 .

Krohmer, H., Homburg, C., & Workman, J. P. (2002). Should marketing be cross-functional? Conceptual development and international empirical evidence. *Journal of Business Research*, *55*(6), 451-465.

Kumar, S., & Seth, A. (1998). The design of coordination and control mechanisms for managing joint venture–parent relationships. *Strategic management journal*, *19*(6), 579-599.

Kwan, L. B. (2019), "The collaboration blind spot", *Harvard Business Review, Vol.* 97 No. 2, pp. 66-73.

Lambert, D. M., García-Dastugue, S. J., & Croxton, K. L. (2005). An evaluation of process-oriented supply chain management frameworks. *Journal of business Logistics*, *26*(1), 25-51.

Lawrence, P.R. and Lorsch, J.W. ([1967] 1986), *Organization and Environment – Managing Differentiation and Integration,* Harvard Business School Classics edition, Harvard Business School Press, Boston, MA.

Leenders, M. & Wierenga, B. (2002), "The effectiveness of different mechanisms for integrating marketing and R&D", *Journal of Product Innovation Management, Vol.1*9 No.4, pp.305-17

Le Meunier-FitzHugh, K., & Piercy, N. F. (2007). Does collaboration between sales and marketing affects business performance?. *Journal of Personal Selling & Sales Management*, *27*(3), 207-220.

Le Meunier-Fitzhugh, K., & Massey, G. R. (2019), "Improving relationships between sales and marketing: the relative effectiveness of cross-functional coordination mechanisms", *Journal of Marketing Management*, Vol. 35 No. 13/14, 1267-1290

Lee, H. W. (2020), "The cost and benefit of interdepartmental collaboration: An evidence from the US Federal Agencies", *International Journal of Public Administration*, Vol. 43 No. 4, 294- 302.

Lin, Y., Wang, Y., & Kung, L. (2015), "Influences of cross-functional collaboration and knowledge creation on technology commercialization: Evidence from high-tech industries", *Industrial Marketing Management*, Vol. 49 No. August, pp. 128–138

Loebecke, C., Van Fenema, P. C., & Powell, P. (1999), "Co-opetition and knowledge transfer", ACM SIGMIS Database: the DATABASE for *Advances in Information Systems*, Vol. 30 No. 2, pp. 14-25

Lohmann, P., & Zur Muehlen, M. (2019), "Regulatory Instability, Business

Process Management Technology, and BPM Skill Configurations", in Hildebrandt T., van Dongen B., Röglinger M., Mendling J. (eds) *Business Process Management* (pp. 419-435). BPM 2019. Lecture Notes in Computer Science, Vol. 11675. Springer, Cham

Lopes Pimenta, M., Lago da Silva, A., & Tate, W.L. (2016), "Characteristics of cross-functional integration processes: Evidence from Brazilian organizations", *The International Journal of Logistics Management*, Vol. 27 No. 2, pp. 570-594

Luo, X., Slotegraaf, R. J., & Pan, X. (2006). Cross-functional "coopetition": The simultaneous role of cooperation and competition within firms. *Journal of Marketing*, *70*(2), 67-80.

Lynch, D.F., Keller, S.B. and Ozment, J. (2000), "The effects of logistics capabilities and strategy on firm performance", *Journal of Business Logistics, Vol*. 21 No. 2, pp. 47-67.

Maclnnis, D. J., Moorman, C. & Jaworski, B. J. (1991), "Enhancing and measuring consumers' motivation, opportunity, and ability to process brand information from ads", *Journal of Marketing*, Vol. 55 No. 4, pp. 32-53

Malone, T. W. & Crowston, K. 1994. The Interdisciplinary Study of Coordination. ACM Computing Surveys, 26(1): 87-119.

Mani, D., Barua, A., & Whinston, A. (2010). An empirical analysis of the impact of information capabilities design on business process outsourcing performance. *Mis Quarterly*, 39-62.

March, J.G. & Simon, H.A. ([1958] 1993). *Organizations,* 2nd ed., Blackwell, Cambridge, MA.

MacKenzie, S.B., Podsakoff, P.M., and Podsakoff, N.P. (2011). "Construct Measurement and Validation Procedures in MIS and Behavioral Research: Integrating New and Existing Techniques." *MIS Quarterly 35(2):293–334*

McCann, J. & Galbraith, J. R. 1981. Interdepartmental Relations. In P. C. Nystom & W. H. Starbuck (Eds.), *Handbook of Organizational Design: 60*-84. New York, NY: Oxford University Press.

Merschmann, U., & Thonemann, U.W., (2011). Supply Chain Flexibility, Uncertainty and Firm Performance: An Empirical Analysis of German Manufacturing Firms. *International Journal of Production Economics 13*0(1):43–53.

Miller D, Dröge C. Psychological and Traditional Determinants of Structure[J]. *Administrative Science Quarterly, 1996,* 31(4):539-560

Mohamed, M., Stankosky, M., & Murray, A. (2004). Applying knowledge management principles to enhance cross-functional team performance. *Journal of knowledge management*

Mohsen, K., & Eng, T. Y. (2016), "The antecedents of cross-functional coordination and their implications for marketing adaptiveness", *Journal of Business Research*, Vol. 69 No. 12, pp. 5946-5955

Mollenkopf, D.A., Gibson, A., & Ozanne, L. (2000). "The Integration of Marketing and Logistics Functions: An Empirical Examination of New Zealand Firms." *Journal of Business Logistics 2*1(2):89–112.

Nakata, C. & Im, S. (2010), "Spurring cross-functional integration for higher new product performance: A group effectiveness perspective", *Journal of Product Innovation Management* Vol. 27 No. 4, pp. 554–571

Narasimhan, R., & Das, A. 2001. "The Impact of Purchasing Integration and Practices on Manufacturing Performance." *Journal of Operations Management 19*(5):593–609.

Nonaka, I. (1994). A dynamic theory of organizational knowledge creation. *Organization science*, *5*(1), 14-37.

Nguyen, N. P., Ngo, L. V., Bucic, T., & Phong, N. D. (2018). Cross-functional knowledge sharing, coordination and firm performance: The role of cross-functional competition. *Industrial Marketing Management*, *71*, 123-134

.

Oliva, R., & Watson, N. (2011). Cross-functional alignment in supply chain planning: A case study of sales and operations planning. *Journal of Operations Management*, *29*(5), 434-448.

O'Leary-Kelly, S.W. & Flores, B.E. (2002), "The integration of manufacturing and marketing/sales decisions: impact on organizational performance", *Journal of Operations Management, Vol. 2*0 No. 3, pp. 221-40

Ordanini, A., Parasuraman, A. & Rubera, G. (2014), "When the recipe is more important than the ingredients: A Qualitative Comparative Analysis (QCA) of service innovation configurations", *Journal of Service Research, Vol. 17* No. 2, pp. 134-149

Ozbas, O. (2005). Integration, organizational processes, and allocation of resources. *Journal of Financial Economics*, *75*(1), 201-242.

Pagell, M. (2004), "Understanding the factors that enable and inhibit the integration of

operations, purchasing, and logistics," *Journal of Operations Management, Vol.* 22 No. 5, pp. 459-87

Pellathy, D. A., Mollenkopf, D. A., Stank, T. P., & Autry, C. W. (2019). Cross-Functional Integration: Concept Clarification and Scale Development. *Journal of Business Logistics*, *40*(2), 81-104.

Pfeffer, J., Salancik, G. (1978), *The External Control of Organizations: A Resource Dependence Perspective*. Harper and Row, New York

Piercy, N. & Ellinger, A. (2015), "Demand- and supply-side cross-functional relationships: an application of disconfirmation theory", *Journal of Strategic Marketing*, Vol. 23 No. 1, pp. 49- 71 .

Pimenta, M.L., Silva, A.L.S. & Tate, W.L. (2016), Characteristics of cross-functional integration processes: evidence from Brazilian organization. *International Journal of Logistics Management, Vol. 27* No. 2, forthcoming

Prabhaker, P.R., Goldhar, J.D. & Lei, D. (1995), "Marketing implications of newer manufacturing technologies", *Journal of Business and Industrial Marketing, Vol. 10* No. 2, pp. 48-58

Reddock, J. R. (2017). Seven parameters for evaluating universal health coverage: Including supply- and- demand perspectives. *International Journal of Healthcare Management, 10*(3), 207-218.

Patrashkova-Volzdoska, R.R., McComb, S.A., Green, S.G., & Compton, W.D., (2003), Examining a curvilinear relationship between communication frequency and team performance in cross-functional project teams. *Transactions on Engineering Management*, vol. 50, no. 3, pp. 262-269

Rho, B. H., Hahm, Y. S. & Yu, Y. M. (1994). Improving interface congruence between manufacturing and marketing in industrial-product manufacturers. *International Journal of Production Economics*, *37*(1), 27-40.

Robbins, SP 1990, Organization Theory: *Structure Designs and Applications*, 3rd ed., Prentice Hall, Englewood Cliffs, NJ

Rosado Feger, A. L. (2014), "Creating cross-functional strategic consensus in manufacturing facilities", *International Journal of Operations & Production Management*, Vol. 34 No. 7, pp. 941-970

Rowe, F., El Amrani, R., Bidan, M., Marciniak, R. & Geffroy-Maronnat, B. (2005), "Does ERP provide a cross-functional view of the firm? Challenging conventional wisdom for SMEs and large French firms", ICIS 2005 Proceedings. Paper 43

Sabath, R., & Whipple, J. M. (2004). Using the customer/product action matrix to enhance internal collaboration. *Journal of Business Logistics*, *25*(2), 1-19.

Sanders, N. R., & Premus, R. (2005). Modeling the relationship between firm IT capability, collaboration, and performance. *Journal of business logistics*, *26*(1), 1-23.

Schoenherr, T., and Swink, M., 2012. "Revisiting the Arcs of Integration: Cross-Validations and Extensions*." Journal of Operations Management 34*(1–2):99–115

Sherman, D.J., Berkowitz, D., & Souder, W.E. 2005. "New Product Development Performance and the Interaction of Cross-Functional Integration and Knowledge Management." *Journal of Product Innovation Management 22(*5):399–411.

Shams, S. R., Vrontis, D., Weber, Y., & Tsoukatos, E. (2018). An integrated cross-functional model of strategic innovation management in business: The implications of ten cross-functional business areas. In *Business Models for Strategic Innovation* (pp. 176-187). Routledge.

Simatupang, T. M., Wright, A. C., & Sridharan, R. (2002). The knowledge of coordination for supply chain integration. *Business process management journal*.

Song, M. & Montoya-Weiss, M.M. (2001), "The effect of perceived technological uncertainty on Japanese new product development", *Academy of Management Journal, Vol. 44* No. 1, pp. 61-80

Sroufe, R. (2017). Integration and organizational change towards sustainability. *Journal of Cleaner Production*, *162*, 315-329.

Ståhle, M., Ahola, T., & Martinsuo, M. (2019), "Cross-functional integration for managing customer information flows in a project-based firm", *International Journal of Project Management*, Vol. 37 No. 1, 145-160

Stank, T.P., Daugherty, P.J. and Ellinger, A.E. (1999), "Marketing/logistics integration and firm performance", *The International Journal of Logistics Management, Vol*. 10 No. 1, pp. 11-24

Stank, T.P., Keller, S.B., & Daugherty, P.J. (2001b). "Supply Chain Collaboration and Logistics Service Performance." *Journal of Business Logistics 22*(1):29–48.

Stipp, D. M., Pimenta, M. L., & Jugend, D. (2018). Innovation and cross-functional teams: Analysis of innovative initiatives in a Brazilian public organization. *Team Performance Management: An International Journal*.

Strauss, A. (1988). The articulation of project work: An organizational process. *Sociological Quarterly*, *29*(2), 163-178.

Stock, G.N., Greis, N.P. & Kasarda, J.D. (1998), "Logistics, strategy, and structure: a conceptual framework", *International Journal of Operations & Production Management, Vol. 18* No. 1, pp. 37-52.

Su, Z., Chen, J., & Wang, D. (2019), "Organizational structure and managerial innovation: the mediating effect of cross-functional integration", *Technology Analysis & Strategic Management*, Vol. 31 No. 3, pp. 253-265

Swink, M., Narasimhan, R., & Wang, C., 2007. "Managing Beyond the Factory Walls: Effects of Four Types of Strategic Integration on Manufacturing Plant Performance." *Journal of Operations Management 25*(1):148–64.

Swink, M. & Nair, A. (2006), "Capturing the competitive advantage of AMT: design-manufacturing integration as a complementary asset," *Journal of Operations Management, Vol. 2*5 No. 3, pp. 736-54

Swink, M., & Schoenherr, T. (2015). The effects of cross-functional integration on profitability, process efficiency, and asset productivity. *Journal of Business Logistics*, *36*(1), 69-87.

Szalavetz, A. (2018), "Sustainability-oriented cross-functional collaboration to manage tradeoffs and interdependencies", *International Journal of Management and Economics*, Vol. 54 No. 1, 3–17.

Tesone, D.V. (2006). *Hospitality Information Systems and E-commerce*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Thompson, J. D. [1967] 2003. Organizations in Action - Social Science Bases of Administrative Theory (Transaction ed.). New Brunswick, NJ: Transaction Publishers

Tsai, K.-H., & Hsu, T. T. (2012), "Linking cross-functional collaboration, innovation performance and competitive intensity: towards a mediated moderation perspective", *Asian Journal of Technology Innovation*, Vol. 20 No. 1, pp. 113-126

Turkulainen, V. (2008). *Managing cross-functional interdependencies-the contingent value of integration*. Teknillinen korkeakoulu

Turkulainen, V., & Ketokivi, M. (2012). Cross-functional integration and performance: what are the real benefits?. *International Journal of Operations & Production Management*.

Tushman, M. L., & Nadler, D. A. (1978). Information processing as an integrating concept in organizational design. *Academy of management review*, *3*(3), 613-624

Van de Ven, A. H., Delbecq, A. L., & Koenig, R., Jr. 1976. Determinants of Coordination Modes within Organizations. American Sociological Review, 41(2): 322-338.

Van Looy, A., & Shafagatova, A. (2016). Business process performance measurement: a structured literature review of indicators, measures, and metrics. *SpringerPlus*, *5*(1), 1797.

Van Teijlingen, E. R., & Hundley, V. (2001). The importance of pilot studies. Social Research Update, 35

Verma, R., Thompson, G.M., Moore, W.L. & Louviere, J.J. (2001), "Effective design of product/services: an approach based on integration of marketing and operations management decisions", *Decision Sciences, Vol. 32* No. 1, pp. 165-93.

Wang, E.T.G., & Wei, H., 2007. Interorganizational governance value creation: coordinating for information visibility and flexibility in Supply Chains. *Decision Sciences 38*(4):647–74

Weick, K.E., & Quinn, R.E., 1999. "Organizational Change and Development." *Annual Review of Psychology* 50(1):361–86

Williams, B.D., Roh, J., Tokar, T., & Swink, M. 2013. "Leveraging Supply Chain Visibility for Responsiveness: The Moderating Role of Internal Integration." *Journal of Operations Management 31(7)*:543–54.

Wong, C.Y., Boon-Itt, S., 2008. The influence of institutional norms and environmental uncertainty on supply chain integration in the Thai automotive industry. *International Journal of Production Economics 115*, 400–410

Zeng, S. X., Meng, X. H., Yin, H. T., Tam, C. M., & Sun, L. (2010). Impact of cleaner production on business performance. *Journal of Cleaner Production*, *18*(10-11), 975-983.

APPENDIX A: Consent Form

ADULT ONLINE CONSENT TO PARTICIPATE IN A RESEARCH STUDY

The impact on cross-functional integration (collaboration, coordination, communication) on organization performance

SUMMARY INFORMATION

Things you should know about this study:

Purpose: The purpose of the study is to find out if work processes mainly collaboration, coordination, and communication affect the way organizations achieve cross-functional integration effectively.

Procedures: If you choose to participate, you will be asked to complete an online survey.

Duration: This will take about 10-15 minutes of your time.

Risks: The main risk or discomfort from this research is taking time out of your schedule to complete the survey.

Benefits: The main benefit to you from this research is gaining insights into the improvement of organizational cross-functional integration within your organization.

Alternatives: There are no known alternatives available to you other than not taking part in this study.

Participation: Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

PURPOSE OF THE STUDY

The study aims to find out if organizational work processes, mainly collaboration, coordination, and communication, affect the way organizations achieve cross-functional integration effectively.

NUMBER OF STUDY PARTICIPANTS

If you decide to be in this study, you will be one of approximately 150 people in this research study.

DURATION OF THE STUDY

Your participation will involve 10-15 minutes of your time

PROCEDURES

If you agree to be in the study, we will ask you to do the following things:

1. Complete an online survey with items measuring cross-functional integration at a time convenient to you.
2. Set aside approximately 10-15 minutes to complete the survey in one sitting.

RISKS AND/OR DISCOMFORTS

While there are no foreseeable risks, the only discomfort from this research is taking time out of your schedule to complete the online survey, which is reasonable for others involved in similar studies.

BENEFITS
The main benefit of this research is gaining additional knowledge in the improvement of cross-functional integration within your organization. It is also expected that this study will benefit society by providing insights into improving the area of organizational cross-functional integration in general.

ALTERNATIVES
There are no known alternatives available to you other than not taking part in this study.

CONFIDENTIALITY
This study's records will be kept private and will be protected to the fullest extent provided by law. In any sort of report, we might publish, we will not include any information that will make it possible to identify you. Research records will be stored securely, and only the researcher team will have access to the records. However, your records may be inspected by authorized University or other agents who will also keep the information confidential.

COMPENSATION & COSTS
There are no costs or payments to you for participating in this study.

RIGHT TO DECLINE OR WITHDRAW
Your participation in this study is voluntary and you will not lose any benefits if you decide not to participate.

RESEARCHER CONTACT INFORMATION
If you have any questions about the purpose, procedures, or any other issues relating to this research study you may contact Loraine Jackson at lmowa001@fiu.edu to learn more or receive a final copy.

IRB CONTACT INFORMATION
If you would like to talk with someone about your rights of being a subject in this research study or about ethical issues with this research study, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

PARTICIPANT AGREEMENT
I have read the information in this consent form and agree to participate in this study, and I have had a chance to ask any questions I have about this study. By clicking on the "consent to participate" button below I am providing my informed consent.

APPENDIX B: Survey Instrument

Cross-functional Integration (adopted from Pellathy et al., 2019 and Makenzie et al., 2011)

Collaboration (α= 0.87, AVE = 0.63)

In my organization, different areas of the functional units work across functional boundaries to.....

1.	Jointly establish the overarching goals that direct our individual functional activities	0.769
2.	Make sure there is joint agreement on functional unit goals	dropped
3.	Engage constructively in debates about the goals of the functional units	dropped
4.	Ensure an open and transparent process for establishing common goals	0.815
5.	Establish a regular process for reviewing joint functional unit goals	0.820
6.	Support other functions in achieving common goals	0.768
7.	Adjust goals and objectives to reflect constraints faced by different functions	dropped

Coordination (α= 0.86, AVE = 0.60)

In my organizational, different areas of the functional units work across functional boundaries to.....

8.	Actively manage lead times across functions	0.772
9.	Ensure that functional activities are synchronized across the different areas	0.746
10.	Jointly manage interdependencies across functional areas	0.791
11.	Make sure everyone is focused on process optimization rather than achieving separate functional goals	dropped
12.	Make sure functional decisions do not conflict with each other	dropped
13.	Make sure functional areas see themselves as part of a larger overall process	0.796

Communication (α= 0.85, AVE = 0.60)

In my organizational, different areas of the functional units work across functional boundaries to.....

14.	Make sure relevant information gets to the right people in different functional areas.	0.767
15.	Keep key players in different functions informed about what is going on	dropped
16.	Make sure everyone understands what information needs to be communicated out to different functional areas	0.806
17.	Make sure information that is being communicated is useful to those on the receiving end	dropped
18.	Make sure everyone understands how information is used in different functional areas.	0.770
19.	Make sure those on the receiving end understands why they are getting the information that they are getting.	0.718

Performance - Achieved Integration (adopted from Kahn & Mentzer, 1998; α= 0.84, AVE = 0.60)

Evaluate your organization based on the following:

20.	The functions in our organization are well integrated	0.803
21.	Problems between functions are solved easily, in the organization	dropped
22.	Functional coordination works well in our organization	0.756
23.	The functional units in our organization work well together	dropped
24.	Our organization functions coordinate their activities	0.743
25.	Our organization functions work interactively with each other	0.711

Organizational Structure (adopted from Miller & Drogel, 1996 and Bai et al., 2017; α= 0.93, AVE = 0.73)

Evaluate your organization based on the following:

26.	The views of staff can be quickly transferred to business leaders	0.869
27.	Market information of product/services can be quickly feedback to the organization decision-making	0.857
28.	Our organization is able to break departmental boundaries to collaborate and respond to Changes quickly	0.816
29.	Our organization can rapidly respond to market integration of resources required	0.885
30.	Our organization promotes team collaboration in order to enhance the ability to cope with change	0.847

α= Cronbach's Alpha, AVE = average variance extracted

APPENDIX C: Empirical studies of cross-functional integration, organization, and performance

Arthur(s)	Context	Operationalization of internal integration	Theoretical foundation	Sample	Results
Bai et al., (2017)	New Product Development team. Mfg. & High-tech' production, marketing	Organizational Structure, CFI, and performance	Information Processing / Resource Dependency	268 university alumni; team & organ level	Mech OS to CFI (-); Organic OS to CFI (+); CFI to Performance (+); OS to CFI to Performance (+)
Bendoly et al., (2012)	MFG & MKTG; Supply Chain & MKTG	CFI coordination, information system capability, intelligence quality	New product development model (NPD); joint capabilities	1023 MFG managers; 386 different firms	role of CF_ coordination to IS capabilities (+)
Canacott et al., (2018)	Marketing, Sales	strategy implementation for CFI collaboration and communication strategies	No known theory. Grounded	2 stages of mgrs. 18 Executives from marketing & advertising agencies	Inter-functional communication is required to break down barriers. Strong demand for integration of content. Closer collaboration between sales & marketing functions is vital.
Chen et al., (2007)	Mktg, logistics, R&D	Firm-wide integration & performance; collaboration & integration/team collaboration	Constituency theory	Supply chain executive	mktg/logistics collaboration to firm performance (+); mktg/logistics collaborative activities to firm-wide CFI (+)
Deluca & Atuahene-Gime, (2007)	High-Tech R&D/MKT	MKT knowledge dimension, CFI, & product innovation performance	Contingency theory & knowledge base view of the firm.	363 high-tech managers; 50 firms	market knowledge specificity and cross-functional collaboration affect product innovation performance through knowledge integration mechanisms

Ellinger et al., (2000)	Logistics/MKTG/Manufacturing	MKT/Logistics integration and performance	Perceived effectiveness and information exchange approach	360 logistics & marketing managers	Positive association between collaboration and perceived effectiveness of inter-departmental relationships.
Engelen, Brettel & Wiest (2012)	New Product Development team & production	CFI and new product performance. National and corporate culture	The need for CFI is based in resource dependency theory. Functional dept. depends on resources and functions from other areas	619 firms, 6 countries, 321 participants	Strong cross-functional integration positively impacts new product success
Ettlie & Reza, (1992)	MFG, R&D, Cust, Supplier	Integration and process innovation, coordination	No known theory. Grounded	39 plants, multiple industries	Integration significant with utilization. Cycle time, flexibility & service calls were not significant
Flynn et al., (2010)	Manufacturing	Supply chain integration and performance	Contingency and configuration approach	617 Supply chain mgrs and executives surveyed	SCI is related to operational and business performance. Internal and customer integration were strongly related to improving performance than supplier integration.
Foerstl et al., (2013)	Purchasing, supply mgmt.	CFI and coordination		148 companies global cross section surveys	positive impact of cross-functional integration and functional coordination on purchasing performance, and of purchasing performance on firm performance
Kahn, (1996)	MFG, MKTG, R&D	Collaboration and interaction	interdepartmental integration and product development performance	514 functional managers; electronics	Collaboration positively affects performance. More important than interaction

Le Meunier-Fitzhugh & Massey, (2019)	Sales and marketing	the effectiveness of cross-functional coordination mechanism			Not all coordination mechanisms are equally effective. Reducing conflict and increasing collaboration between sales & marketing positively influence business performance.
Lin, Wang & Kung, (2015)	Marketing, R&D	Knowledge creation and cross-functional collaboration	TC model that considers the effect of knowledge creation.	203 marketing, R&D high-tech managers	cross-function collaboration reveals fresh opportunities for creating knowledge. Knowledge creation plays an important role in TC performance through mediating the relationship between cross-functional collaboration and TC performance
Olivia & Watson, (2011)	Sales and Operations	CFI alignment in supply chain planning. Process attribute and constructive engagement	Grounded Theory, develop explanation for theory and practice	25 semi-structured, 45- to 90-min interviews with leaders and participants from all the functional areas involved in the S&OP process	process perspective was adopted, and results show that integration was achieved despite formal functional incentives that did not support it.
Pagell (2004)	CFI with operations	Process of interaction, collaboration, cooperation		11 firms in USA	Job rotation, communication and reward system impact consensus and performance
Pellathy et al., (2019)	CFI scale development/supply chain IT	Collaboration, coordination, communication	Reflective 2nd order constructs, a priori theoretical model	2 samples 182 & 182; SCM managers, USA	CFI relationships is based on trust, commitment, and mutual respect

Schoenherr & Swink (2012)	Multiple functions working together	Cross-validation and extensions	Information processing theory-internal integration and capacity to absorb and use information		Internal CFI is directly associated with all dimensions of operational performance
Swink & Schoenherr (2015)	supply chain functions	CFI on profit, process efficiency and productivity	Information Processing Theory on achieved internal integration	115 supply chain management, 32 companies	Internal integration is positively associated with process efficiency, productivity, and asset productivity
Turkulainen & Ketokivi, (2012)	Manufacturing (electronics, machinery, & transportation)	CFI integration & performance: What are the real benefits?	Contingency Theory	266 mid-large size firms, 3 industries, 9 countries	CFI integration on performance is positive, but contingent and varies from one dimension to the next

APPENDIX D: Sample Demographics

Table 1: Sample Demographics (n=325)

Age	**n**	**%**	Company Size	**n**	**%**
18-24	13	4%	1-100	76	23.4%
25-34	151	46.5%	101-499	123	37.8%
35-44	92	28.3%	500-999	72	22.2%
45-54	48	14.8%	1000-4999	34	10.5%
55-64	17	5.2%	5000 and above	20	6.2%
Over 65	4	1.2%			
Industry:	**n**	**%**	**Scope of Duties**	**n**	**%**
Healthcare	33	10.2%	Director, Snr. Manager, Exec	58	17.8%
Hospitality/tourism	27	8.3%	Manager, Asst, supervisor	221	68%
Food & Beverage	23	7.1%	Line staff, clerical, auxiliary	39	12%
Education	28	8.6%	Other responsibility	7	2.2%
Manufacturing/Construction	69	21.2%			
Information Technology	91	28%			
Banking/finance/Insurance	34	10.5%			
Government/Non-profit	8	2.5			
Other	12	7			
Length of employment	**n**	**%**	**Time spent on CFI**	**n**	**%**
Less than I year	7	2.2%	0-19%	18	5.5%
1 to 2 years	83	25.5%	20-39%	113	34.8%
3 to 5 years	161	49.5%	40-59%	141	43.4%
6 to 10 years	53	16.3%	60-79%	45	13.8%
10 years or more	21	6.5%	80-100%	8	2.8%
CFI functional area	**n**	**%**	**Gender**	**n**	**%**
Research & Development	24	7.4%	Male	215	66
Manufacturing/Operations	54	16.6%	Female	110	34
Logistics & Transportation	20	6.2%			
Human Resources	25	7.7%			
Customer Service	29	8.9%			
Marketing	57	17.5%			
Admin (finance, acct, legal)	28	8.6%			
Information Technology	80	24.6%			
Other	8	2.5%			

APPENDIX E1: Descriptive Statistics

Table 2: Descriptive Statistics of all variables (N=325)							
		Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
AGE		1	8	2.76	1.09	1.461	3.842
GNDR		1	2	1.34	0.474	0.686	-1.539
COLLLAB		1	5	4.0892	0.69481	-1.01	3.103
COOR		1	5	4.0646	0.66815	-0.863	2.561
COMM		1	5	4.1015	0.66701	-0.856	1.696
PERF		1	5	4.0077	0.64962	-1.048	2.471
OS		1	5	3.0262	1.09858	0.002	-1.197

APPENDIX E2: Loadings of variables

Table 3: Loadings of all variables						
Measurement instruments Loadings, Composite Reliability (CR), Average Variance extracted (AVE)						
	Items	1	2	3	4	5
1. Collab	Collab_1	**0.769**				
CR = 0.87	Collab_4	**0.815**				
AVE = 0.63	Collab_5	**0.820**				
	Collab_6	**0.768**				
2. Comm	Comm_1		**0.767**			
CR = 0.85	Comm_3		**0.806**			
AVE = 0.60	Comm_5		**0.770**			
	Comm_6		**0.718**			
3. Coord	Coord_1			**0.772**		
CR = 0.86	Coord_2			**0.746**		
AVE = 0.60	Coord_3			**0.791**		
	Coord_6			**0.796**		
4. OS	OS_1				**0.869**	
CR = 0.93	OS_2				**0.857**	
AVE = 0.73	OS_3				**0.816**	
	OS_4				**0.885**	
	OS_5				**0.847**	
5. Perf	Perf_1					**0.803**
CR = 0.84	Perf_3					**0.756**
AVE = 0.60	Perf_5					**0.743**
	Perf_6					**0.711**

APPENDIX F1: Correlation Matrix

Summary of results

Hypotheses	Predictors	β	t-value	p-value	Result
H1	Collab -> Perf	0.140	2.505	0.012*	Supported
H2	Coord -> Perf	0.358	5.056	0.000**	Supported
H3	Comm -> Perf	0.411	6.952	0.000**	Supported
H4a	OS*COLLAB -> Perf	0.040	0.594	0.553***	Not Supported
H4b	OS*COORD -> Perf	0.177	2.601	0.009*	Supported
H4c	OS*COMM -> Perf	-0.169	2.651	0.008*	Supported

(*p < 0.05, **p < 0.01, ***p<0.001.)

APPENDIX F2: Total Variance Explained

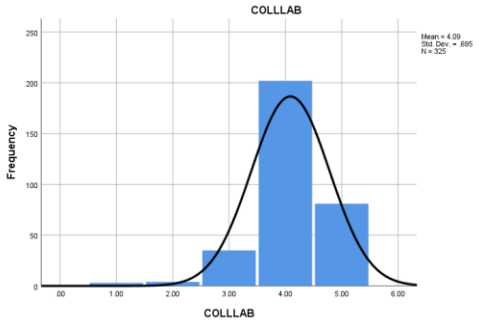
Total Variance Explained

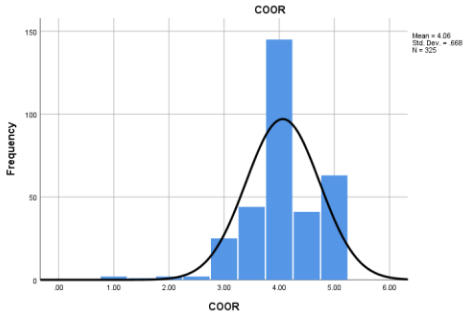
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	8.077	38.460	38.460	8.077	38.460	38.460	3.745	17.832	17.832
2	3.238	15.421	53.881	3.238	15.421	53.881	3.738	17.800	35.631
3	1.294	6.160	60.041	1.294	6.160	60.041	3.060	14.569	50.201
4	.879	4.185	64.226	.879	4.185	64.226	2.065	9.831	60.032
5	.778	3.704	67.929	.778	3.704	67.929	1.659	7.898	67.929
6	.692	3.294	71.223						
7	.599	2.853	74.077						
8	.591	2.814	76.891						
9	.539	2.569	79.460						
10	.489	2.330	81.790						
11	.462	2.200	83.990						
12	.452	2.152	86.142						
13	.430	2.049	88.192						
14	.400	1.903	90.095						
15	.379	1.803	91.898						
16	.337	1.606	93.503						
17	.311	1.482	94.986						
18	.302	1.439	96.424						
19	.274	1.304	97.728						
20	.257	1.225	98.953						

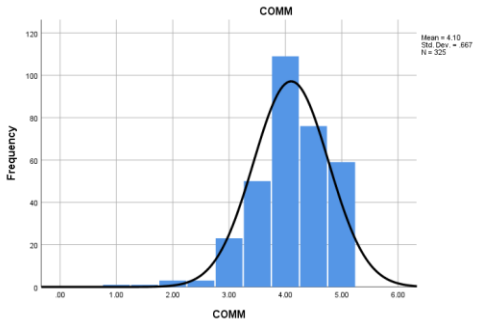
21	.220	1.047	100.000						

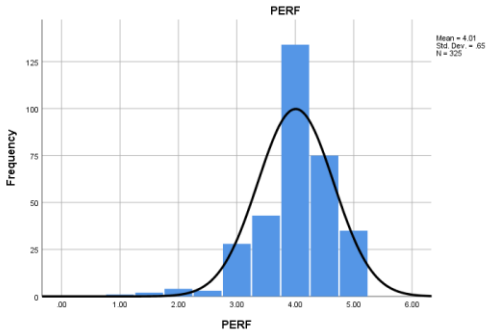
Extraction Method: Principal Component Analysis.

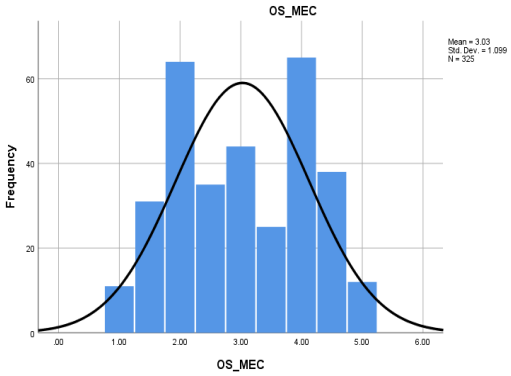
APPENDIX G: Normality Curve





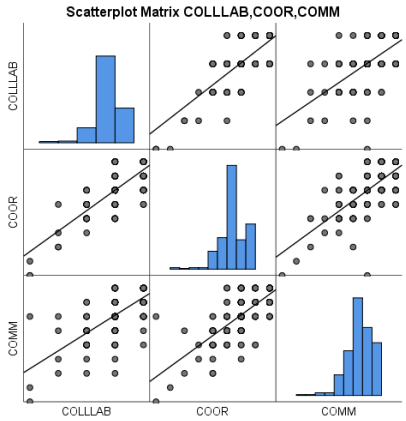




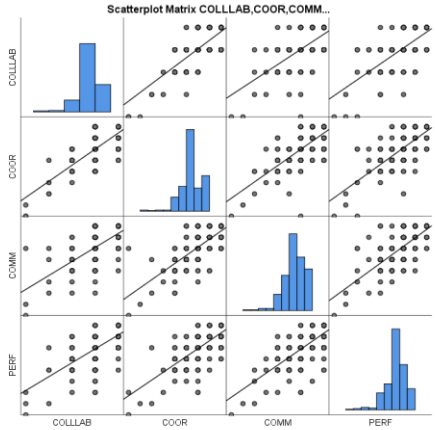


APPENDIX H: Scatterplot Matrix

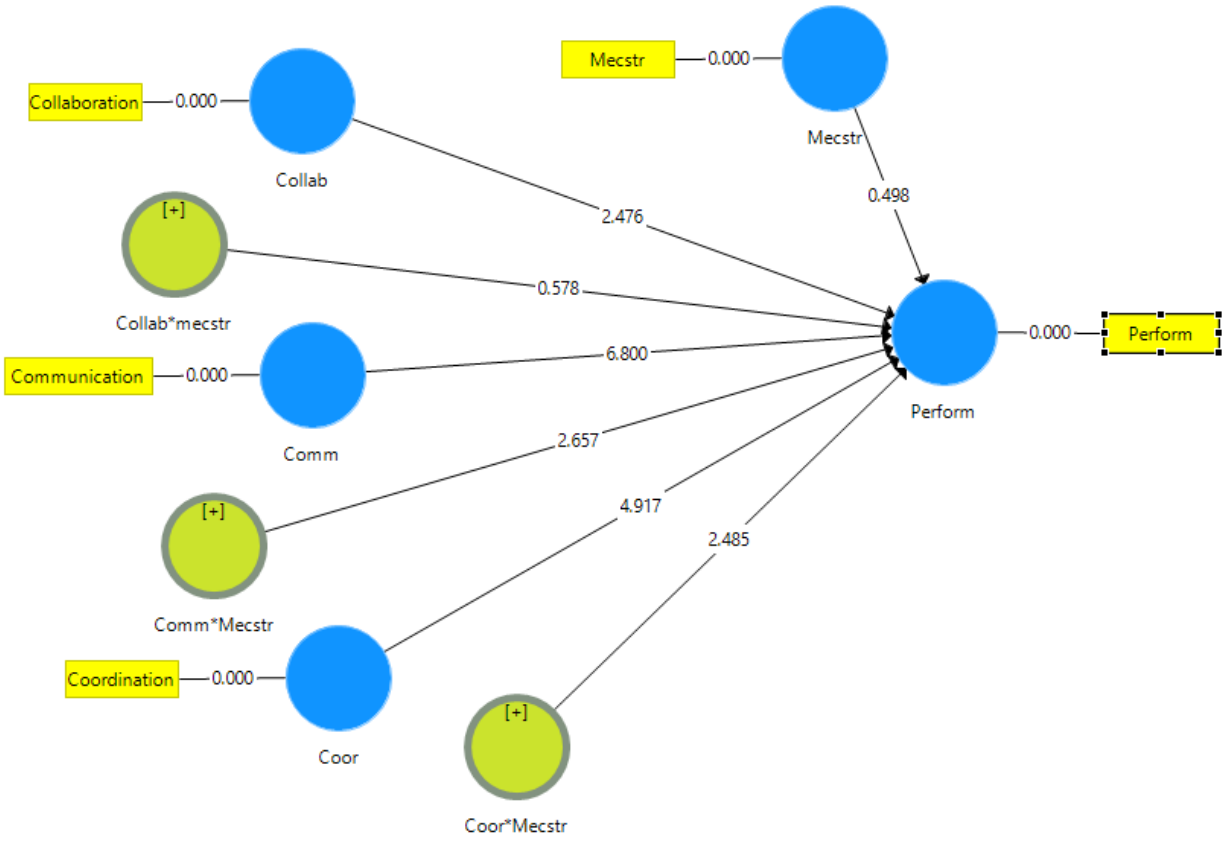
Scatterplot Matrix



Scatterplot matrix CFI - performance



APPENDIX I: 5000 sample bootstraps



APPENDIX J: Discriminant Validity with interaction

Discriminant Validity with interaction

	Collab	Collab*mecstr	Comm	Comm*Mecstr	Coor	Coor*Mecstr	Mecstr	Perform
Collab	1							
Collab*mecstr	-0.104	1						
Comm	0.674	-0.101	1					
Comm*Mecstr	-0.096	0.726	-0.062	1				
Coor	0.764	-0.07	0.745	-0.08	1			
Coor*Mecstr	-0.069	0.759	-0.082	0.805	-0.036	1		
Mecstr	0.167	0.018	0.192	0.068	0.183	0.073	1	
Perform	0.689	-0.032	0.76	-0.071	0.775	0.014	0.155	1

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