
QRBD

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FROM THE EDITORS

The November issue of *Quarterly Review of Business Disciplines* offers theoretical and practical pieces that help to enhance the body of knowledge in our field. In the first article, Zhang, Kakabadse, Van Deusen, and Fadil investigate the impact of the COVID-19 pandemic on the resilience of Boards of Directors. While past COVID-19 research published here and in other academic journals has mainly focused on its impact on education, this article uses it as a test of a critical group in the corporate world.

The second article by Deng offers something that we see too infrequently in our journals, a conceptual piece that proposes a research model. Deng proposes a model to study the effects of IT affordances on users' virtual experiences and purchase intentions in social commerce platforms. As Deng notes, "...this conceptual paper not only benefits the researchers in understanding the implications of IT affordances and user experiences for successful social commerce, but also assists practitioners in developing better technology strategy for social commerce."

The research and conceptual design provided in the third article adds to the theory and business use of the BSC (balanced scorecard) financial perspective and offers an application to the telecom industry. It proposes the model of the financial perspective of the BSC development based on Norton and Kaplan (1996), along with specific telecom industry examples of strategic objectives and financial indicators.

In the final article, Nichols, McKinzie, and Appiah Otoo update their earlier work on faculty pay differences based on sex and rank at several business schools. The current investigation branches out from a study of just a few business schools to include faculty in the STEM, nursing and social science fields at all ten public institutions in one state.

We encourage you to take some time to review this important research.

Charles A. Lubbers, *University of South Dakota*, Issue Editor

Vance Johnson Lewis, *Southeastern Oklahoma University*, Editor-in-Chief

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**RESILIENCE IN THE COVID-19 PANDEMIC:
A STUDY OF BOARD DIVERSITY THROUGH A CRISIS MANAGEMENT PLAN**

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ABSTRACT

During the initial phase of the COVID-19 pandemic, businesses faced an economic shock never seen before. This paper addresses what firms could do to enhance resilience in a crisis of this magnitude. We argue that diversity in boards can enable firms to bounce back from a crisis. Moreover, a board's involvement in a crisis management plan is critical in strengthening firm resilience. We have applied an information processing perspective to examine two diversity dimensions: board cognitive diversity and board gender diversity. Survey data of 271 responses collected between April and June 2020 from the US are used in the structural equation modeling analysis. The results show that, on the one hand, board cognitive diversity is a desirable feature, significantly improving a board's contribution to a crisis management plan, which strengthens a firm's resilience. On the other hand, board gender diversity poses a negative impact on resilience. The paper concludes with discussions and future research proposals.

Keywords: COVID-19; Resilience; Boards of Directors; Cognitive Diversity; Gender Diversity; Crisis Management Plan

INTRODUCTION

As the decision-making apex, boards of directors exert a critical impact on firm performance, especially during a turbulent period such as a crisis (Fernandes, Farinha, Artins, & Mateus, 2017; Luciano, Nahrgang, & Shropshire, 2020; McNulty, Florackis, & Ormrod, 2013). The COVID-19 pandemic provides just such a situation to enable us to examine board influence in devastating times for many businesses (Foss, 2020). The speed and indiscriminate nature of the pandemic has brought an economic shock that we have never seen before (The Economist, 2020d). Already in March and April of 2020, businesses had started to face disrupted supply chains and a severe decline in revenues, with only enough cash and inventories to survive three to six months, and many undertook a high risk in furloughing their employees (The Economist, 2020b, 2020c). The economy was not yet out of the woods when the total daily cases in the US surpassed 100,000 by early November of 2020 (CDC, 2020).

In the initial phase of the pandemic, amid the chaos, researchers observed a lack of diverse perspectives in dealing with the COVID-19 outbreak. This may have hindered discussions of alternatives that top decision-makers ignored until long into the pandemic (Foss, 2020). The lack of information diversity falls short of meeting the information-processing demand for novel and complex decision-making in turbulent times (Luciano et al., 2020). However, the study of board

diversity in crises is limited (Duchek, Raetze, & Scheuch, 2020). It may be the case that a lack of diversity simplifies information that could help firms adapt to a crisis swiftly. Still, there is support for the argument that a richer information variety and more deliberate information gathering can create sustainable advantages that firms need to handle the COVID-19 pandemic (Foss, 2020).

An interdisciplinary approach could help deliver meaningful research on firm actions in a pandemic (Budhwar & Cumming, 2020). This study aims to combine board diversity and the crisis management plan to shed light on how board diversity influences firm resilience during the early phase of the COVID-19 outbreak in the US. A crisis management plan underscores the extent to which a firm is prepared to handle a crisis. It entails a process that gathers and stores the information needed to guide a firm to reduce the external shock and even enable the firm to explore opportunities (Bundy, Pfarrer, Short, & Coombs, 2017; Egelhoff & Sen, 1992). Evidence suggests that board involvement in a crisis management plan mitigates a crisis's negative financial impact (Ferrero-Ferrero, Fernandez-Izquierdo, & Munoz-Torres, 2012) as well as an adverse strategic impact (Preble, 1997), strengthening business resilience to bounce back. We further argue that board involvement in developing a crisis management plan reflects the effort of performing shared tasks involving boards and top management teams, coordinating the understanding of strategic change versus persistence *ex ante* (Luciano et al., 2020).

The paper has applied the information processing perspective (Galbraith, 1974; Olson, Parayitam, & Bao, 2007) to address the issue of information diversity in the pandemic (Foss, 2020). First, this perspective claims that diverse information is a prerequisite for meaningful information processing (Galbraith, 1974; Weick, 1988), and the presence of it is critical for problem-solving (Simons, 1978), especially during a crisis (Galbraith, 1974). According to the information processing theory (Galbraith, 1974; Olson et al., 2007), a broad pool of diverse information presents many benefits. It improves the quality of group decision-making (Simons, Pelled, & Smith, 1999; Williams & O'Reilly, 1998) and reduces information risk embedded in the uncertainty of the external environment (Olson et al., 2007). It can even facilitate a fast decision-making process (Eisenhardt, 1989; Kanadli, Bankewitz, & Zhang, 2018). Second, information processing emphasizes the use of diverse information, where sharing and processing the available and unique information is crucial for problem-solving (Simons, 1978; Van Knippenberg, De Dreu, & Homan, 2004). The claim supports exploring a potential mediator that brings the idea of using diverse information to light.

The contribution of the paper is three-fold. First, the paper contributes to the call for examining the boards of directors in a crisis (Duchek et al., 2020; Luciano et al., 2020). We provide evidence supporting the importance of building board diversity as an effective approach to crisis management. Second, continuing the discussion of identifying and examining mediators when studying board diversity (McNulty et al., 2013; Triana, Miller, & Trzebiatowski, 2014; Van Knippenberg et al., 2004), we demonstrate the power of a context-relevant mediator—board involvement in a crisis management plan—in shaping resilience during the pandemic. Third, the paper contributes to studies of diversity dimensions (Milliken & Martins, 1996; Nkomo, Bell, Roberts, Joshi, & Thatcher, 2019; Williams & O'Reilly, 1998) by investigating board cognitive and board gender diversity simultaneously. Albeit there are concerns regarding the dimensions of diversity (Van Knippenberg et al., 2004), the separation improves the understanding of how board diversity influences resilience in the COVID-19 crisis.

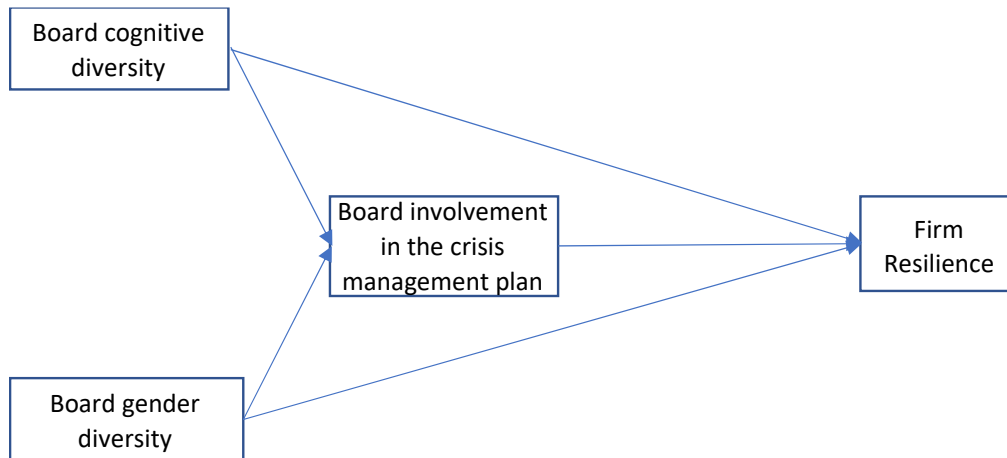
BOARD DIVERSITY AND RESILIENCE

The term “diversity” comes in different shapes and sizes. In principle, diversity describes differences perceived in a group, which can mean an infinite number of dimensions of characteristics (Van Knippenberg et al., 2004). It is interesting to point out that earlier inconsistent findings of group diversity have pushed the research effort into identifying diversity dimensions, such as demographic diversity and cognitive diversity, to shed light on distinct diversity impacts in an empirical setting (Dahlin, Weingart, & Hinds, 2005; Jackson, May, & Whitney, 1995; Miller, Burke, & Click, 1998; Milliken & Martins, 1996; Pelled, 1996; Simons et al., 1999; Van Knippenberg et al., 2004; Williams & O'Reilly, 1998). We continue the effort in examining the impact of two dimensions of diversity on resilience in a crisis, namely cognitive diversity and gender diversity.

Cognitive diversity captures the information/decision-making advantages due to differences in, for example, educational backgrounds, experiences, skills, and values (Jackson et al., 1995). We use board cognitive diversity to address differences in individual directors’ assumptions, thinking modes, perspectives, and causal beliefs. Board cognitive diversity can bring out multiple aspects of a key issue that the firm needs to be aware of when responding to adversity. Gender diversity captures a degree of balance between female and male boards of directors of a firm. The board gender diversity has shown increasing importance in board research (Kakabadse, Figueira, Nicolopoulou, Yang, Kakabadse & Ozbilgin, 2015; Triana et al., 2014), where a gender diverse board seems to add more value to a firm than a male-dominated board.

Board diversity is not only beneficial for normal business operations; it could also influence resilience during the COVID-19 pandemic. During the early phase of the pandemic, unessential activities stopped temporarily, cities were in lockdown for weeks, and the difficulty in handling this sudden change was tremendous (The Economist, 2020b, 2020c, 2020d). Facing devastating consequences, organizations must respond to in order to survive (Weick, 1988). We present the research framework in Figure 1, arguing that board diversity can be a desirable feature for firms to approach crisis management and strengthen their resilience in a crisis.

Figure 1. Research Model



Cognitive Diversity

The information processing theory postulates that the acquisition of diverse and unique information precedes and influences effective decision-making (Olson et al., 2007). Cognitive diversity is conducive to the process of collective information acquisition (Galbraith, 1974; Olson et al., 2007). In this regard, cognitive diversity focuses on an individual's task-related differences, an individual as an information processor, assembling, sorting, and filtering unique information that is potentially critical for solving problems (Gibson, 2001). The more diverse a group is, the broader the range for collective information accumulation, and the better the group outcome (Smith, Smith, Olian, Sims, Bannon & Scully, 1994). We elaborate on the advantages of cognitive diversity in the following.

First, the extent of collective information accumulation helps to deal with the many uncertainties entrenched in a crisis, and is a necessary organization contingency that we need to pay attention to (Thompson, 1967). When uncertainty increases, the amount of diverse information needed to achieve effective decision-making also increases (Egelhoff & Sen, 1992; Galbraith, 1974). Scholars examining the top management team have demonstrated that functional diversity becomes more useful when the environment becomes more uncertain (Cannella, Park, & Lee, 2008).

Second, the extent of diverse information is instrumental for the cognitive elaboration of decision-makers in a crisis (Stubbart, 1987), stimulating group creativity in identifying an innovative solution. Studies have validated the claim that cognitive diversity of the top decision-makers strengthens innovative problem-solving in the team (Pelled, Eisenhardt, & Xin, 1999; Torchia, Calabrò, & Morner, 2015) and contributes to the generation of strategic alternatives (Erhardt, Werbel, & Schrader, 2003). Albeit innovative solutions are good to have in general, they are even more valuable in a volatile environment, where standard approaches and solutions cease to be effective (Bantel & Jackson, 1989; Wiersema & Bantel, 1992). Moreover, researchers have found that cognitive diversity enhances organizational adaptations to a changing environment (Wiersema & Bantel, 1992) and improve administrative innovations in an organization (Bantel & Jackson, 1989). It is reasonable to suggest board cognitive diversity can enable the members to battle non-routine challenges in the pandemic.

Third, cognitive diversity engages multiple information filters to reduce information risks in a high-stakes environment, such as a crisis (Egelhoff & Sen, 1992; Olson et al., 2007). In a diverse group, individual decision-makers apply various filters to plow through the information presented to them and select those that are the most task-relevant—the more filters applied in sorting and selecting critical information, the better the quality of the decision-making. The use of filters may seem trivial when the decision-making is simple; however, it is increasingly important when a simple issue turns into a high-stakes matter. For example, it is normal for revenue to fluctuate; yet, a sudden drop in revenue due to a pandemic can quickly propel firms to shore up short-term liquidity. There are different approaches, such as cutting R&D investment, closing stores, or furloughing employees. Some are perhaps better than others. Directors could engage their multiple filters to reduce the information risk in selecting an appropriate one to recommend to management.

In short, the board's cognitive diversity fits the need to solve complex crises by using multiple filters.

Will the amount of unique information slow down the decision-making speed? One view suggests that diversity eventually leads to a high level of disagreement among members, who will take a longer time to settle their differences (Jehn, Northcraft, & Neale, 1999). Also, the amount of various views and opinions might increase the comprehensiveness of discussions, slowing down the integration of diverse information (Dahlin et al., 2005). Another view, however, indicates otherwise, which shows that top-level decision-makers understand the importance of time and can speed up the decision-making process in a diverse team (Kanadli et al., 2018). The second view also claims that fast decision-makers usually demand a greater amount of information than slow decision-makers (Eisenhardt, 1989). We align our thought with the latter view. It is reasonable to assume that directors are aware of the importance of time, and their quality of work depends on the amount of diverse information and their decision-making speed. Directors could also be fast decision-makers during a crisis when the organization must respond without delay to survive (Weick, 1988).

Overall, board cognitive diversity creates task-related information advantages, reduces uncertainty, limits information risk, and increases the creativity of decisions in a crisis. Firm resilience becomes stronger.

Hypothesis 1.1: Board cognitive diversity is positively associated with resilience during the COVID-19 pandemic.

Gender Diversity

Gender diversity is an often researched diversity dimension (Van Knippenberg & Schippers, 2006; Williams & O'Reilly, 1998). Board gender diversity measures the degree of gender balance in a boardroom. Despite the benefit of gender diversity in a board, male directors dominate most corporate boards (Eagly, 2016; Kakabadse et al., 2015; Triana et al., 2014). Improvements are being made over the years by implementing a gender quota system to promote female participation, such as in Norway (Huse, 2018). Still, female directors' involvement is limited. A recent article points out that female directors only hold about 17% of board directorships in global companies in the MSCI ASWI Index and about 21% of board seats in the S&P 500 (Cheng & Groysberg, 2020). In the U.S., female directors have increased by a net amount of 2,700, while male directors have declined by 1,900 from 2015 to 2021 (Wakefield, et. al, 2021). U.S. firms have advanced greatly toward a gender-balanced board. Using information processing theory (Galbraith, 1974), a gender diverse board is more likely to gain information advantages than a less diverse board in a crisis.

From the information processing view, female and male directors can bring a multiplicity of information sources. It is due to the fact that female directors significantly differ from their male counterparts in professional background, education, and pattern of board affiliations (Hillman, Cannella, & Harris, 2002). Such differences in disciplinary and educational backgrounds reflect information variety (Harrison & Klein, 2007), signifying female directors are able to generate a different set of expertise, experiences, and network ties, complementing their male counterparts.

It is interesting to notice that female directors influence not only the type of information and issues to be discussed but also the manner in which diverse views are shared among members (Kakabadse et al., 2015). That is, women tend to display a collaborative working style, and they demonstrate strong empathy and sensitivity (Terjesen & Val Sign, 2009). The gender traits suggest female directors are willing to listen to dissimilar opinions and can be effective communicators of diverse views. Thus, a gender diverse board can better circulate unique information: a crucial aspect of managing information processing during a crisis (Osler, 2016). Other researchers even claim that female directors' unique knowledge could serve as a better control mechanism to strengthen a firm's financial performance (Campbell & Minguez-Vera, 2008; Gul, Srinidhi, & Ng, 2011; Poletti-Hughes & Briano-Turrent, 2019).

There is a risk. Researchers using the social categorization perspective point out that gender diversity creates group conflicts and biases because of the incompatible differences between males and females (Tajfe, 1981; Van Knippenberg et al., 2004). It also creates a perception of inferior social status (Kakabadse et al., 2015; Main & Gregory-Smith, 2017; Nielsen & Huse, 2010), influencing female directors' career advancement. Meantime, male directors may feel the need to protect their authority, which reduces group cohesion and group performance. The impact of disparity could overpower that of information variety, and the net effect becomes negative.

Nevertheless, we argue that the urgency of dealing with a crisis may help directors keep things in perspective. The significance of any crisis with a considerable impact may shape directors' attention towards value-focused activities. Hence, the effect of information variety becomes stronger than that of social categorization.

Hypothesis 1.2: Board gender diversity is positively associated with resilience during the COVID-19 pandemic.

Studies of gender diversity are still inconclusive (Eagly, 2016), and research on cognitive diversity also yields a similar result (Miller et al., 1998). The direct impact of gender and cognitive diversity on firm resilience becomes questionable. To address this issue, we could explore potential mediators through which diversity exerts its effect (McNulty, 2013; Meissner & Wulf, 2017; Van Knippenberg et al., 2004). For example, directors' involvement in an open discussion is an effective way to utilize diverse information of a board, through which board cognitive diversity improves board strategic task performance (Zhang, 2010). Indeed, identifying a context-specific mediator could increase our understanding of the board's actions in a crisis (McNulty, 2013).

BOARD INVOLVEMENT IN A CRISIS MANAGEMENT PLAN

A crisis is considered to be an event that is highly salient, unexpected, and potentially disruptive for business operations (Bundy et al., 2017). Crisis management “*broadly captures organizational leaders' actions and communication that attempt to reduce the likelihood of a crisis, work to minimize harm from a crisis, and endeavor to reestablish order following a crisis*” (Bundy et al., 2017, p.1663).

There is a strong call for boards of directors to fully participate in developing a firm's crisis management plan (Cohn, 2020; Deloitte, 2019; Osler, 2016), in addition to their typical board roles. They are, for example, monitoring the management on behalf of shareholders, providing valuable advice, and networking (Johnson, Daily, & Ellstrand, 1996; Zahra & Pearce, 1989). Albeit it is the top executives' responsibility to develop the plan articulating pre-crisis defensive and preventive initiations, the board is responsible for approving the plan (Preble, 1997). In the following, we apply the information processing perspective to present the benefits of board involvement in a crisis management plan.

According to information processing, crisis management is about developing a system of gathering, storing, sharing, and interpreting information for decision-making and communication (Egelhoff & Sen, 1992). A noticeable feature of crisis management is the uncertainty of the event, which suggests that the amount of uncertainty elicits a corresponding amount of information that has to be processed during the execution of strategies and policies (Galbraith, 1974). When the uncertainty is low, the group understands a task well before performing it, and the group can plan much of the activities (Galbraith, 1974). When the information uncertainty increases, the plan becomes difficult. Consequently, a crisis management plan should prepare firms to engage in strategies and policies to increase flexibility and the ability to reduce the impact of information uncertainty on planning (Galbraith, 1974), and help firms manage the information uncertainty before, during, and after a crisis (Bundy et al., 2017). Board involvement in a crisis management plan could help build the amount of information required to navigate the uncertainty.

Boards of directors can bring the benefit of diverse backgrounds and expertise, and enrich the information-gathering stage of crisis management. The information variations could help create collective managerial mindfulness of the changing environment (Weick, Sutcliffe, & Obstfeld, 1999), contributing to a highly reliable organization capable of managing unexpected events (Bundy et al., 2017). Also, crisis management recognizes the negative impact of cognitive limitations in managing a crisis (Kahn, Barton, & Fellows, 2013), implying the potential benefit that board diversity could present to the crisis management plan.

Board involvement in a crisis management plan underscores the need to utilize information in a volatile environment, instrumental for building strategic leadership by the board in a crisis (Luciano et al., 2020). Strategic leadership suggests that, besides working independently of the management team, directors should also work *with* the management team to process information (Luciano et al., 2020). As a result, the coordination of understanding *ex ante* and the coordination of actions responding to a crisis strengthens. The importance of collective information processing due to the board's engagement with the management team is also noticed in other studies. For instance, it can reduce the barrier to information (Boivie, Bednar, Aguilera, & Andrus, 2016) and avoid sub-optimal strategic decisions (Morais, Kakabadse, & Kakabadse, 2018).

The above benefits of board involvement in crisis management echo the observation of board participation. For instance, boards of directors can challenge a crisis management proposal by scrutinizing the plan, ensuring the crisis management plan is executed correctly, intervening when the management team fails to manage the crisis, and learning from each crisis management (Cohn, 2020; Deloitte, 2019; Loop, 2017; Osler, 2016). We summarize the board involvement in four areas: 1) the creation of the crisis management capabilities, 2) the development of crisis

management responsibilities and roles, 3) the identification of a crisis spokesperson, and 4) the development of IT preparedness to be deployed during a crisis.

First, the boards of directors could contribute to the crisis management plan by ensuring that the crisis management capabilities are in place (Deloitte, 2019). Crisis management capabilities reflect dynamic management capabilities, which construct, integrate, and reconfigure the organization's resources and competences (Adner & Helfat, 2003). It resonates with the idea of organizational preparedness for a crisis, drawing from an internal perspective of crisis management (Bundy et al., 2017). Practitioners believe that whether or not a firm can successfully walk out of a crisis with minimal damage is directly associated with its crisis management capabilities (Loop, 2017; Osler, 2016).

Building crisis management capabilities could stimulate proactive interventions. Even though most crises are unforeseeable, there are often clues signaling pending crises, which are identifiable. Firms could manage the uncertainty to a certain degree by addressing potential problems before developing into an uncontrollable disaster. Specifically, the boards of directors' alertness to the early warning signals from the external environment could strengthen crisis management capabilities in developing defensive approaches to managing a crisis (Loop, 2017; Osler, 2016). Case in point, before most US businesses came to a halt by March 2020, there were already warning signs in other parts of the world. Several European countries, such as Italy and Spain, stopped normal economic activities to slow down the spread of COVID-19 (The Economist, 2020a). The fall of revenue generation became unavoidable for many businesses. The warning signs could also be seen from within organizations (Gephart, Van Maanen, & Oberlechner, 2009), underlying the destructive managerial behavior of complacency and over-optimism. Board's involvement in developing the crisis management capabilities helps the management team initiate preventive approaches limiting the behavioral mismanagement of a crisis (Bundy et al., 2017).

All in all, crisis management capabilities can yield a more comprehensive approach to the overall productive strategic management of a crisis (Preble, 1997). Firm resilience is likely to strengthen.

Second, identifying a crisis handler, specifying the responsibilities of leading the firm in a crisis has received much research focus in crisis management (Bundy et al., 2017), resonating with the practitioner's view of crisis management at the board level (Osler, 2016). The board adds value by establishing clear expectations of the responsibilities and roles during a crisis period. The board's involvement may create opportunities for meaningful discussions between the directors and the management team of what to do, contributing to identifying key members from the management team, who, besides their regular duties, are trained and prepared to take additional responsibilities and roles during a crisis (Loop, 2017; Osler, 2016).

Developing crisis-related responsibilities satisfies the information-processing demand. Managing information flow in a timely and effective fashion is a critical element of a crisis management plan (Bharosa, Lee, & Janssen, 2010; Ozanne, Ballantine, & Mitchell, 2020). The specification of the crisis-related responsibilities and roles increases information-processing capacity, which reduces the information-processing overload on a daily management structure when the uncertainty heightens (Galbraith, 1974). Moreover, when the crisis-related responsibilities and roles are integrated with the day-to-day operational design, the execution of crisis management becomes

more efficient (Preble, 1997). In short, the board can affect the internal preparedness by clarifying the crisis management related responsibilities and roles. The firm's survival is enhanced.

Third, firms bear the responsibility to inform the vast stakeholders of the crisis impact and firm responses (Christianson, Farkas, Sutcliffe, & Weick, 2009). Identifying a chief spokesperson could be one efficient approach. The public, consumers, and employees are keen on receiving prompt updates during a crisis; a crisis, thus, contains a seed of opportunity for leaders and managers to display leadership skills through communication (Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017).

The practicality of identifying a chief spokesperson has received support from business communities, where boards of directors play a role (Deloitte, 2019; Loop, 2017; Osler, 2016). It is tough to provide accurate and timely information to satisfy the demand, especially when opinions, false stories, and facts are entangled (Loop, 2017). A selection of the right spokesperson before a crisis may achieve effective 'meaning' making, facilitating the progression of recovery (Williams et al., 2017), as well as safeguarding a firm's reputation (Osler, 2016).

Fourth, information technology (IT) preparedness is another critical aspect of the crisis management plan (Egelhoff & Sen, 1992), and doing so strengthens the internal preparedness of an organization for a crisis (Bundy et al., 2017). A recent study shows that firms with IT preparedness before the COVID-19 pandemic fare better than those without (Shankar, 2020). During the epidemic, employees worked remotely, and traditional face-to-face business transactions also went online (The Economist, 2020a). Organizational IT preparedness suggests firms are prepared to transition to the online space with reduced disruption. Boards of directors can add value by ensuring that goal.

To sum up, the boards of directors are a vital force for a crisis management plan. They can help develop the crisis management capabilities, clarify crisis management responsibilities and roles, identify the key spokesperson, and ensure IT preparedness.

Hypothesis 2.1: The degree of the board's involvement in the crisis management plan is positively associated with firm resilience during the COVID-19 pandemic.

A crisis management plan resonates with the concept of motivated information processing, describing a specific motivational influence on group information processing and decision-making (De Dreu, Nijstad, & Van Knippenberg, 2008). Researchers have claimed that information processing includes various activities centered on epistemic motivation, capturing a group's willingness to expend effort to understand the creative generation, dissemination, and integration of information (De Dreu et al., 2008). Board diversity may build a stronger epistemic motivation that engages the board to find solutions pertaining to a crisis intelligently. Thus, it is reasonable to suggest a positive link between board diversity and board involvement in the crisis management plan.

The positive relationship gets additional support from what may happen if the diversity is absent during a crisis. Researchers have demonstrated that boards of directors often fail to understand a crisis because of their narrow vision (Merendino & Sarens, 2020). Board diversity could help

correct the limited vision by developing an inclusive view of a crisis management plan, increasing awareness of various stakeholder demands during a crisis. The success of managing COVID-19 in South Korea confirms comprehensive information processing in a crisis needs multiple sources of information (Lee, Yeo, & Na, 2020). Hence, board diversity addresses the need for adequate information provision in a crisis management plan (Ozanne et al., 2020).

Hypothesis 2.2: Board cognitive diversity positively and indirectly improves resilience through board involvement in the crisis management plan during the COVID-19 pandemic.

Hypothesis 2.3: Board gender diversity positively and indirectly improves resilience through board involvement in the crisis management plan during the COVID-19 pandemic.

METHOD

We applied survey data in this study. The data was collected between April 23 and June 5 of 2020 in the US. It was a period when many firms had started to suffer the impact of the extreme economic volatility induced by the COVID-19 pandemic (The Economist, 2020b, 2020c). Data collection involved two stages. First, we developed the survey items to capture the constructs, and then we collaborated with Qualtrics to launch the data collection in the US.

The survey questions contain firm information, board directors' characteristics, and board responses to the COVID-19 pandemic. We have undertaken three steps to ensure the survey's quality: examining survey questions in reports of board crisis responses (e.g., Deloitte, 2019; Loop, 2017; Osler, 2016), conducting the literature review of board behavior (e.g., McNulty et al., 2013; Sellevoll, Huse, & Hanse, 2007), and discussing survey item development with researchers and practitioners in the field of the boards of directors. To gauge the quality, we launched two pilot tests in April of 2020 among board researchers and board directors, and integrated the feedback into the final design.

Qualtrics is an experience management company owned by SAP. It provides the survey tool and a rich network of professionals willing to assist researchers in collecting data. Using Qualtrics to collect data comes with a fee proportionate to the data collection difficulty and the amount of data collected. There is some evidence that data collection through Qualtrics satisfies a rigorous research requirement (Holt & Loraas, 2019). However, caution is needed in the survey design and data screening (Owens & Hawkoin, 2019). Following the suggestions of using Qualtrics effectively (Holt & Loraas, 2019; Owens & Hawkoin, 2019), we set up several criteria for the data collection process. First, participants are companies with boards of at least four members. Respondents can be a company's CEO, its board chairperson, or board member. Some 538 respondents participated in the survey from 41 US states. The exclusion of responses with a board size smaller than four reflects a situation where small firms are unlikely to develop a crisis management plan (Berbane, 2010), which is a crucial element in this study. Second, the average length of completion time is about nine minutes, and we removed responses with a completion time of less than five minutes. Third, we removed responses that showed any typical data patterns, such as an exact ascending or descending order in the answers. Fourth, we removed responses

where the percentage of female directors was 100%, and where the board has more than eight directors, as such cases are relatively rare (Cheng & Groysberg, 2020). Fifth, any incomplete response regarding directors' competence is removed. Sixth, responses with any inconsistencies in questions related to the total board members and the total women directors are also removed. After screening, we have 271 cases.

Of the final data, 23% of the respondents are CEOs, 12% are board chairpersons, 15% serve dual positions of both a CEO and a board chairperson, 47% are inside board directors, and 3% are outside board directors. The mix of different respondents may reduce respondent bias in a survey design (Meier & O'Toole Jr., 2013). Regarding the board size, 80% of the final data suggests a size between four and ten directors. Specifically, four-member boards count for 11%, five and six-member boards each count for 15% respectively, seven-member boards count for 10%, eight-member boards for 11%, nine-member boards for 6%, and ten-member boards for 11%. Last, 4.4% of cases suggest a board size larger than 15 members.

Regarding the early COVID-19 impact on firm revenue, most responses have indicated a negative effect, where 66% have seen an evident decline in firm financials, and half of which claimed a significant drop. Some 12.5% of respondents have not yet observed any financial impact. The rest saw an increase in financials. We also surveyed the industry of the firms: 18% of them are from the IT segment, 17% from finance, 11% each from manufacturing and retail market respectively, 9% from healthcare, 6% each from the hospitality and the construction sector respectively, and 5% from transportation and logistics. The remainder make up less than 2%. We present additional descriptive statistics in Table 1.

Table 1. Descriptive Data and Correlation

N= 271	Min	Max	Mean	Std. Dev	1	2	3	4	5	6
Employee	2	6	4.32	1.490	1					
Revenue 2019	1	6	3.83	1.698	0.581***	1				
Tenure	1	5	2.94	0.867	0.009	0.123	1			
Total board directors	4	>15	10	3.253	0.208***	0.227***	0.030	1		
Board gender diversity (Blau Index)	0	0.50	0.45	0.06	0.030	-0.041	-0.155*	-0.006	1	
Life cycle stage	1	4	2.59	0.595	0.078	0.070	0.124*	0.060	0.006	1

Notes

***. Correlation is significant at the 0.001 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Employee numbers

1: Below 100, 2: 101–300, 3: 301–500, 4: 501–700, 5: 701–900, 6: More than 900

Firm's revenue for 2019

1: Below USD 10 million, 2: USD 11–50 million, 3: USD 51–100 million, 4: USD 101–300 million, 5: USD 301–600 million, 6: More than USD 600 million

Life cycle stage

1: Start-up stage, 2: Growth stage, 3: Mature stage, 4: Decline stage

Constructs and Variables

We present survey questions for the constructs in Appendix 1. They include board cognitive diversity, board involvement in the crisis management plan, resilience, and board expertise that serves as a control variable in the model.

Board cognitive diversity measures the degree of variation in directors' backgrounds related to board task performance and decision-making quality (Simons et al., 1999; Williams & O'Reilly, 1998). Specifically, we have focused on differences regarding directors' educational background, industry expertise, and functional knowledge. These differences can suggest a healthy informational variety and serve as an indicator of a group's cognitive strength (Harrison & Klein, 2007). We include directors' visions for the firm and personal values, as they also lead to informational variety in a group (Jackson et al., 1995).

The idea of resilience represents a firm's ability to overcome adversity, and its specific measurement can, however, vary depending on the research context (Duchek et al., 2020; Williams et al., 2017). We chose one of the typical approaches to measure resilience, measuring how well the firm has managed to respond to and bounce back from the crisis (Linnenluecke, 2017). In that respect, resilience should address a firm's strength to recover following an initial economic shock (Williams et al., 2017), which includes a firm's ability to adapt to a sudden change (Lengnick-Hall & Tammy, 2005), and to avoid and navigate risks (Somers, 2009). In our context, we have seen how COVID-19 has disrupted the supply chain, created a devastating effect because of the lockdown, and increased the risk of financial liquidity problems for businesses (The Economist, 2020b, 2020c). As a result, we selected four items to measure resilience, measuring the firm's ability to adapt to market volatility, overcome uncertainty, avoid/reduce negative impact, and deal with financial liquidity problems due to the COVID-19 pandemic.

Board involvement in crisis management is the third construct. It influences resilience and also serves as the mediator between board cognitive diversity and resilience. Four items are used to measure board involvement in crisis management. As presented earlier, this construct measures the extent to which the board is involved in developing crisis management capabilities (Bundy et al., 2017; Deloitte, 2019), clarifying crisis management responsibilities and roles (Bundy et al., 2017; Galbraith, 1974), achieving effective crisis communication through identifying a key spokesperson (Deloitte, 2019; Loop, 2017; Osler, 2016; Williams et al., 2017), and ensuring IT readiness to handle operational emergencies (Egelhoff & Sen, 1992; Shankar, 2020).

The construct of board expertise is the control variable. Board expertise measures the degree of directors' knowledge in their typical roles, such as compensation, nomination, succession, auditing, and strategic planning (Huse, 2018). Board knowledge and expertise contribute to overall organizational knowledge, vital for a firm to develop adaptability to changes, solve problems, and build resilience (Hamel & Valikangas, 2003). Board knowledge can also shape the way in which directors give advice and render service to the management, and ultimately the firm's performance during a crisis (McNulty, 2013; Merendino & Sarens, 2020). In summary, board expertise is an integral part of the firm's internal resources, influencing the board's response to a crisis (Bundy et al., 2017). We also controlled for firm revenue. A healthy revenue helps firms weather the storm

of a market shock (Markman & Venzin, 2014). Firm revenue of 2019 could thus influence resilience in the COVID-19 crisis.

The confirmatory factor analysis (CFA) from the SPSS AMOS is applied to evaluate the four constructs. The summary of the four constructs and the measurement model is presented in Table 2, with the construct reliability and validity measures presented in Table 3. The covariance table is provided in Appendix 2.

Table 2. Constructs and Model Fit

Constructs	Loadings
Board Cognitive Diversity	
<i>Education backgrounds</i>	0.721
<i>Vision for the firm</i>	0.839
<i>Industry expertise</i>	0.689
<i>Functional knowledge</i>	0.746
<i>Personal values</i>	0.825
Resilience	
<i>Adapted well to market volatility</i>	0.712
<i>Overcome uncertainty</i>	0.768
<i>Avoided/reduced the negative impact</i>	0.734
<i>Had financial liquidity problems</i>	0.631
Board Involvement in Crisis Management Plan (BICMP)	
<i>Responsibilities and roles</i>	0.876
<i>Crisis management capabilities</i>	0.837
<i>Chief spokesperson/management leader</i>	0.748
<i>IT preparedness</i>	0.759
Board Expertise	
<i>Compensation</i>	0.788
<i>Nomination</i>	0.780
<i>Audit</i>	0.668
<i>Succession planning</i>	0.722
<i>Strategic planning</i>	0.667
Measurement Model Fit Indices	Values Threshold Values
<i>CMIN/DF</i>	1.569 1- 3
<i>CFI</i>	0.970 >0.95
<i>RMSEA</i>	0.046 <0.06
<i>PCLOSE</i>	0.700 >0.05

In Table 2, the measurement model has indicated a good model fit. The index CMIN/df measures the minimum discrepancy, and a value between 1 and 3 shows an acceptable fit (Carmines & McIver, 1981). The comparative fitness index (CFI) is a relatively independent measure of sample size, and the fit is adequate when a value is larger than 0.95 (Hu & Bentler, 1998). Root Mean Square Error of Approximation (RMSEA) is a popular measure of model fit, and a value smaller

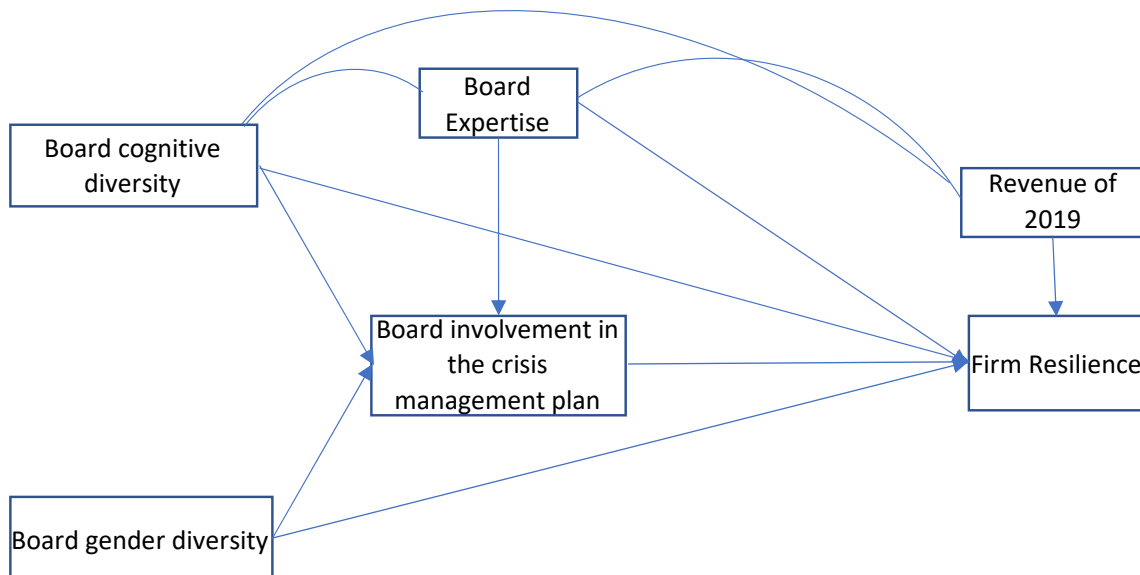
than 0.06 should suffice (Hu & Bentler, 1999). PCLOSE (p of Close Fit) often pairs together with RMSEA when RMSEA is smaller than 0.05 (which is the case in our study), and a value larger than 0.05 suggests a close fit (Hair, Black, Babin, & Anderson, 2010).

Table 3. Reliability and Validity

	CR	AVE	MSV	MaxR(H)				
BICMP	0.888	0.665	0.417	0.896	0.815			
Board Cognitive Diversity	0.876	0.587	0.048	0.886	0.220	0.766		
Resilience	0.805	0.508	0.321	0.811	0.567	0.164	0.713	
Board Expertise	0.848	0.528	0.417	0.855	0.646	0.160	0.533	0.727

Reliability and validity measures are presented in Table 3. The reliability of a construct measures the consistency of items. We use the Composite Reliability (CR) index, which takes into consideration errors of items, and a value above 0.7 suggests acceptable reliability (Hair et al., 2010). The CR values of the four constructs are all higher than 0.8. We have no reliability concerns. The validity of a construct measures the degree of the quality of the measurement. We use the Average Variance Extracted (AVE) to measure the convergent validity, and a value larger than 0.5 suggests that a construct is well measured by the indicators (Fornell & Larcker, 1981). All AVEs are higher than 0.5, and the significant factor loadings in Table 2 echo the same result. Four factors of the study show a good convergent validity. We have measured the discriminant validity, which examines how different constructs are from each other. Good discriminant validity requires that the Maximally Shared Variance (MSV) is smaller than the corresponding AVE, the Maximum Rho (MaxR(H)) is larger than MSV, and the square root of the AVE of the constructs is larger than the correlation displayed on the diagonal of the table (Fornell & Larcker, 1981). The four constructs satisfy these requirements (see Table 3), and they are distinctively different from each other. To conclude, we have obtained good measurements for the constructs.

Figure 2. SEM of the Research



Structure Model fit:

CCMIN=1.371 (1-3), CF = 0.996 (>0.95), RMSEA=0.037 (<0.06), PCLOSE=0.535 (>0.05)

Analysis

Structural Equation Modeling (SEM) is applied. We used SPSS AMOS version 25.0.0 to run the SEM model and check the model fit (see Figure 2). In the model, we regress board cognitive diversity and gender diversity on firm resilience directly and indirectly through the mediator of board involvement in the crisis management plan.

The model fit indices suggest we have a good model fit. In particular, the RMSEA is 0.037, indicating a good and close fit (Byrne, 2001). The R square for resilience and board involvement in the crisis management plan is 0.469 and 0.526, respectively, indicating we could reasonably draw statistical inferences from the model results (see Table 4).

Table 4. Direct, Indirect and Total Effect

	Resilience R ² =0.469			Board Involvement in Crisis Management Plan (BICMP) R ² =0.526		
	Direct effect	Indirect effect	Total effect	Direct effect	Indirect effect	Total effect
Board expertise	0.308 P=0.009	0.274 P=0.001	0.582 P=0.008	0.695 P=0.004	0.000 -	0.695 P=0.004
Revenue 2019	0.097 P=0.043	0.000 -	0.097 P=0.043	0.000 -	0.000 -	0.000 -
Board cognitive diversity	0.017 P=0.640	0.045 P=0.011	0.062 P=0.168	0.114 P=0.021	0.000 -	0.114 P=0.021
Board gender diversity	-0.059 P=0.085	-0.014 P=0.159	-0.072 P=0.069	-0.034 P=0.168	0.000 -	-0.034 P=0.168
BICMP	0.394 P=0.002	0.000 -	0.394 P=0.002	0.000 -	0.000 -	0.000 -
N=271						

The hypotheses aim to evaluate the direct and indirect effects. The direct effect concerns how board cognitive diversity and gender diversity influence resilience. The indirect effect concerns how board involvement in a crisis management plan mediates the above relationships. Therefore, it is necessary to evaluate the indirect, direct, and total effect in the SEM analysis (Siegfried & Thomas, 2011).

The direct effect describes a direct relationship without any mediation. We investigate 1) the effect of board diversities and the effect of board involvement in crisis management planning on resilience, and 2) the effect of board diversities on board involvement in a crisis management plan. Regarding regression on resilience, board gender diversity significantly and negatively influences resilience at -0.059 with $p=0.085$. The impact of board cognitive diversity, however, is insignificant with $p=0.640$. The effect of board involvement in crisis management is significant at 0.394 with $p=0.002$. Regarding regression on board involvement in the crisis management plan, board cognitive diversity significantly influences the mediator at 0.114 with $p=0.021$, while board gender diversity fails to produce a significant result.

The indirect impact describes the mediation effect. We only examine the indirect effect of board diversities on resilience through board involvement in a crisis management plan. The results show that board cognitive diversity has a significant and positive indirect effect on resilience at 0.045 with $p=0.011$, while board gender diversity fails to produce a significant result.

The total effect describes an overall impact from both the direct and indirect influences. We checked two total effects: the total effect of board diversity on resilience, and the other the total effect of board diversity on board involvement in a crisis management plan. The results show that the total effect of board gender diversity on resilience is significant at -0.072 with $p=0.069$. The total effect of board cognitive diversity is insignificant. The total effect of board gender diversity on board involvement in a crisis management plan is insignificant, and while board cognitive diversity has a significant and positive impact at 0.114 with $p=0.021$. Hypothesis 1.1 suggests a positive relationship between board cognitive diversity and resilience. The direct and total effect of board cognitive diversity on resilience is insignificant, rejecting the hypothesis. Hypothesis 1.2 describes a positive relationship between board gender diversity and resilience. This hypothesis fails to receive support, as the direct and total effects are both significantly negative.

Hypothesis 2.1 claims a positive relationship between board involvement in the crisis management plan and resilience. We have found support for this hypothesis, where the direct and total effect of board involvement in the crisis management plan on resilience are both significant at 0.394 with $p=0.002$.

Hypothesis 2.2 suggests a positive and indirect effect of board cognitive diversity on resilience through board involvement in the crisis management plan. When examining the mediation effect of board involvement in crisis management, board cognitive diversity's direct and total impact on resilience is insignificant. However, the indirect effect is significant at 0.045 with $p=0.011$. Albeit it is difficult to examine the mediation effect when there is a lack of direct and total effect (Baron & Kenny, 1986), such cases do exist (Rucker, Preacher, Tormala, & Petty, 2011). Participants may have difficulty generating thoughts about a concept, and are thus less confident and less favorable about it, leading to insignificant direct and total effects (Tormala, Falces, Brinol, & Petty, 2007). In our case, the participants may have difficulty perceiving board cognitive diversity with confidence in a crisis without knowing how cognitive diversity is utilized (Van Knippenberg et al., 2004). As a result, the direct and total effects become insignificant. However, a potential mediator could still exist (Rucker et al., 2011; Tormala et al., 2007), as exemplified by a significant indirect

relationship between board cognitive diversity and resilience via board involvement in a crisis management plan. Hypothesis 2.2 receives support.

Hypothesis 2.3 suggests a positive and indirect effect of board gender diversity on resilience through board involvement in the crisis management plan. The indirect effect is insignificant ($p=0.159$). Hypothesis 2.3 fails to receive support.

DISCUSSION

Scholars and researchers have long noticed that boards of directors affect firm performance during a crisis (Duchek et al., 2020; Fernandes et al., 2017; Lorsch & MacIver, 1989; Luciano et al., 2020; McNulty, 2013). The influence is becoming ever more crucial when the pace, severity, and complexity of the modern crisis is seen to have intensified, so much so that most firms experience a crisis every four or five years (Kahn et al., 2013). However, what used to work in a normal situation, may not apply in crises when examining board behavior (Fernandes et al., 2017; Kapper & Love, 2004; Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998), such as the impact of board diversity. Although there is evidence indicating both board cognitive diversity and gender diversity can improve firm performance (Roberson, Holmes, & Perry, 2017), the relationship between diversity and resilience remains underexplored during a crisis (Duchek et al., 2020). This paper investigates the impact of board diversity on resilience during the initial phase of the COVID-19 when the speed of the pandemic caught businesses off guard, and many of them failed to cope with a sharp revenue decline in a short time and had to file for bankruptcy (The Economist, 2020b, 2020c, 2020d).

Board Involvement in Crisis Management

According to information processing theory, it is fruitful to investigate potential mediators to shed light on how group diversity can be utilized (Simons, 1978; Van Knippenberg et al., 2004). Our study confirms the usefulness of the approach by identifying board involvement in crisis management as the mediator. Board involvement in the crisis management plan underscores the board's willingness to spend its effort on developing guidelines for actions to take control of a chaotic situation induced by a crisis. The plan can be strategic, providing a long-term solution (Preble, 1997). It can also serve as a short-term toolbox, enabling the search for an immediate response (Weick, 1988). The study result shows that the impact on resilience of board involvement in the crisis management plan is strong at 0.394, higher than the effect of board expertise at 0.308. The indirect effect of board expertise via board involvement in the crisis management plan is also significant at 0.274 ($p=0.001$) (see Table 4). The significant results suggest that the boards of directors utilize its members' knowledge and expertise through a process of developing a crisis management plan, building a deep level of information richness (Jackson et al., 1995), and ultimately creating a positive impact on resilience.

The importance of board involvement in a crisis management plan also fits the argument of sense-making (Weick, 1988), which may become more useful for organized collective decision-making under specific guidelines (Foss, 2020). The deeply ambiguous nature of crises, such as the initial phase of COVID-19, suggests a lack of precise understanding of what to do. A crisis management

plan is likely to reduce the confusion, guiding the collective decision-making effort to make a best guess for a way forward in an uncertain situation.

Board Cognitive Diversity

Board cognitive diversity has generated an unexpected result in this study. We have observed a significant and indirect relationship between board cognitive diversity and resilience, but we fail to confirm a direct relationship between them. Such a combination is rare but possible (Rucker et al., 2011; Tormala et al., 2007). It suggests that respondents may have difficulties perceiving board cognitive diversity without knowing how cognitive diversities are utilized (e.g., Rucker et al., 2011; Tormala et al., 2007). The explanation renders support to the information processing claim that sharing and processing diverse and unique information is crucial when examining cognitive diversity's impact (Simons, 1978; Van Knippenberg et al., 2004), and perhaps more so in a crisis.

Board Gender Diversity

The result of an adverse effect of board gender diversity on resilience has three implications. First, the negative effect of -0.059 suggests that a potential benefit due to information variety of gender diversity has not occurred. The explanation of informational advantages has not received support for gender differences. The negative result is consistent with the prediction of social categorization theory (Tajfe, 1981; Van Knippenberg et al., 2004). According to the theory, gender diversity is prone to promote in-group and out-group associations between male and female directors, increasing group conflicts and reducing group cohesion (Tajfe, 1981; Van Knippenberg et al., 2004). It is possible in our case, gender diversity has impeded the sharing and disseminating of diverse information, and consequently, we have observed a negative relationship between gender diversity and resilience. Social categorization's negative effect could be present when evaluating the direct effect of gender diversity on board involvement in a crisis management plan. The effect is -0.034 but insignificant.

Second, the indirect effect of gender diversity on resilience is not significant with $p=0.159$; board involvement in the crisis management plan does not mediate board gender diversity on resilience. There are two inferences. First, it is necessary to differentiate the dimensions of diversities, as they may exert different impacts (Milliken & Martins, 1996; Nkomo et al., 2019; Williams & O'Reilly, 1998). Second, the mediating mechanism, which is effective for board cognitive diversity, fails to work for board gender diversity. Tapping into informational benefits due to gender may require a different mechanism; perhaps, board leadership may serve as an effective mediator (Kakabadse et al., 2015).

Third, the discussion of gender differences in a board is likely to continue. We may witness an intensified working relationship between male and female directors in a crisis when there is less time, and perhaps, less patience for the in-group members to hear out the out-group members. Although gender diversity can create positive effects (Kakabadse et al., 2015; Poletti-Hughes & Briano-Turrent, 2019), our study suggests gender diversity in the pandemic may produce more stress and conflicts.

Future Research

This paper has focused on board involvement in the crisis management plan as a mediator. Future research could investigate other mechanisms. For example, some have used the degree of cognitive diversity as a moderator of information integration (Dahlin et al., 2005). They found that after the degree of diversity reaches a saturation point, it becomes difficult for members to absorb the additional unique information: the marginal benefits of cognitive diversity decline. The degree of cognitive diversity gains interest in another study of debiasing judgment in an executive team (Meissner & Wulf, 2017). However, the paper suggests a high degree of cognitive diversity is more powerful than a low degree of cognitive diversity in reducing decision-making biases. In a crisis, whether the degree of diversity matters in resilience, we know little about yet.

Leadership is another critical moderator, which improves group diversity effectiveness (Wang, Kim, & Lee, 2016). Future studies may combine leadership and gender diversity in the context of a crisis and explore how leadership could moderate the negative impact of gender diversity on resilience.

It is important to point out a special feature of a crisis. Besides being highly salient, unexpected, and potentially disruptive, a crisis is a part of a larger process rather than a discrete event (Bundy et al., 2017; Williams et al., 2017). Therefore, the board's involvement in the crisis management plan should reflect a continuous effort, such that the plan can change to fit an evolving environment (Egelhoff & Sen, 1992; Osler, 2016; Preble, 1997). While focusing board diversity on knowledge and skills is a critical part of building a strong process (McNulty et al., 2013), future studies could examine change in a crisis management plan and how board diversity influences that change.

The current paper has measured resilience using the organizational response to COVID-19. We see two potential areas of further study relating to resilience measurement in a crisis. First, future studies could approach resilience by measuring organizational reliability and employee strengths (Linnenluecke, 2017). In particular, it could be interesting to investigate the impact of board diversity on employee strengths during COVID-19. Second, while we have chosen a long-term perspective in our to approach resilience; however, a firm's response to resilience isn't the same for all, and decision-makers' subjective values can influence the choice of actions (Jones, 2019). The response to the pandemic could signal a short-term orientation, such as laying off employees and closing stores (Campello, Giambona, Graham, & Harvey, 2011), which may create an immediate result but at the cost of weakened employee strengths (Linnenluecke, 2017). Future studies could explore board involvement in both long- and short-term responses to a crisis.

Finally, this study has not examined the impact of a crisis management plan for small businesses with a board size below four members. Researchers have pointed out the acute situation smaller firms endure during a crisis and the benefits a crisis management plan may bring (Berbane, 2010). However, small businesses' approaches to resilience may vary substantially from more resourceful firms (Harries, McEwen, & Wragg, 2018). Future research, therefore, could explore conditions under which small businesses implement the crisis management plan to improve resilience.

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Appendix 1 - Survey items on the four constructs

1. Please rate the degree of directors' expertise using a 7-point Likert scale between extremely low to extremely high.
 - a. Compensation
 - b. Nomination
 - c. Audit
 - d. Succession planning
 - e. Strategic planning
2. Using a 7-point Likert scale between very similar to very different, circle how different are the directors in their
 - a. Education backgrounds
 - b. Visions for the firm
 - c. Industry expertise
 - d. Functional knowledge
 - e. Personal values
3. Using a 7-point Likert scale between never to very frequently, circle before COVID-19, how often has the board
 - a. inquired about responsibilities and roles in case of a crisis?
 - b. asked about the crisis management capabilities of the executive team?
 - c. asked who the chief spokesperson/management leader is during the crisis period?
 - d. inquired about the IT preparedness in case of a crisis?
4. Using a 7-point Likert scale between strongly disagree to strongly agree, regarding the business continuity during COVID-19, the firm has
 - a. adapted well to the market volatility
 - b. overcome the uncertainty
 - c. avoided/reduced the negative impact
 - d. had financial liquidity problems (reverse coding)

Appendix 2 – Covariance Matrix

	Div1	Div2	Div3	Div4	Div5	Resilience			
						1	2	3	4
Diversity_Education	2.547	1.425	1.272	1.415	1.562	.132	.230	.316	.326
Diversity_Vision	1.425	2.242	1.391	1.512	1.721	.110	.152	.185	.306
Diversity_Expertise	1.272	1.391	2.503	1.859	1.451	.090	.146	.203	.401
Diversity_Functions	1.415	1.512	1.859	2.656	1.670	-.025	.107	.293	.533
Diversity_Values	1.562	1.721	1.451	1.670	2.728	.096	.136	.295	.429
Resilience_Volatility	.132	.110	.090	-.025	.096	1.632	1.061	.848	.834
Resilience_Uncertainty	.230	.152	.146	.107	.136	1.061	1.926	1.059	.872
Resilience_Impact	.316	.185	.203	.293	.295	.848	1.059	1.846	1.022
Resilience_Liquidity	.326	.306	.401	.533	.429	.834	.872	1.022	2.182
BICMP_Responsibilities	.377	.403	.232	.313	.295	.448	.567	.662	.624
BICMP_Capabilities	.388	.270	.160	.125	.200	.494	.598	.499	.385
BICMP_Spokesperson	.397	.298	.268	.268	.268	.668	.842	.678	.630
BICMP_IT	.332	.268	.094	.245	.296	.631	.732	.699	.546
Expertise_Compensation	.402	.179	.014	.194	.173	.425	.483	.508	.573
Expertise_Nomination	.301	.134	.097	.180	.153	.339	.479	.410	.628
Expertise_Audit	.136	.145	.058	.085	.085	.365	.498	.494	.603
Expertise_Succession	.296	.121	.293	.215	.133	.319	.473	.507	.686
Expertise_Strategy	.400	.160	.187	.277	.109	.321	.439	.361	.578

	BICMP					Exp1	Exp2	Exp3	Exp4	Exp5
	1	2	3	4						
Diversity_Education	.377	.388	.397	.332	.402	.301	.136	.296	.400	
Diversity_Vision	.403	.270	.298	.268	.179	.134	.145	.121	.160	
Diversity_Expertise	.232	.160	.268	.094	.014	.097	.058	.293	.187	
Diversity_Functions	.313	.125	.268	.245	.194	.180	.085	.215	.277	
Diversity_Values	.295	.200	.268	.296	.173	.153	.085	.133	.109	
Resilience_Volatility	.448	.494	.668	.631	.425	.339	.365	.319	.321	
Resilience_Uncertainty	.567	.598	.842	.732	.483	.479	.498	.473	.439	
Resilience_Impact	.662	.499	.678	.699	.508	.410	.494	.507	.361	
Resilience_Liquidity	.624	.385	.630	.546	.573	.628	.603	.686	.578	
BICMP_Responsibilities	1.598	1.168	1.142	1.152	.735	.642	.595	.669	.531	
BICMP_Capabilities	1.168	1.488	1.146	.981	.589	.573	.491	.528	.479	
BICMP_Spokesperson	1.142	1.146	1.906	1.169	.590	.595	.569	.571	.502	
BICMP_IT	1.152	.981	1.169	1.867	.759	.742	.586	.567	.515	
Expertise_Compensation	.735	.589	.590	.759	1.339	.860	.691	.821	.714	
Expertise_Nomination	.642	.573	.595	.742	.860	1.417	.826	.788	.714	
Expertise_Audit	.595	.491	.569	.586	.691	.826	1.589	.791	.680	
Expertise_Succession	.669	.528	.571	.567	.821	.788	.791	1.505	.884	
Expertise_Strategy	.531	.479	.502	.515	.714	.714	.680	.884	1.358	

IT AFFORDANCES, USER EXPERIENCES AND PURCHASE INTENTION IN SOCIAL COMMERCE

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ABSTRACT

Social commerce, the use of social networking capabilities for commercial transactions and activities that are primarily driven by social interactions and user contributions, has evolved quickly and attracted much research attention. Drawing on the stimulus–organism–response framework and the affordance theory, this paper develops a research model to examine the impacts of IT affordances and users’ virtual experiences on users’ purchase intentions in social commerce platforms. More specifically, a research model is developed to explore how the IT affordances (product visibility, interactivity, personalization and social connections) of social commerce platforms affect users’ virtual experiences in terms of their cognitive experiences (information support, preference fit, social presence, and flow) and affective experiences (product affection, emotional support, familiarity, and closeness), which in turn influence users’ trusting intention in social commerce and their intention to purchase products from the social commerce platforms. The model also highlights the mediation role of user’s virtual experiences in the relationship between IT affordances and users’ trusting intention and purchase intention in social commerce platforms. This conceptual paper not only emphasizes the importance of understanding the implications of IT affordances and user experiences for social commerce but also provides theoretical guidance to assist online vendors in designing effective social commerce platforms for optimal user experiences and successful product promotion.

INTRODUCTION

Social commerce, a relatively new phenomenon involving the convergence of e-commerce and social media, has attracted much research attention (Hajli, 2015). Social commerce takes advantage of social networking capabilities and provides features to support commercial transactions and activities primarily driven by social interactions and user contributions (Liang, Ho, Li & Turban, 2011; Wang & Zhang, 2012; Zhang, Lu, Gupta & Zhao, 2014). It involves e-commerce websites that are equipped with Web 2.0 tools to facilitate user content generation and user interactions (such as Amazon.com) as well as social networking sites that integrate e-commerce features (such as Facebook and Instagram) (Huang & Benyoucef, 2013). Realizing the economic value of social commerce depends on customer participation and purchase behaviors (Wang & Zhang, 2012) in social commerce platforms. So, an understanding of the factors driving customers’ purchase behaviors in social commerce can help businesses to develop successful social commerce platforms. The purpose of this paper is to develop a research model to examine how the technological characteristics of social commerce platforms influence users’ virtual experiences and subsequently their intentions to purchase products and services from the social commerce platforms. This conceptual paper applies the lens of IT affordances (Gibson, 1977; Tuncer, 2021) to characterize the technological environments of social commerce and draws on the stimulus–organism–response (S-O-R) framework (Mehrabian & Russell, 1974) to investigate the roles of IT affordances of social commerce and users’ virtual experiences in driving users to develop trusting and purchase intentions in social commerce platforms.

THEORETICAL BACKGROUND

The Stimulus-Organism-Response (S-O-R) Model

The Stimulus-Organism-Response (S-O-R) model of environmental psychology (Mehrabian and Russell, 1974) suggests that various aspects of the environment (S), such as the technological features of a social commerce platform, can influence individuals' internal states and organismic experiences (O) that involve the affective and cognitive internal processes, which in turn affect their behavioral responses (R). According to S-O-R model, the internal affective and cognitive processes of organisms play a mediating role between their behavioral responses and the environmental stimuli (Bagozzi, 1986). These affective and cognitive processes generally consist of the perceptual, physiological, feeling, and thinking activities (Bagozzi, 1986; Bagozzi & Youjae, 1988). Behavioral responses represent psychological reactions consisting of passive or active attitudinal and behavioral reactions (Sautter, Hyman & Lukosius, 2004), such as satisfaction, trust and purchase intention.

The existing literature indicates that the S–O–R model has been applied extensively in a number of studies to examine the effects of online shopping environmental characteristics on customer behavioral responses (Animesh, Pinsonneault & Yang, 2011; Zhang, Lu, Gupta & Zhao, 2014; Tang & Zhang, 2018). Animesh et al.'s study used the S–O–R model to explore the impacts of virtual worlds' technological features on users' virtual experiences and purchase behaviors (Animesh, Pinsonneault & Yang, 2011). Zhang et al.'s study also applied the S-O-R model to investigate the effects of technological features of social commerce on user's virtual experiences and subsequently their participation intention in social commerce (Zhang, Lu, Gupta & Zhao, 2014). Their findings suggest that the S-O-R model is appropriate for explaining the effects of technological features as environmental stimuli on individuals' virtual experiences as internal reactions and their subsequent behavioral responses in social commerce. So, this conceptual paper employs the S-O-R model to link the technological environments of social commerce platforms to users' purchase behaviors via the mediating effect of virtual experience.

IT Affordances of Social Commerce

Some IS researchers suggest that a social commerce platform should be designed in such a way that its technological features create certain affordances that can engage users, thereby leading to active participation and purchase behaviors (Chen, Liu, Wei & Liu, 2021; Tuncer, 2021). The notion of affordance originated from ecological psychology, which suggests that animals are not concerned with what a particular object is but with what it can afford (Gibson, 1986). Gibson (1977) indicates that affordances are properties conceived of in relation to an animal in the environment, which is independent of the animal's ability to perceive them. The concept of affordance was then introduced into the technology field to explain the relationship between technologies and actors (Hutchby, 2001). Norman (1998) proposes that an affordance is a combination of actual and perceived properties of a thing, primarily those that determine how the thing can be used. Recent IS research has suggested that technology affordance is rooted in the relationships between the physical properties of technologies, the capabilities of users, the goals and intentions of users, and the environment with which they interact (Chen, Wei, Davison & Rice, 2020; Wang, Wang & Tang, 2018). So, the central tenet of affordance theory in IS research is that specific technological

functions or features alone do not determine technological capabilities, which instead exist as part of the relationships between users and technological artifacts in specific situations (Leonardi, 2011). In other words, the usability of technological features lies in what a technology affords and whether the affordances allow individuals to perform specific actions that may satisfy certain needs in particular situations (Norman, 1998).

Some recent IS research has indicated that the affordance theory can be used to understand user behaviors in technology-driven environments, such as social commerce platforms (Dong & Wang, 2018; Chen, Liu, Wei & Liu, 2021; Tuncer, 2021). Adopting an affordance lens can overcome the limitation of a technological determinism approach that only develops an argument of specific technological components, which may soon be replaced or altered (Chen, Wei, Davison & Rice, 2020). The IT affordances of social commerce are essentially a set of actionable properties between the technological features of social commerce platforms and users (Gibson, 1977). Thus, the theory of affordance provides an analytical link between the technological features of a social commerce platform and user experiences as well as users' subsequent behavioral reactions (Tuncer, 2021).

In this conceptual paper, the IT affordances of a social commerce platform refer to the possibilities for social shopping actions provided to users through the technological features of the social commerce platform (Leonardi, 2011; Tuncer, 2021). According to prior social commerce studies, a social commerce platform generally provides the following IT affordances: product visibility affordance, interactivity affordance, personalization affordance and social connections affordance (Zhang, Lu, Gupta & Zhao, 2014; Chen, Liu, Wei & Liu, 2021; Tuncer, 2021). The product visibility affordance refers to making the product information and users' knowledge of products visible on the social commerce platform (Tuncer, 2021). Social commerce platforms provide product visibility affordance by allowing users to present visual information about products/services (e.g., photos, videos and texts). Based on the functional view of interactivity as "the extent to which users can participate in modifying the form and content of a mediated environment in real time" (Steuer, 1992, p.84), the interactivity affordance of a social commerce platform is defined as the degree to which a user can control the social commerce environment in modifying its form and content in real time (Zhang, Lu, Gupta & Zhao, 2014). The interactivity affordance typically consists of two-way communication, synchronicity, and controllability (Mollen & Wilson, 2010). It reflects users' perception that the social commerce platform can facilitate the interaction between them and the technology (Hui & Nadda, 2015). The personalization affordance refers to a user's perception that a social commerce platform can customize its content to meet his or her personal needs/interests (Zhang, Lu, Gupta & Zhao, 2014). It involves the process of customizing web offerings to satisfy individual users' needs and preferences (Benlian, 2015). The mechanism for personalization affordance consists of two steps: first, it enables individual users to present "the self" and obtain identification from others by allowing them to input rich personal information to generate profiles (Huang & Benyoucef, 2013; Olbrich & Holsing, 2011); second, it offers content and layout personalization by delivering appropriate content to a specific user at the right time (Benlian, 2015). Social connections affordance reflects that a social commerce platform can be considered a medium for building and maintaining social ties among members through social interactions on the platform (Chen, Liu, Wei & Liu, 2021). Social commerce platforms support communications and develop social ties before, during, and after purchases in a variety of ways. Users of social commerce platforms can connect and interact with one another through reviews and ratings, comments, repost, "likes",

instant messages, live broadcasts, and etc. The collections of these social connections aggregate into interconnected network structures (Himmelboim & Golan, 2019), which are central to social commerce (Wang & Zhang, 2012). As users are given opportunities to interact and connect freely, social connections among them are often self-determined based on relevance and thus are distributed unequally, with a few enjoying disproportionately large numbers of connections initiated with them while most others having very few ties (Himmelboim & Golan, 2019). Users with many connections with others are central in the network structure of social commerce platforms, and they tend to stand out through recognitions from fellow users, attract a larger size of audience and maintain higher levels of activities, because they stand a much greater chance of being observed and receiving accreditation with rich accessibility to more user traffic (Yang, Liu & Davison, 2012). Digital influencers are such focal users that gain higher visibility and have greater influence on others with this advantageous position (Yang, Liu & Davison, 2012). They are digital opinion leaders who have amassed connections with large numbers of followers through their knowledge and expertise in a given area and/or attractiveness to consumers (Wang, Huang & Davison, 2020; Kapitan & Silvera, 2016). Through their contents and communications on social commerce platforms, digital influencers attract larger sized audiences who browse their posts on products/services and/or watch their livestreams (Kapitan & Silvera, 2016), which in turn influence the audiences' attitudes towards products/services to encourage purchase decisions (Meilatinova, 2021).

Virtual Experiences in Social Commerce

There are two types of environmentally induced internal states: cognitive state and affective state (Mehrabian and Russell, 1974; Ward, Bitner & Barnes, 1992). Cognitive states are associated with information-processing and inference theories, whereas affective states are related to emotions and feelings (Kumar & Kim, 2014). Studies on social commerce define users' virtual experiences as comprising cognitive experiences and affective experiences and indicate their critical role in determining user behaviors (Li, 2019; Zhang, Lu, Gupta & Zhao, 2014). Table-1 lists the cognitive and affective experiences in social commerce.

Cognitive Experiences in Social Commerce

In social commerce, the cognitive experiences typically involve the experiences of information support, preference fit, social presence and flow (Benlian, 2015; Curty & Zhang, 2011; Liang, Ho, Li & Turban, 2011; Park & Cameron, 2014). First, users experience information support and feel being assisted by their peers' reviews, recommendations, comments, and advice (Hajli, 2014; Lin, Hsu, Cheng & Chiu, 2015; Romaniuk, 2012; Sheikh, Yezheng, Islam, Hameed & Khan, 2019; Yan & Tan, 2014) in social commerce. Second, social commerce provides a mechanism for increasing preference fit by constantly matching users' preferences with product/service recommendations informed by users' personalization activities (Ho, Bodoff & Tam, 2011). Thus, preference fit is improved when users recognize greater overlaps between their needs and the attributes of offered products or services in social commerce platforms (Schreier, 2006). Third, a social commerce platform that conveys a sense of personal, sociable and sensitive human contact via socially rich text and multimedia contents (Gefen & Straub 2004; Hassanein, Head & Chunhua, 2009) increases social presence by allowing users to experience other users as being psychologically present (Fulk, Steinfield, Schmitz & Power, 1987). Finally, since the activities of

social searching, shopping, recommendation and communication in social commerce platforms are highly interactive, enjoyable and involving (Animesh, Pinsonneault & Yang, 2011), the social commerce environment can evoke a flow experience in users, which involves a sense of control, attention focus, curiosity and intrinsic interests obtained from the interactions in social commerce (Zhang, Lu, Gupta & Zhao, 2014; Qiu & Benbasat, 2005).

Table-1. Virtual Experiences in Social Commerce

Virtual Experiences		Definitions
Cognitive Experiences	Information Support	A type of social support that provides users with useful information needed for purchasing decisions and helps them solve problems via peer advice, suggestions, guidance, recommendations, experience, and valuable information and knowledge (Chen & Shen, 2015; Liang, Ho, Li & Turban, 2011)
	Preference Fit	A user’s subjective evaluation of the extent to which a product’s or service’s features match his or her preference system (Ho, Bodoff & Tam, 2011; Tam & Ho, 2005)
	Social Presence	The degree to which a user is perceived as a “real person” in technology-mediated communication (Gunawardena, 1995)
	Flow	An optimal experience that people reach when they act with total involvement in activities (Csikszentmihalyi & Csikszentmihalyi, 1988)
Affective Experiences	Emotional Support	A type of social support among peers centered on emotional communications such as empathy, encouragement, care, concerns and understanding (Liang, Ho, Li & Turban, 2011; Lin, Hsu, Cheng & Chiu, 2015).
	Product Affection	A user’s positive affection toward the products presented in the social commerce platforms (Chen, Lu, Wang & Pan, 2019).
	Familiarity	A feeling of understanding among users of social commerce platforms, often based on previous interactions, experiences, and learning the why, who, and when of what others do (Lee & Kwon, 2011; Ng, 2013).
	Closeness	A feeling of intimacy and emotional bonding that involves intense liking and moral support among users of social commerce platforms (Lee & Kwon, 2011; Ng, 2013).

Affective Experiences in Social Commerce

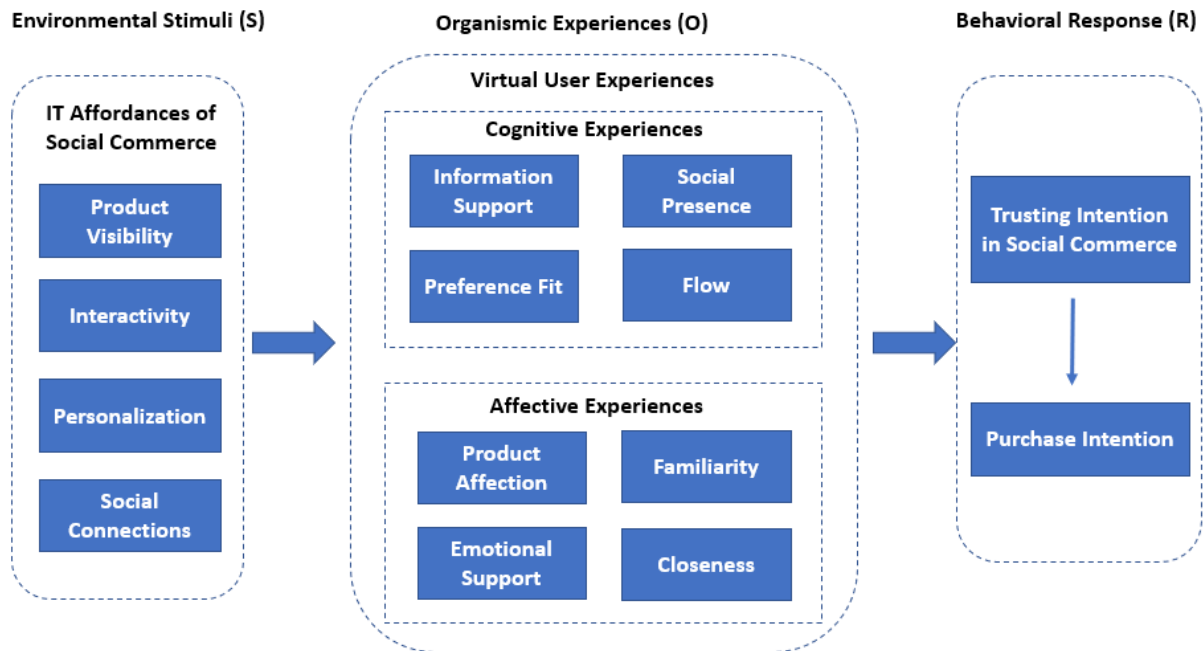
In social commerce, the affective experiences generally include the experiences of emotional support, product affection, familiarity, and closeness (Chen, Lu, Wang & Pan, 2019; Liang, Ho, Li & Turban, 2011; Ng, 2013). First, users experience emotional support when they feel being cared for by others in social commerce platforms (Liang, Ho, Li & Turban, 2011). Second, highly vivid presentations of products that fit users’ tastes/interests in social commerce platforms are likely to elicit positive emotions and product affections in users. Finally, feelings of familiarity

and closeness can develop as a result of social interactions in social commerce platforms (Ng, 2013).

RESEARCH MODEL AND PROPOSITIONS

Based on the S-O-R model, the affordance theory, and prior research in social commerce, a research model (Figure 1) is developed to examine the impacts of IT affordances of social commerce platforms (product visibility, interactivity, personalization and social connections) on users' virtual experiences in terms of their cognitive and affective experiences, which in turn influence users' trusting intention in social commerce and their intention to purchase products from the social commerce platforms. Consistent with the S-O-R model, the proposed model highlights the mediation role of user's virtual experiences in the relationship between IT affordances and users' trusting intention and purchase intention in social commerce platforms. The theoretical propositions specifying relationships among the constructs in the research model are presented in Figure 2 and illustrated as follows.

Figure 1. Research Model of IT Affordances, Virtual Experiences, and Trusting and Purchase Intentions in Social Commerce



Effects of IT Affordances of Social Commerce Platforms on Virtual Experiences

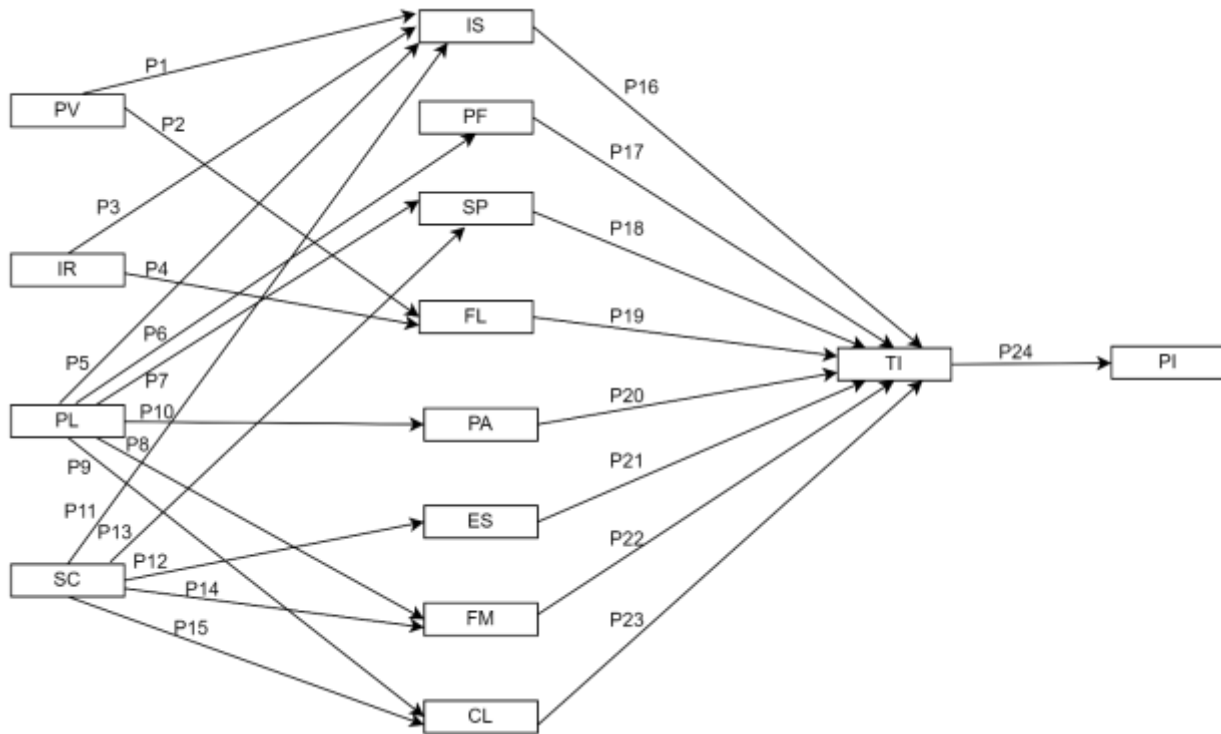
The product visibility affordance, interactivity affordance, personalization affordance and social connections affordance, which constitute the dimensions of IT affordances in social commerce platforms, represent the environmental stimuli in the framework of the S-O-R model. Product visibility affordance offers easy access to product information and other users' knowledge of products (Dong, Wang & Benbasat, 2016). Social commerce platform provides product visibility affordance by presenting vivid and visual information about the product and sharing users'

knowledge of and experiences with products, thus conveying information about product features and quality for better purchase decisions. Furthermore, the need for detailed product information before making a purchase decision drives buyers to focus on product visuals as well as ratings and reviews of product usage on social commerce platforms, thus eliciting a feeling of immersion and a state of flow in the buyers (Sun, Shao, Li, Guo & Nie, 2019; Tuncer, 2021). Thus, the following propositions are formulated.

Proposition 1: Product visibility affordance in social commerce is positively associated with perceived information support.

Proposition 2: Product visibility affordance in social commerce is positively associated with flow experience.

Figure 2. Theoretical Propositions of the Effects of IT Affordances on Virtual Experiences and Trusting and Purchase Intentions in Social Commerce



PV = Product Visibility, IR = Interactivity, PL = Personalization, SC = Social Connections, IS = Information Support, PF = Preference Fit, SP = Social Presence, FL = Flow, PA = Product Affection, ES = Emotional Support, FM = Familiarity, CL = Closeness, TI = Trusting Intention, PI = Purchase Intention

Interactivity affordance enables users to interact with social commerce platforms through content creation and sharing, such as posting product images and messages, rating and reviewing product qualities, and presenting product usage experiences (Zhang, Lu, Gupta & Zhao, 2014). Such interactions with the social commerce platforms provide informational support for purchase decision-making by offering advice and recommendations (Liang, Ho, Li & Turban, 2011). Prior research also suggests that websites with higher levels of interactivity create a sense of flow in

users (Novak, Hoffman & Yung, 2000). Interactivity affordance allows a user to portray a desired self-image in social commerce platforms (Animesh, Pinsonneault & Yang, 2011). The self-presentation theory suggests that people desire to project a social self-image among others (Gofiman, 1959). Being highly motivated to fulfill such desire, users tend to fully immerse themselves in the social media interactive process of projecting desired self-image in social commerce platforms. The deep engagement in the explorations and interactions with the social commerce platforms make them completely absorbed in the positive self-image projection process without noticing the passage of time, which is likely to induce a flow experience (Zhang, Lu, Gupta & Zhao, 2014). Therefore, the following propositions are suggested.

Proposition 3: Interactivity affordance in social commerce is positively associated with perceived information support.

Proposition 4: Interactivity affordance in social commerce is positively associated with flow experience.

Personalization affordance in social commerce generates relevant and better-customized contents on social media platforms that closely match users' idiosyncratic preferences and needs (Komiak & Benbasat, 2006). It allows an individual user to input rich personal information to generate a profile and deliver appropriate content in the right format to a specific user at the right time (Benlian, 2015; Huang & Benyoucef, 2013; Olbrich & Holsing, 2011; Tam & Ho, 2005). So, in social commerce platforms with personalization affordance, recommended items to users are uniquely personalized recommendations tailored to users' own needs. Through continuous interactive feedbacks and recommendation adaptations, personalization affordance can reduce information overload and facilitate greater information support for users by providing more relevant information about products/services that they are interested in (Huang, 2000; Liu, Li, Dai & Guo, 2021). Social commerce platforms providing personalization affordance also produce higher preference fit. The underlying mechanism for personalization affordance allows users to reveal their personal preferences and needs and then operates to constantly match between users' individual preferences and product/service recommendations informed by users' personalization activities (Ho, Bodoff & Tam, 2011). Thus, preference fit is improved when users recognize greater overlaps between their own needs and the attributes of recommended products/services (Schreier, 2006). Prior research indicates that the personalization level of a website is positively related to the perceived social presence of the site (Kumar & Benbasat, 2006). Personalization affordance in social commerce platforms also involves the practice of presenting social recommendations to target users using social network information (such as a list of friends who have similar tastes/interests) (Choi, Lee & Kim, 2011), which in turn creates a high social presence environment for the users (Tam & Ho, 2006). The provision of highly personalized social recommendations in social commerce platforms leads users to develop a high level of social identification with other users in the platforms, and thus will generate a sense of social presence among the users in social commerce (Liang, Ho, Li & Turban, 2011). Additionally, the increased social identification with the other users in a social commerce platform may also generate a stronger sense of familiarity with them (Animesh, Pinsonneault & Yang, 2011) and thus may induce warm and close personal relationships among the users (Kumar & Benbasat, 2006). Therefore, it is reasonable to argue that personalization affordance would also lead to greater feelings of familiarity and closeness among the users in social commerce. According to the preference fit theory (Simonson, 2005), a closer fit between users' preferences and product/service

attributes produces greater benefits for the users. Thus, the responsive functions of personalization affordance are expected to draw users' attention, stimulate their sensory experiences, and subsequently lead to positive emotional responses in users. As such, personalization affordance that interactively responds to users' preferences through visual representations of personal adaptations can provide users with greater pleasures and elicit users' positive emotions toward recommended products/services, thus resulting in feelings of product/service affection in users. With these considerations, the following propositions are formulated.

- Proposition 5: Personalization affordance in social commerce is positively associated with perceived information support.
- Proposition 6: Personalization affordance in social commerce is positively associated with perceived preference fit.
- Proposition 7: Personalization affordance in social commerce is positively associated with perceived social presence.
- Proposition 8: Personalization affordance in social commerce is positively associated with feeling of familiarity.
- Proposition 9: Personalization affordance in social commerce is positively associated with feeling of closeness.
- Proposition 10: Personalization affordance in social commerce is positively associated with feeling of product affection.

Social connections affordance enables users to establish and maintain social ties with one another as well as involve users in the reciprocal relationships on social commerce platforms by effectively supporting social interactions among users, including communicating with others, rating and reviewing products and services, reviewing others' opinions, seeking others' opinions, sharing their experiences and recommending products and services (Chen, Liu, Wei & Liu, 2021; Hajli, 2013; Li, 2019; Tang & Zhang, 2018). In social commerce, receiving and reviewing product/service information provided by other users can assist buyers in solving their problems and making better purchase decisions, thus providing them with information support (Li, 2019). Furthermore, through social interactions with others in a social commerce environment, users may present themselves socially, form their own social identities, and provide not only information support but also emotional support to others (Zhang, Lu, Gupta & Zhao, 2014). Obtaining unbiased information and getting useful recommendations from others who share their knowledge and personal experiences make users feel that they are helped, valued and cared for by others in the platform, which satisfies users' need of receiving care and emotional support from others (Amblee and Bui, 2011; Liang, Ho, Li & Turban, 2011). Social connections affordance also increases users' perceptions of social presence in social commerce platforms (Li, 2019; Zhang, Lu, Gupta & Zhao, 2014). By bringing users together through technology-enabled social interactions, social connections affordance enables users to experience others as being psychologically present, thus inducing a sense of social presence among (Li, 2019; Zhang, Lu, Gupta & Zhao, 2014). A social commerce platform that affords social connections may also create a sense of familiarity by facilitating interpersonal relationships and increasing mutual understanding among users. Familiarity is a sense of understanding based on interpersonal interactions (Gefen, 2000). Social connections affordance can foster users' self-expressions, contribute to users' social identities, and strengthen users' recognition of their common interests and characteristics shared with other users in social commerce platforms (Chen, Liu, Wei & Liu, 2021), thereby enhancing the feeling of

familiarity in the social interactions among users. In addition, social connections affordance facilitates the development of close, warm and personal relationships through social interactions and emotional bonding, thus invoking feelings of affection, warmth and closeness among users in social commerce platforms (Animesh, Pinsonneault & Yang, 2011; Li, 2019). In line with the above reasoning, the following propositions are suggested.

- Proposition 11: Social Connections affordance in social commerce is positively associated with perceived information support.
- Proposition 12: Social Connections affordance in social commerce is positively associated with feeling of emotional support.
- Proposition 13: Social Connections affordance in social commerce is positively associated with perceived social presence.
- Proposition 14: Social Connections affordance in social commerce is positively associated with feeling of familiarity.
- Proposition 15: Social Connections affordance in social commerce is positively associated with feeling of closeness.

Effects of Virtual Experiences on Trusting Intention in Social Commerce

Trust in social commerce refers to the extent to which a user has confidence in the reliability and integrity of using a social commerce platform to shop (Leung, Shi & Chow, 2019). It reflects one's willingness to depend on or be vulnerable to social commerce (McKnight, 2005). In virtual environments, such as social commerce platforms, trust is an extremely important factor (Hajli, Wang, Tajvidi & Hajli, 2017; Keen, Ballance, Chan & Schrupp, 1999; Wang & Enurian, 2005) because the absence of face-to-face communication creates uncertainties (Featherman & Hajli, 2016) and trust involves a certain level of willingness to accept uncertainties and take risks (Keller, Mayo, Greifeneder & Pfattheicher, 2015).

The cognitive experiences of information support, preference fit, social presence and flow help to build trust in social commerce. Information support assists users to evaluate products and services by observing others' purchase experiences and obtaining knowledge of products and services, and helps them to overcome risk perception and uncertainty in the purchasing process (McKnight, Choudhury & Kacmar, 2002), hence resulting in increased trust in social commerce. High levels of perceived preference fit lead users to have high confidence that social commerce provides more relevant and better-customized product/service recommendations, and thus feel more comfortable in relying on social commerce platforms for their shopping needs. Therefore, greater preference fit will enhance trust in social commerce. Gefen and Straub (2004) considered trust to be an outcome of social interactivity and social presence. Hassanein and Head (2007) found that higher levels of perceived social presence generate greater trust in online shopping websites. In social commerce, users who experience social presence through warm and personal social interactions with others may feel more secure and comfortable (Lu, Fan & Zhou, 2016), and are likely to perceive less risks in reliance on others in social commerce platforms. Thus, a high level of social presence is conducive to trust formation (Ou, Pavlou & Davison, 2014). Flow is a deep involvement state that can create strong trust (Johnson, Bardhi & Dunn, 2008). Prior research has supported the notion that flow experience builds user trust in a virtual environment (Chandra, Srivastava & Theng, 2012). Flow experience can reduce the perceived risks of incurring negative

results associated with social commerce, based on the need for users to manage cognitive dissonance arising from spending too much of their time engaging with social commerce platforms (Agarwal and Karahanna, 2000). Thus, trust is created as users seek to rationalize their total involvement in social commerce by attributing positive results to it. These considerations suggest the following four propositions.

Proposition 16: Perceived information support is positively associated with trusting intention in social commerce.

Proposition 17: Perceived preference fit is positively associated with trusting intention in social commerce.

Proposition 18: Perceived social presence is positively associated with trusting intention in social commerce.

Proposition 19: Flow experience is positively associated with trusting intention in social commerce.

The affective experiences of product affection, emotional support, familiarity and closeness also help to improve trust in social commerce. Product affection reflects a pleasurable experience that can serve as a heuristic for trustworthy judgments. Prior research has shown that affect laden information infuses into an individuals' cognitive processes, which thereby affects their judgments and behaviors in a mood-congruent direction (Forgas, 1995; Forgas & George, 2001). People in positive affective states are likely to access and recall positive information from the memory, whereas a negative affective state facilitates the recall of negative information. This recall of positive or negative information will in turn influence judgments and behaviors. Positive affective states will lead to positive heuristic judgments and behaviors. Therefore, product affection is expected to positively influence the users' trusting intention in social commerce. When users have strong emotional support, they receive care and help from others, which reduces perceived risks and thus increases the level of trust (Hajli, 2013). Prior research suggests that feelings of familiarity and closeness in social interactions increase levels of trust in the social networking community (Ng, 2013). Familiarity is considered a subjective mechanism leading to trust (Gefen, 2000; Gulati, 1995). Familiarity can reduce uncertainty and foster a sense of belonging so as to increase users' confidence and trust in a website (Casalo, Flavián & Guinalú, 2007). Moreover, the feeling of closeness reduces social distance and increases trust. When users feel close to others, they tend to tolerate others' mistakes and develop deep relationships with others (Marsden & Campbell, 1984), which contributes to the development of trust in social commerce platforms (Hajli, 2014). Based on the above arguments, the following four propositions are formulated.

Proposition 20: Feeling of product affection is positively associated with trusting intention in social commerce.

Proposition 21: Feeling of emotional support is positively associated with trusting intention in social commerce.

Proposition 22: Feeling of familiarity is positively associated with trusting intention in social commerce.

Proposition 23: Feeling of closeness is positively associated with the trusting intention in social commerce.

Effect of Trusting Intention on Purchase Intention in Social Commerce

Trust plays a critical role in reducing users' perceptions of risks and uncertainties toward social commerce, and in turn increases their tendencies to make purchases in social commerce platforms (Hajli, Sims, Zadeh & Richard, 2017). Previous studies have supported the significant effect of trust on users' intentions to purchase from websites or on their loyalty to particular websites (Gefen, 2000; Hajli, 2013; Kim & Park, 2013; Lu, Fan & Zhou, 2016; Rashid, Rashid & Pitafi, 2020; Weisberg, Te'eni, & Arman, 2011). When users have a high level of trust in social commerce, they are more likely to exchange shopping information and make purchases in social commerce platforms (McKnight, Choudhury & Kacmar, 2002). Trust reduces uncertainty in online transactions and enables complex decisions (Weisberg, Te'eni & Arman, 2011). When individuals believe that their exchange partners are trustworthy, they are likely to engage in economic transactions with them (Mutz, 2009). Moreover, a trustworthy social commerce platform will lead users to develop perceptions of less opportunistic behaviors, such as deceptive advertising (Chen & Shen, 2015). As a result, users tend to rely on other users' product recommendations and shopping experiences to make purchase decisions in the social commerce platform. Therefore, it is reasonable to argue that if a user has a strong trusting intention in social commerce, he/she is more likely to make purchase. Accordingly, the following proposition is suggested.

Proposition 24: Trusting intention in social commerce is positively associated with purchase intention.

CONCLUSIONS AND FUTURE RESEARCH

This conceptual paper proposes a research model of the effects of IT affordances on users' virtual experiences and purchase intentions in social commerce platforms. Drawing on the S-O-R model, the affordance theory and IS research on social commerce, the model identifies four IT affordances of social commerce platforms – product visibility, interactivity, personalization and social connections, and suggests that these IT affordances influence users' virtual experiences in terms of their cognitive experiences (information support, preference fit, social presence and flow) and affective experiences (product affection, emotional support, familiarity and closeness), which in turn affect users' trusting and purchase intentions in social commerce platforms. Theoretically, this paper helps understand the underlying process connecting IT affordances to purchase intention in social commerce. Practically, a better and complete understanding of how such a process takes place is essential to provide guidance on how to design effective social commerce platforms for optimal user experiences and successful product promotion. So, this conceptual paper not only benefits the researchers in understanding the implications of IT affordances and user experiences for successful social commerce, but also assists practitioners in developing better technology strategy for social commerce. For example, managers can promote user trust and purchase intention in social commerce platforms through improving users' cognitive and affective experiences by providing IT affordance optimization for the platforms, such as affording highly interactive user interfaces, presenting target products/services in high-quality photographs and videos, increasing customized offerings based on users' preferences/needs, and enhancing reciprocal interpersonal connections via multimedia social interaction tools.

This conceptual paper makes several contributions to the research on social commerce. Firstly, it advances the technology affordances and social commerce literature by utilizing the affordance-based approach to conceptualize the technological environments of social commerce. Many existing studies have focused primarily on specific technical features of social commerce platforms (Al-Adwan, 2019; Li, 2019; Gibreel, AlOtaibi & Altmann, 2018; Han, Xu & Chen, 2018; Curty & Zhang, 2013) but ignored users' role in technology usage when exploring the effects of technical features. The IT affordances of social commerce platforms serve as the dynamic link between the technical features of social commerce and its users. By focusing on user-recognized action possibilities afforded by technical features, this paper enriches the theoretical foundation for the characterization of technological environments of social commerce and provides a novel theoretical view for understanding the underlying process of IT effects in the context of social commerce. Secondly, this paper contributes to the research on the drivers of trusting and purchase intentions in social commerce from the perspective of users' virtual experiences. It provides new insights into the determinants of social commerce purchase intention by examining the antecedents and outcomes of social commerce virtual experiences. Moreover, this paper stresses the mediation role of virtual experiences in the relationship between IT affordances and users' trusting and purchase intentions in social commerce platforms. Thus, it enriches the experiential perspective of social commerce and contributes to the literature on user experience in social commerce. Thirdly, this paper provides a comprehensive research framework to enable the development of user-centered social commerce platforms. It not only highlights the critical roles of user-driven IT affordances and users' virtual experiences in social commerce, but also explores social commerce user experiences in more detail by identifying both cognitive experiences and affective experiences with social commerce platforms. It responds to the suggestion that "social commerce needs to focus on user-centered design in order to become a mainstream phenomenon" (Shin, 2013, p. 54).

This conceptual paper also provides opportunities for future research. The future research could empirically test the research model and its associated propositions in the social commerce context using a survey. Data will be collected from people who are active in online shopping at social commerce platforms (such as Instagram, Facebook, and Amazon Live) about their perceived IT affordances of the social commerce platforms, their cognitive experiences and affective experiences with the platforms, as well as their trusting and purchase intentions in social commerce. The partial least squares structural equation modeling (PLS-SEM) will be utilized to test the measurement model and structural model.

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HOW THE TELECOM INDUSTRY CAN MAKE EFFECTIVE USE OF THE BSC FOR THE IMPROVEMENT OF FINANCIAL INDICATORS: A CASE STUDY

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ABSTRACT

Management Control focuses on execution of the policies, among others, resources of the company. Intensified competition among high tech industries aggravated by rapidly changing and challenging external environment, companies realized the importance of operational performance excellence and current financial results improvements. Companies are formulating and paying attention to strategic goals and development of the effective mechanism of these goals implementation. This case study investigates the management control in telecom companies in Canada in light to the balanced scorecard (BSC) as a tool of management control. It provides a review of the BSC approach, paying special attention to the financial perspective of the BSC, in general, and financial perspective of the telecom companies, in particular. The case specifically describes the results of investigation of the financial indicators used by Canadian telecom companies for their performance evaluation and communication. It also provides the methodology of these indicators' development and integration into the BSC. The importance of the paper is in the developed design methodology of the BSC model, which incorporates four Canadian largest telecom companies' business practice. Developed model can be used as a pattern in the industry for better and distinct performance results presentation for telecom managers, investors, and public.

Keywords: BSC, Financial Perspective, Telecom Companies and Management Control.

INTRODUCTION

In recent years of intensified competition aggravated by rapidly changing and challenging external environment, many companies realized the importance of not only operational performance excellence and current financial results improvements, but also formulating of clear strategic goals and development of the effective mechanism of these goals implementation. The BSC as a concept was designed to resolve the issues of traditional performance measures limited by only financial indicators and to ensure the performance metrics connection to the clearly defined strategic goals.

The paper describes the results of investigation of the financial indicators used by Canadian telecom companies for their performance evaluation and communication. It also provides the methodology of these indicators' development and integration into the BSC. The importance of the paper is in the developed design methodology of the BSC model, which incorporates four Canadian largest telecom companies' business practice. Developed model can be used as a pattern

in the industry for the better and distinct performance results presentation for telecom managers, investors, and general public.

The model of the BSC introduced by Kaplan and Norton in 1992, has been one of the major contributions towards advanced performance measurement during the previous 20-30 years (De Wet & De Jager, 2007). Recent research shows that most of the biggest USA companies have implemented the BSC, and more companies worldwide are trying to follow their practice (De Wet & De Jager, 2007).

According to Kaplan and Norton (1992) ‘the Balanced Scorecard is like the dials in an airline cockpit: it gives managers complex information at a glance’. The BSC did not only switch from a narrow focus on traditional financial or accounting measures of performance, but also integrated the strategy of the organisation into the measurements system in such a way that it ‘keeps companies looking – and moving – forward instead of backward’ (Kaplan & Norton, 1992).

As a tool of the company’s performance trace and evaluation by managers, Kaplan and Norton (1992) suggested the following four perspectives of performance metrics:

- the financial perspective
- the customer perspective
- the internal business process perspective
- the innovation and learning perspective.

Among four perspectives, the financial perspective is frequently referred to as the most important component of the BSC. In addition, in the BSC the financial measures that evaluate what had happened in the past (lagging measures) are supplemented with the operational measures affecting future financial performance (leading measures), and customer satisfaction, innovation and learning indicators metrics are included.

As a tool of strategy implementation, Kaplan and Norton proposed that a well-designed BSC contains the following elements (Peters, 2014):

1. It establishes cause and effect relationships. Instead of isolated measures, indicators are linked to each other, and their network describes the strategy.
2. It should have a combination of leading and lagging indicators. The example of the lagging indicator is market share, which is widely used in the industry and offer no information about forthcoming changes, only about past. Leading indicators give an idea what can happened in a time for taking correcting measures to return on track.
3. All the indicators of the effective BSC are linked to financial measures. By this, Kaplan and Norton mean that initiatives such ‘as results of re-engineering or lean production need to be tied to financial measures rather than pursued indiscriminately’.

Before the BSC concept development, the most popular area for the manager’s quantification has been finance, which was required for the complex sets of ratios, measures, analytical tools and software understanding. Every penny a company spends could be analyzed in a huge number of ways, and ‘such are the powers of financial measures persuasion that entire companies can be driven only by financial indicators’ (Peters, 2014). In the BSC era ‘every manager knows the mantra what gets measured gets done’ (Peters, 2014), and the power of only financial measures has been declined.

The present research adds to the theory and business practice of the BSC financial perspective design and implementation in telecom industry. It proposes the model of the financial perspective of the BSC development based on the Norton and Kaplan (1996) model, along with the specific for the telecom industry examples of strategic objectives and financial indicators. In general, the paper investigates the measures of the BSC financial perspective and provides a mechanism of financial indicators selection for Canadian telecom companies.

The research results are important for telecom companies that use the BSC as a methodology of strategy implementation and performance evaluation. They can be used for the improvement of the quality of the financial statements, which is important for the company management, investors and general public. This results in positive image and higher investment attractiveness of the company.

LITERATURE REVIEW

Since introducing of the BSC in 1992, many academics and practical managers, including founders of the concept, published papers describing different aspects of its theory and business practice. Kaplan and Norton (1996) started the development of the BSC approach by announcing their finding that usually some organisations perform better than others because their processes are coordinated. They also stated that any organisation can become a high performer if all its units are aligned. ‘Alignment’ means integration of all the business functions of an organisation by developing integrated strategic maps and corresponding Balanced Scorecards for every department (starting from the corporate office to the business units to support offices and customers). Kaplan and Norton (2006) concluded that alignment can be achieved by sharing common ‘strategic themes’ across all business units of the company. The concept is like Management by Objective (MBO), in which every department in an organisation should have short-term objectives, which are aligned with the long-term objectives of the corporation. Through alignment, the enterprise will be able to create synergies. The value generated by operational units sharing the common objectives will be greater than would be if they had been operating autonomously. The set of objectives, which describe enterprise-derived value, is called by Kaplan and Norton (2006) ‘an enterprise value proposition’. Implementation of this methodology requires a tool like Balanced Scorecard and strategic map. The sequence of the alignment process was proposed by Kaplan and Norton (2006) as follows: ‘first separate BSC should be developed for each unit, and then the headquarters is aligned with operating units, thereafter, aligning internal support and service units and then external organisations. The alignment process after that includes the alignment of strategy and the organisation structure’.

Moreover, Kaplan and Norton (2006) proposed two possible models for cascading the alignment process as following: ‘1) the franchise operations or top-down common value proposition and 2) the holding companies or bottom-up common value proposition’. While the latter has several advantages over the former, on practice cascading can be done either way, resulting in the BSC ultimately aligns the departmental level and enterprise level strategies.

According to Burney and Swanson (2010), strategic emphasis in the performance measurement systems will motivate managers to make decisions that create long-term value, thereby eliminating

the short-term focus. Moreover, study's findings suggest that a greater emphasis on making decisions based on leading indicators is associated with greater job satisfaction. Leading indicators are most often long-term nonfinancial measures, while lagging indicators are generally short-term financial measures.

The purpose of the Davis and Albright's (2004) study was to determine whether an improvement in performance on practice occurred after implementing the BSC and whether the change in financial performance is greater comparing the environment when traditional financial measures are in place. In the study they provided evidence supporting the assumption that the BSC can be used to improve financial performance; the findings indicate that branches where the BSC was implemented outperformed non-BSC branches on common financial measures.

The presentation of detailed scorecards (Bean & Jarnagin, 2002) in quarterly and annual financial statements would provide the users of financial statements (i.e., investors, general public, etc.) with the same kind of valuable decision-making information that is used by internal management. Instead of only using historical financial information to make investment decisions about an entity, investors and other stakeholders would then be able to understand what financial performance measures the company is going to emphasize, and whether the company is achieving its financial performance goals or not and if not, which actions it plans to take. Specifically, the implementation of the BSC information in the quarterly and annual financial statements would allow their users to more fully:

1. Determine the clients-oriented goals that the company finds important and the progress in achieving those goals.
2. View internal process changes and the possible impact of such changes on the financial statements and understand whether significant costs are planned to implement changes.
3. Evaluate investments in employees and technology that are important to sustain the long-term growth of the company.
4. See the current and future issues and opportunities facing the organization.

Ittner, Larcker, and Meyer (2003) defined those issues related to the implementation of the BSC may be far more important to the success or failure than the Scorecard's technical attributes (e.g., the number and types of measures, their classification into categories, or the presence of a causal business model). Thus, the implementation of such a system should constitute a project with the budget, timeline and project team and be supervised on a senior management level.

Financial Perspective of the Balanced Scorecard

The financial perspective of the BSC is often called as the most important component of the BSC. In practice, the methodology of the financial component of the BSC development has not moved much beyond the original suggestions of its founders - Kaplan and Norton (1996). Proposals of the different approaches to the financial perspective of the Balanced Scorecard development can be found in research; for example, the model of De Wet and De Jager (2007) containing five internal performance measures uses the following selected ratios for the BSC:

- the performance spread, or 'spread', which is standardised EVA (EVA/ICbeg)
- invested capital at the beginning of the year, or 'ICbeg'
- economic value added, or 'EVA'

- the cash flow from operations (after tax, but before interest and dividends) standardised as CFL/ICbeg
- the sales growth percentage from the previous period.

The main uncertainty about this model is that the advantages for using five measures provided by De Wet and De Jager (2007) do not explain whether the choice of these five variables is enough for any kind of strategy perusing by the company at the time. Strategic context is important in terms of constant market challenges companies are facing nowadays.

The classical model of Kaplan and Norton (1996) of financial perspective development is presented on Figure 1. This model connects financial indicators with the strategies and financial themes. According to Kaplan and Norton (1996) model, financial objectives of the same company can change significantly at each stage of a business’s life cycle. Business strategy theory suggests several different strategies that business units can follow, ranging from market share growth to exit and liquidation. For simplification purposes, Kaplan and Norton (1996) take into consideration the following stages: growth, sustain, harvest, and three financial themes that drive the business strategy: revenue growth and mix, cost reduction/ productivity improvement, asset utilization/ investment strategy.

Figure 1. Model of Balanced Scorecard financial perspective development.
Reprinted from Kaplan and Norton (1996)

		Strategic Themes		
		Revenue growth and Mix	Cost Reduction/ Productivity Improvement	Asset Utilization
Business Unit Strategy	Growth	Sales growth by segment Percentage revenue from new product, services, and customer	Revenue/ Employee	Investment (percentage of sales) R&D (percentage of sales)
	Sustain	Share of targeted customers and accounts Cross-selling Percentage revenues from new applications Customer and product line profitability	Cost versus competitors Cost reduction rates Indirect expenses (percentage of sales)	Working capital ratios (cash-to-cash cycle) ROCE by key asset categories Asset utilization rates
	Harvest	Customer and product line profitability Percentage unprofitable customers	Unit cost (per unit of output, per transaction)	Payback Throughput

Eventually, all objectives and measures in the other than financial BSC perspectives should be linked to achieving one or more objectives in the financial perspective (Kaplan & Norton, 2006). The linkage to financial objectives is important as the long-term goal and the purpose of the business itself which is to generate financial returns to investors. As a result, all the strategies,

programs, and initiatives should enable the business departments to achieve their financial objectives and every measure selected for a BSC ‘should be part of cause-and-effect relationships, ending in financial objective, thus making the scorecard a story of a strategy’ (Kaplan & Norton, 2006).

As a result, the reasonable choice of financial indicators from the strategy point of view and their clear presentation in financial statements will provide investors with the indicators which evaluate strategy implementation results and company management with the performance measurement system. To make the right choice, the investigation of strategies and financial measurements used by Canadian telecom companies will provide the specific examples for strategy and performance results representation in telecom industry.

METHOD

The synopsis of the telecom companies that comprise the research sample is provided below:

BCE Inc. (Bell Canada Inc.): BCE Inc., provides a full range of communication services to residential and business customers in Canada. The Company's services includes local, long distance and wireless phone services, high speed and wireless Internet access, IP-broadband services, value-added business solutions and direct-to-home satellite and VDSL television services.

Rogers: Rogers Communications, Inc. is a diversified communications and media company. The Company's activities include wireless voice and data communications services over its national GSM, HSPA and LTE networks; cable television, telephony and high speed Internet access services over its broadband networks; and radio and TV broadcasting, televised shopping, magazines, and sports.

Shaw: Shaw Communications, Inc. provides broadband cable television, Internet, and satellite television services.

TELUS: TELUS Corporation is a telecommunications company providing a variety of communications products and services. The Company provides voice, data, Internet, and wireless services to businesses and consumers in Canada.

The financial information of the above sample companies during the period from 2011 to 2015 are presented in table 1. The financial information includes Return on Equity (ROE), Return on Assets (ROA) and Return on Invested Capital (ROIC).

According to the Canadian Radio-Television and Telecommunications Commission (2014), ‘Bell Canada, Rogers, Shaw, and TELUS are Canada’s four largest providers of telecommunications services. All combined (including their affiliates), they accounted for about 85% of total market revenues. The next five largest groups/entities—Bragg, Cogeco, Quebecor, Saskatchewan Telecommunications and Telesat Canada—accounted for less than 10% of total market revenues. The remaining groups/entities captured the rest of the market revenues. The top ten groups/entities are facilities-based service providers, meaning that they own and operate the transmission

equipment required to provide telecommunications services. Of the remaining groups/entities, the vast majority are resellers. For the present research, the four largest telecom companies have been chosen as a sample. Together these companies constitute 85% of the Canadian market, so the sample is big enough for the analysis of the major Canadian telecom industry players.

Table 1. Company Financial Information (ROE, ROA and ROIC)

	BCE Inc			Rogers			Shaw			Telus		
	ROE	ROA	ROIC	ROE	ROA	ROIC	ROE	ROA	ROIC	ROE	ROA	ROIC
2011	24.61	6.21	11.02	42.64	8.83	15.04	15.33	3.97	10.21	15.96	6.16	8.46
2012	23.23	6.46	11.00	46.13	8.92	13.1	21.69	5.75	9.85	15.84	5.96	9.24
2013	17.88	4.88	9.27	39.56	7.72	11.91	19.95	5.86	9.53	16.48	6.16	9.56
2014	20.95	5.45	9.14	26.42	5.35	8.96	20.32	6.60	9.91	18.42	6.36	9.62
2015	21.08	5.68	8.91	24.60	4.96	8.03	17.68	6.16	9.10	18.27	5.57	8.41

To understand the main financial indicators used by the major sample telecom companies in Canada, the annual corporate reports have been studied. This analysis started from the data collection about strategy objectives that describes one of three strategic themes in Kaplan and Norton (1996) model, and financial indicators, linked to those objectives. The indicators were accepted for further analysis only if the company announced them to be directly linked with the strategy objective (providing that linkage in the financial statement). In addition, corporate strategy was used for the stage of a business’s life cycle determination. The latest annual corporate report of these sample companies available to the public was the source of the data for this case study. Among existing approaches to the financial indicator’s development, the Balanced Scorecard of Kaplan and Norton (1996) was chosen. The main advantage of the model is that it provides the tool of strategy and financial indicators linkage that is critical for the presentation of the company performance results in annual reports.

The formed data sample was analysed using the Kaplan and Norton (1996) model by matching the indicators used by telecom companies in practice and classical measures proposed by Kaplan and Norton (1996) within the model. Finally, the discrepancies were investigated and recommendations for financial indicators development with the use of the Balanced Scorecard approach were worked out. Moreover, found telecom measures were accepted as the example of the financial perspective creation which can be used as a pattern for the industry or a standard solution for the further tailoring according to the company specificity.

RESULTS AND DISCUSSION

After the analysis of the four largest Canadian telecom companies’ corporate reports, the model of Kaplan and Norton (1996) supplemented with the specific strategic themes and indicators is presented in figure 2. In this model the universal indicators proposed by the model authors are

supplemented by the indicators currently used in the business practice within the telecom industry. This addition makes the model more contemporary and practically oriented.

The general investigation of the four major telecom companies’ data shows the following flaws of the annual reports.

- *Company strategy* as a statement is not always clearly presented (only Bell Canada has clearly defined strategy statement).
- *Strategic objectives* as the components of the strategy are more often obviously defined (by all four companies).
- *Financial indicators as the specific strategic objectives* criteria are not always clearly defined (for example, only Bell Canada has clearly defined financial indicators for strategic themes, while Shaw and TELUS have financial indicators for none of the strategic themes).
- *Financial indicators* of shareholder value and financial performance (revenue growth, EBITDA growth, etc.) are published in each report, but in none of them they are directly referred to some specific strategic goal.

FIGURE 2. Model of Kaplan and Norton (1996) with Telecom Industry Patterns (*Italic font*). Adapted from Kaplan & Norton (1996).

Strategic Themes		
<p>Revenue growth and Mix</p> <ul style="list-style-type: none"> - <i>servicing and engaging customers through our high-quality products and services along with cost-effective bundling options</i> - <i>deliver another year of significant consolidated free cash flow</i> - <i>increase cash returns to shareholders consistently over time</i> - <i>generate strong wireless and broadband data growth consistent with our data usage monetization strategy</i> - <i>continue the growth in our smartphone subscriber base to drive wireless data revenue and ARPU</i> - <i>invest in the evolution of current TV platform and extend video offerings to new platforms</i> - <i>leveraging network infrastructure and programming assets to offer customers a wider variety of products and services</i> - <i>enhancing existing products to provide greater value to customers</i> - <i>bundling product offerings to provide value to both Shaw and the customers</i> - <i>focusing relentlessly on growth markets of data, IP and wireless</i> 	<p>Cost Reduction/ Productivity Improvement</p> <p><i>Achieve a competitive cost structure</i></p>	<p>Asset Utilization:</p> <ul style="list-style-type: none"> - <i>Invest in broadband networks and services</i> - <i>the ongoing expansion of broadband and wireless services coverage across the province</i> - <i>re-establish growth by better leveraging our assets and consistently executing as One Rogers</i> - <i>focusing on sound capital management and operational efficiencies to maintain a competitive edge</i> - <i>investing in internal capabilities to build a high-performance culture and efficient operation.</i>

Business Unit Strategy	Growth	Sales growth by segment Percentage revenue from new product, services, and customer Rogers: <i>Generated free cash flow</i> <i>Increase of the annualized dividend per share</i> <i>Wireless and broadband data revenues growth</i>	Revenue/ Employee	Investment (percentage of sales) R&D (percentage of sales) Bell: <i>Total Capex</i> <i>Capex growth</i> MTS: <i>Total broadband and converged IP revenues growth</i>
	Sustain	Share of targeted customers and accounts Cross-selling Percentage revenues from new applications Customer and product line profitability	Cost versus competitors Cost reduction rates Indirect expenses (percentage of sales) Bell: <i>Annual pre-tax savings (indicating and discussing contributing factors)</i>	Working capital ratios (cash-to-cash cycle) ROCE by key asset categories Asset utilization rates
		Customer and product line profitability Percentage unprofitable customers	Unit cost (per unit of output, per transaction)	Payback Throughput

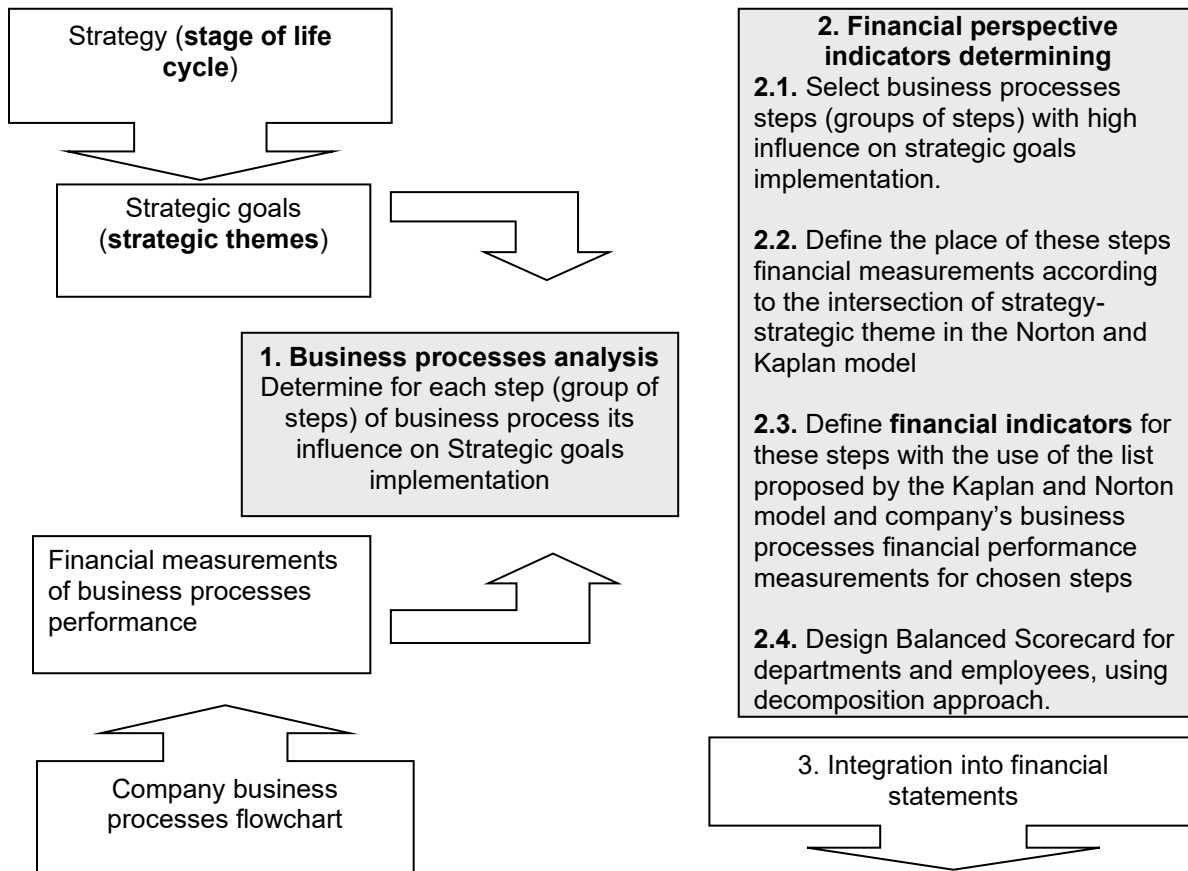
This analysis shows significant flows in strategic goals and performance results presentation in the corporate reporting system, which can become a critical disadvantage for the whole company, as it loses transparency for the management and investors. The detailed analysis of financial data provided in companies’ annual reports brings the following results of the financial goals and measures communication:

- Bell Canada under the strategy of ‘growth’ for the ‘cost reduction’ strategic theme proposes the indicators more suitable for ‘sustain’ life cycle stage.
 - Rogers has financial indicators to directly measure strategic objectives, but some of the strategic goals are presented as indicators. For example, objective ‘Deliver another year of significant consolidated free cash flow’ can be considered as an indicator.
 - Shaw and TELUS do not provide any financial indicators linked to strategic objectives results.
- The analysis shows that each of the four top telecom companies has disadvantages either in the strategy or performance results presentation. Found flaws can potentially degrade the image of the company, which influences negatively on the investor’s decision, and leaves the room for improvement for the company management.

In addition, Kaplan and Norton confirm that for most organizations the financial themes described in their model (1996), such as increasing revenues, improving cost and productivity, enhancing asset utilization, and reducing risk can provide the necessary linkages for all four Balanced Scorecard perspectives. This makes the strategy and financial themes clear indication important for the whole Balanced Scorecard development.

The model, developed in the article, which combines classical Kaplan and Norton’s (1996) indicators and indicators that are in use by telecom companies is recommended for the telecom industry as a methodology of the financial perspective of the Balanced Scorecard design. The algorithm of the further financial indicator’s improvement with the use of the financial perspective of the Balanced Scorecard based on the Norton and Kaplan model approach (1996) is presented in Figure 3.

Figure 3. The algorithm of the financial indicator’s improvement with the use of the Balanced Scorecard



Application of the developed models (with possible tailoring) will result in the creation of annual corporate reports containing strategy, strategic goals and the Balanced Scorecard directly linked to the announced goals. This will provide a tool for the investors and company managers for the strategy results clear understanding.

CONCLUSION

The BSC methodology throughout the years and examples of successful implementation confirmed to be a robust and innovative framework that has continued to develop in many

directions. It represents the approach for strategy implementation and performance evaluation that can help organizations to show superior financial results (Frigo, 2012).

Current research contributes to the BSC theory and practice by describing models and providing recommendations for the financial perspective development in telecom companies. The described approach application significantly increases the value and transparency of management control and strategy implementation results representation for investors, company management, and public. The approach described in the paper is universal for the companies of the telecom industry. It has a potential to significantly improve the quality of corporate reporting and positively influence the image of a company.

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DOES ONE'S SEX IMPACT PAY? COMPARISON OF TRENDS AMONG DIFFERENT DISCIPLINES IN US PUBLIC UNIVERSITIES

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ABSTRACT

This study investigates the existence of salary disparity in various academic fields by sex, rank, and size of universities. We focus our study on three groups in the following fields: Business colleges; Science, Technology, Engineering, and Mathematics (STEM) programs; and Nursing and Social Sciences programs. The numbers of female and male faculties are approximately the same in these fields (i.e. male-dominant, and female-dominant, respectively). We support our research with an empirical analysis of data gathered from the faculty in these three main disciplines of 4-year public universities in one state in the south-central U.S. in 2018. Controlling for faculty heterogeneity, we use factorial N-way ANOVA for our analysis. Our findings indicate that smaller universities pay less than larger public universities and tenure-track professors earn more than non-tenure-track professors in the College of Business and STEM programs. In the Nursing and Social Sciences Disciplines, we found that women typically earn higher salaries than men at every rank in Tier 3 Universities.

Keywords: Wages, Sex Pay Gap, Academic Disciplines, Discrimination, Faculty Heterogeneity

INTRODUCTION

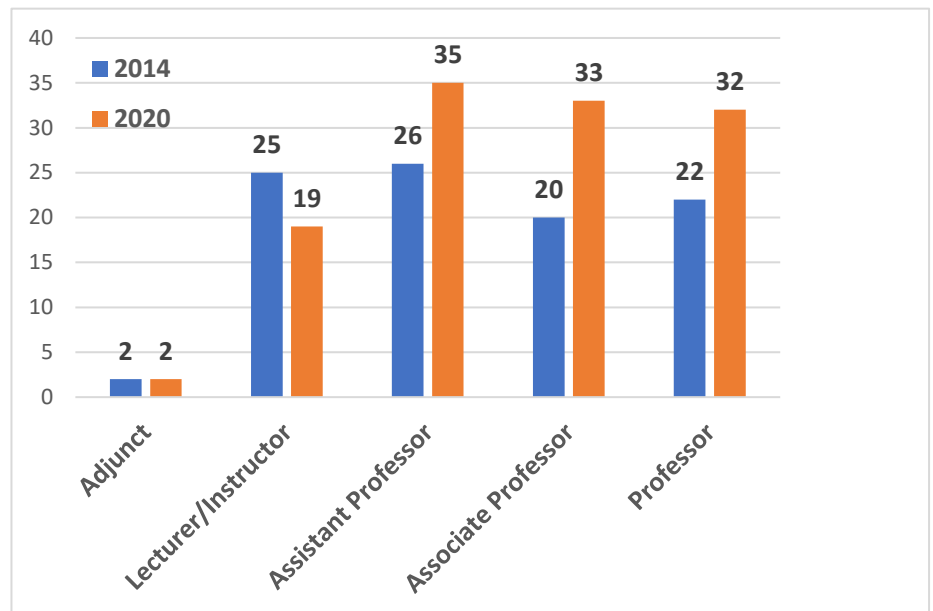
The existence, impact, and measurement of the gender pay gap in the US have been investigated for decades (Olivetti & Petrongolo, 2016; Strittmatter & Wunsch, 2021). However, there remains room for active and innovative research to understand the current trends to inform national and organizational efforts to resolve this issue. Research suggests that, despite the increased participation of women in the labor force, they tend to earn less than their male counterparts (Blau & Kahn, 2017; Ding, Ohyama, & Agarwal, 2021). In this study, we first survey the literature to identify what has been found about the causes of the gender pay gap and any improvements over the years. Even though the study of this topic has been explored across several countries in the world, we will limit our scope to the US. Following our review of existing studies, we will provide new empirical evidence of the extent and trends in the gender wage gap (if any) in the US and their potential explanations.

Recent studies suggest that, for many years beginning in 1955, the ratio of women to men's earnings was about 60%. However, there was an observed steep rise in women's relative pay in the 1980s and a continual but slower and irregular rise thereafter. This trend led to women in full-time jobs earning approximately 79% of what men did annually and about 83% weekly (Blau & Kahn, 2017). We aim to investigate more current trends and discuss possible explanations. Our current study is an update of another conducted in 2014, which was based on data from the faculty

from three different business colleges in Texas at tier 1, 2, and 3 AACSB accredited universities (Lewis & McKinzie, 2019), and another study in 2022 that investigated the existence of pay disparity in colleges of business (McKinzie, Otoo, & Nichols, 2022). We support our current study with updated information from four-year public universities in an entire state in the South-Central US for three major disciplines, namely colleges of business, STEM, and Social Sciences.

As detailed in Figure 1, our initial analysis showed that compared to 2014, the 2020 data showed proportionally more faculty in higher-ranked positions, even with new faculty hires and retirements. Not only were there more higher-ranked positions, but the percentage of faculty positions with women was higher. There was a 3% change in the percentage of female and male faculty members, as the percentage of female faculty members increased from 39% to 42% from 2014 to 2020 with a commensurate decline in the percentage of male faculty members from 61% to 58%.

Figure 1. The comparison of faculty ranks in 2014 and 2020



The previous analysis led us to ask the following research questions:

- What if we take an entire state, rather than just three colleges, and see what is happening?
- Could we also get pay information?
- Would there be differences if we considered the traditional dominant sex of the discipline?
 - Where there are about equal numbers by sex. (Business)
 - Where there are traditionally more men. (STEM)
 - Where there are traditionally more women. (Nursing/Counseling/Social Work – called Social Sciences for this paper)

Based on ANOVA analysis, we seek answers to the above questions. Our ultimate goal is to determine if there are rank and/or salary disparities by sex and compare these disparities by affiliation (discipline) and size of the public universities.

LITERATURE REVIEW

This section provides a review of the literature on the gender wage gap, with an emphasis on US university faculty. In the US, women are significantly underrepresented in the Science and Engineering (S&E) fields (Varma, 2018; Guy, 2022). This trend is observed in both S&E degrees earned and subsequent careers held (Iwasaki, 2015; Ong et al., 2011). In the past two decades, the drivers of women and minority (non-white) underrepresentation in the S&E fields has been extensively studied, however, the findings of such studies have not been successfully applied in

outreach efforts (Aspray, 2016; Varma, 2018). Underrepresentation of women in S&E fields affects high technology firms that will be unable to benefit from women's much-needed talent.

Research suggests that the underrepresentation of women in S&E fields results from the low levels of enrolment in STEM educational programs and not from the lack of women's ability to perform in the fields (Moso-Diez et al., 2021; Diekman et al., 2015). Studies further suggest that women's underrepresentation is attributable to the poor experiences women tend to have in the male-dominated science and engineering fields (Guy, 2022). This can motivate them to seek work in other fields or withdraw from the work field completely to focus on family life (Iwasaki, 2015).

Another factor that causes the wage gap is working overtime. A study by Cha and Weeden (2014) found that overtime work (50 and more work hours per week) and its associated increased wage returns had a significant effect on the gender pay gap. A study found that men were more likely to do overtime work and raise their wages compared to their female counterparts. The effect of overtime work on gender pay disparity was most pronounced in managerial and professional work environments where working long hours is expected and forms part of the organizational culture. With the standard workweek being a 40-hour week and faculty reporting working an average of 61 hours per week, this pay gap should also be notable for faculty (Flaherty, 2014).

The gap further widens for married people and even more for people with children (Goldin & Mitchell, 2017). This is because time-consuming roles are often associated with high wages. However, most individuals find it difficult to combine family life with long hours at work. The impact of marriage and family life on gender wage disparity is especially pronounced in high-prestige occupations (Magnusson & Neramo, 2017). This is because such roles often require time-consuming work arrangements, including demands for constant availability, substantial overtime work, and regular business travel. While the existence of gender wage disparity has been well-researched for prestigious occupations, there is a need for more granular studies which focus on specific fields. For example, academia, though prestigious is also notable for its flexible work schedule with a relatively balanced family and personal life (Crowder & Mouratidou, 2020) as well as having significant control over work travel. Studies however show that even in academia, gender pay disparities persist (AAUW, 2014). A study by Renzulli, Reynolds, Kelly, and Grant (2013) showed institution type and academic rank affect salary interdependently. Further, they found that the locations men and women occupy mediate the effect of gender on pay.

One disparity in pay is the discipline of employment including the different university disciplines (McCarron, 2021). Within universities, pay also is different based on the type of university (Bryant, 2021), namely public, private, independent, or religious. The concern about different pay within engineering and science fields raises the concern over differences based on sex. Within the US, women generally make less money than their male counterparts (Ohyama, & Agarwal, 2021). Some research has shown that women full professors earn more than their male counterparts (Chettri, 2021) however, the existence of controlling for other variables was not evident in that research. Which drove our research to control for some of these variables.

Just as one's pay can be impacted by gender, research has shown that the size of the university can impact one's pay (McCarron, 2021). As one would expect, the smaller the company you work for, the less you get paid (Keenan, 2017). This led us to include a factor to control for the size of the university. In addition to the size of the university, whether this university is research-based or not,

affects faculty salary. A study has shown there is a pay gap for full professor rank over time. In this research, they showed when the institution has greater S&E emphasis this pay gap decreases in comparison to universities with less emphasis on this field (Johnson & Taylor, 2019).

Much research has been done examining the pay gaps of minorities and alludes to this being based on discrimination (Sha, 2019). Focusing on state (public) universities allows us to eliminate another disparity. Research shows that there might be fewer disparities in pay in public universities as the outcomes in litigation appear to favor public sector organizations over private (Terpstra & Honoree, May 11, 2016). When focusing on faculty salaries at public vs private nonprofit universities, there is a distinct increase in the pay scales at the private institutions (Characteristics, 2020) which drew us to limit our research to only public institutions to control for these differences. In addition, women in the public sector can earn a significantly higher wage premium over their private sector counterparts (Mukhtarova et al., September 27, 2021) which might make up for the national lower pay for women. This led us to include controlling for the type of university.

In the U.S., gender pay disparity has been found to widen with age (more so 15 to 20 years after school). Within the academic profession pay increases are primarily tied to tenure-track promotions that are available at scheduled time intervals such as that from Assistant to Associate to Professor. If the pay gap increases with time, then it would also manifest differently at the different ranks. This could be confounded by the assertion that faculty salaries suffer from inversion and compression (Homer et al., 2020) with newer hires earning more than senior faculty who hold a higher rank. Which is the overriding factor? Where are the largest, if any, of the pay gaps? Are they with newer typically more junior in rank) or senior faculty with longer lengths of employment (tied to rank)?

To enter the academic workforce, it is desirable to have a terminal degree. A feat that has seen major strides in recent times (Nerad, 2020). The percentage of women who have been awarded doctoral degrees in the US has drastically increased over the years. For example, in the science and engineering fields, women who received their doctoral degrees increased from 13% in 1970 to 46% in 2018 (Thurgood et al., 2006; NSF, 2019) whereas women in business increased from 1.6% to 42.3% during the same period (National, n.d.). In general, women have earned more than 50% of all doctoral degrees in the US since 2006 (Johnson, 2017). Among these women, only a quarter chose to work in the industry rather than academia (NSF, 2019). However, research suggests that academia has a wider gender pay gap relative to industry (Ding et al., 2021). Our study aims to advance knowledge about the observed trend of the gender pay gap in specific academic disciplines.

METHOD

In this section, we outline the methodological process of our study. We begin by discussing the data source, the variables, and then the examined relationships in the study. We further discuss the variables we controlled for and the analytical methods considered.

Data

We utilized data from four-year public universities in one south-central US state. The data was collected for the year 2018. Since Carnegie no longer utilized the Tier 1, Tier 2, and Tier 3 categorization, we segmented our data based on the Southern Regional Education Board (SREB) categories; Thus, to classify the universities we considered the total student population of each of the colleges (CollegeSimply, n.d.). As seen in Table 1, we saw a clear delineation at the 10,000 and 20,000 student population levels and thus classified the universities by size where 1 is the largest and 3 are the smaller universities. This grouping also matched grouping universities by the SREB categories by grouping the Four-Year 1 university, the Four-Year 2 and 3 universities, and then all of the Four-Year 4 and below universities (Southern, n.d.). As the Carnegie classifications have recently changed to have multiple groupings from the former R1, R2, and R3 classifications, we chose to not use these criteria (The Carnegie, n.d.).

Table 1. Enrollment and Category

2018 Enrollment	Size Category
2,579	3
3,132	3
3,959	3
4,468	3
6,557	3
10,515	2
11,177	2
12,101	2
13,709	2
27,778	1

Table 1 shows the student population by university distribution coloring with enrollments under 10,000 (3) with grey, 10,000 to 19,000 (2) in orange, and (1) 20,000 or more in blue.

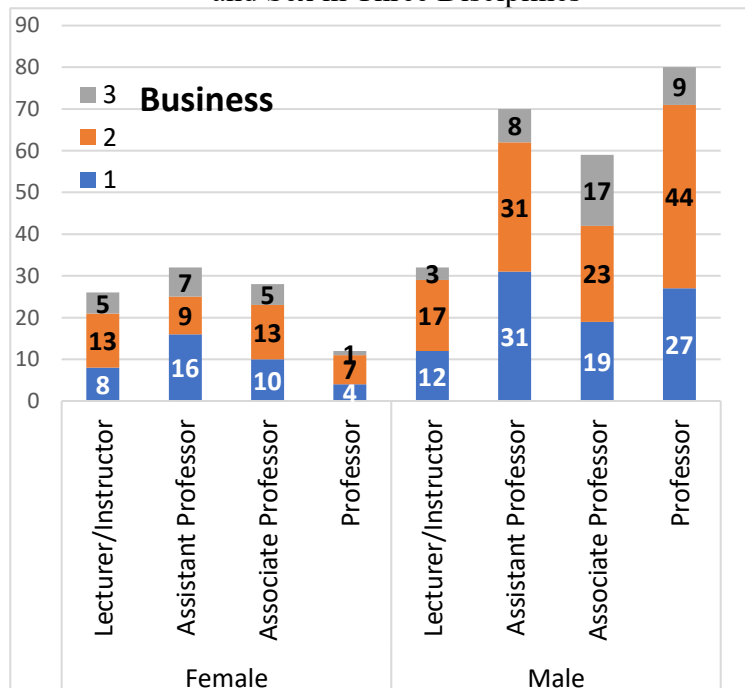
As depicted in Figure 2, we further observed that there were fewer women at higher ranks. These higher ranks also received higher pay. We observed more women at level 3, then level 2, and lastly level 1. The larger schools, higher levels, also paid more. These two criteria alone led us to wonder if it was the school size and rank more than one’s sex driving the pay disparities.

Data Analysis

We used measures of central tendency to compare our data by breaking out the income with our factors (sex, rank, size). This initial exploratory analysis allowed us to understand the relationships and representativeness of the data. Before continuing our analysis, we wanted to ensure our data was representative of our expected population and to understand if there were any gaps or under-represented categories.

We then used an N-way analysis of variance (ANOVA) to test for differences as this allows us to study the influence of multiple independent variables on a single dependent

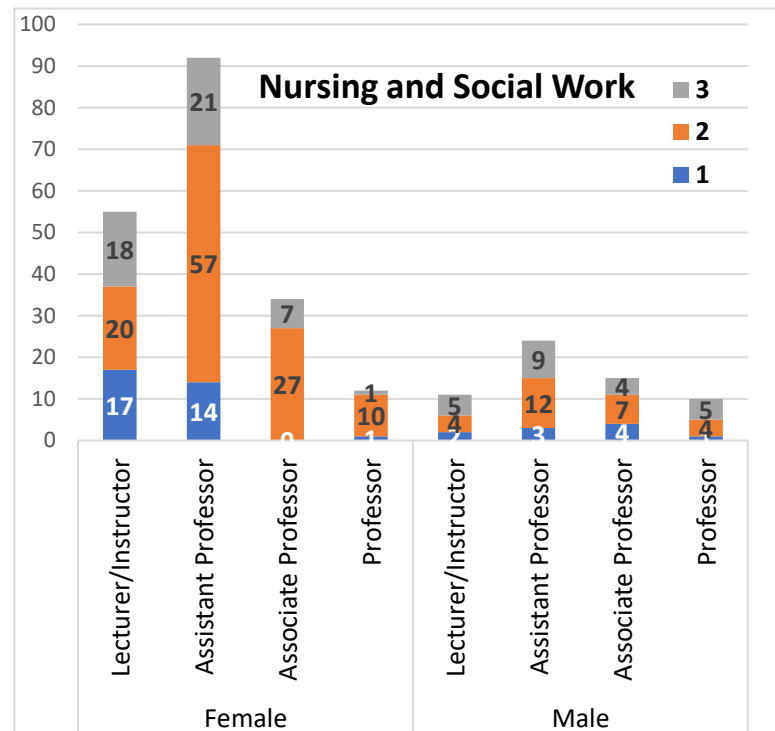
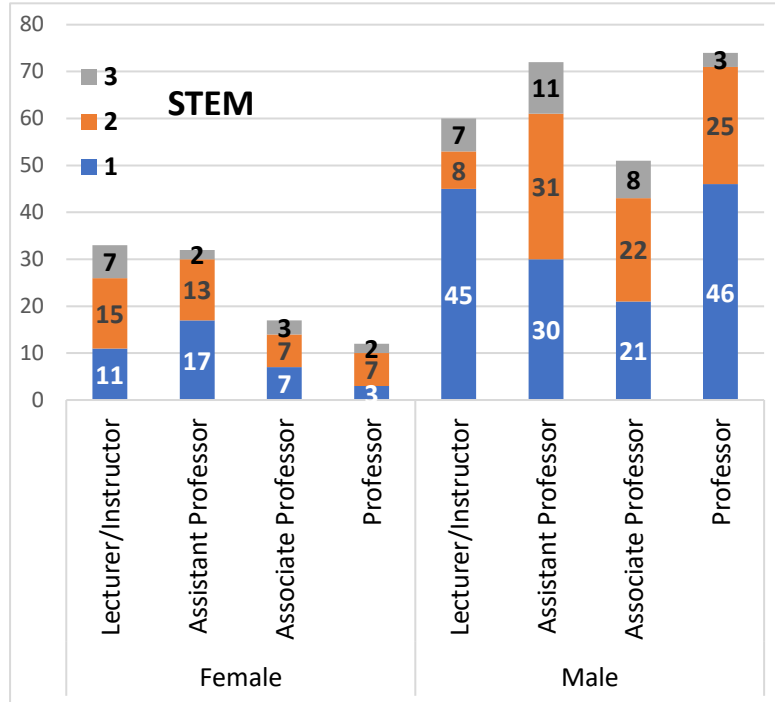
Figure 2. Distribution of faculty by University Level and Sex in Three Disciplines



variable. We had a numerical (interval) dependent variable and three categorical (ordinal and nominal) independent variables. Since we were studying salary (dependent variable) and wanted to control for sex, rank, and university size, this was the most appropriate statistical method. Factorial ANOVA (UCLA, n.d.) specifically allows us to test and partition this data using the Type I, II, and III sum of squares (SS) (Gottingen, n.d.). We had no missing data (empty cells) so Type IV SS was not necessary as this is the same as Type II when there are no empty cells.

The initial analysis using the measures of central tendency confirmed we had unbalanced data as we expected. This led us to consider the interaction effects and if there were impacts from these. Type I SS lets us know if men or women get paid more. We already know that different ranks get paid differently and our data was unbalanced at these ranks, we knew we needed to control for that imbalance (Cooper, 2011). We also hypothesized that people at larger universities get paid more and that was also unbalanced and needed to be controlled for. Thus, although we conducted Type I SS, we were not as concerned with that result. We do note that if there are no interaction effects, then we should rely on Type II over Type III as it will be more powerful. On the other hand, if there are significant interactions, then the main interactions should not be further analyzed.

Once we had the results from the ANOVA, we ran N-Way regression to determine the magnitude of the variable weights. When there were no interaction effects, we could assume that the impacts did not vary within the different variables, e.g. university size where 1 pays more than university



size 2, and lastly university size 3. But when there were interaction effects, the variation in pay became clearer with the regression results.

RESULTS

Data

The data of business and Social Sciences, faculty had interaction effects (Rank*Size) leading us to use SS Type III. The data of STEM faculty had no interaction effects leading us to use SS Type II. Although cursory research may lead one to believe that one’s pay is impacted by one’s sex, when you consider the faculty member’s rank and the size of their school, it is not. There remains a large imbalance in women faculty in STEM and men in Social Sciences across the board. In business (a field where there are approximately equal women/men) the imbalance is observed for women at level 2 and 3 schools and in the higher ranks.

Table 2. College of Business % Women

	1	2	3	Total
Lecturer/Instructor	38%	64%	69%	54%
Assistant Professor	43%	52%	56%	50%
Associate Professor	29%	48%	33%	39%
Professor	12%	28%	15%	20%

In STEM the proportion of women is 27.6% compared to 42% in business. We also observed very few women at the larger schools where the distribution of women by school level was as follows: 33% in level 3, 35% in level 2, and 21% in level 1. The observed distribution of women by rank was: (Lecturer/Instructor) 38%; (Assistant Professor) 31%; (Associate Professor) 25%; (Full Professor) 14%. As expected, the proportion of women in the Social Sciences discipline was significantly higher than men, 73.3%. The proportions of women in the various school levels were as follows: 24% in level 3, 59% in level 2, and 17% in level 1. Similar to STEM we observed a very low proportion of full professors were women in the Social Sciences discipline. The observed distribution of women by rank in the field is as follows: (Lecturer/Instructor) 28%; (Assistant Professor) 48%; (Associate Professor) 18%; (Full Professor) 6%.

Table 3. STEM % Women

	1	2	3	Total
Lecturer/Instructor	20%	70%	50%	38%
Assistant Professor	36%	30%	15%	31%
Associate Professor	25%	24%	27%	25%
Professor	6%	22%	40%	14%

Table 4. Social Sciences % Women

	1	2	3	Total
Lecturer/Instructor	40%	28%	77%	44%
Assistant Professor	33%	81%	90%	75%
Associate Professor	0%	38%	30%	30%
Professor	2%	14%	4%	9%

Our results suggest that significant imbalances exist for Business, STEM, and Social Sciences faculty. This confirmed the need for statistical research. Tables 2, 3 and 4 summarize our observations and show the percentage of women by rank and university size for the three different college groupings. Of note are the smaller percentages of women in STEM.

SS Type I

The analysis of the data from business and Social Sciences showed interaction effects (Rank*Size) leading us to use SS Type III. However, the data of STEM faculty had no interaction effects leading us to use SS Type II for that analysis. But let’s start with discussing the Type I results and why they might often bias one’s conclusions.

If a researcher did not consider the imbalance in the different factors, they may decide to only use an ANOVA SS Type I. In this case, they might only consider the 1-way ANOVA depending on their variable of focus. If they limited their research to differences in sex, then they would conclude there are differences and women are underpaid. As seen in Tables 5 and 6, all three variables (sex, size, and rank) are significant. In Table 7, sex was not significant.

Even if they considered 2-way or full factorial ANOVA, they might conclude that there are differences based on sex if they did not consider the interaction effects because both sex*size and size*rank were significant. However, SS Type I is not an appropriate method when the variables are imbalanced and one should not draw conclusions from Tables 5, 6, or 7.

STEM

SS type II. This method is only appropriate if there are no interaction effects. Our LR

showed interaction effects for Business and Social Sciences faculty, but not for STEM faculty. Therefore, SS Type II is appropriate for STEM. As seen in Table 8, using alpha = 0.05, our findings indicate that all three variables, when considered independently, do impact salary, but not when considered with the other variables. In STEM, men make more than women, faculty make more at larger universities, and (contrary to the belief in salary compression) higher-ranked faculty make more than lower-ranked faculty.

Table 5. Sum of Squares Type I - Business

Source	Pr>F		
	1-way	2-way	Full
Sex	<.0001	<.0001	<.0001
Size	<.0001	<.0001	<.0001
Rank	<.0001	<.0001	<.0001
Sex*Size		0.001	0.0005
Sex*Rank		0.2479	0.4427
Size*Rank		<.0001	<.0001
Sex*Size*Rank			0.7076

Table 6. Sum of Squares Type I - STEM

Source	Pr>F		
	1-way	2-way	Full
Sex	<.0001	<.0001	<.0001
Size	<.0001	<.0001	<.0001
Rank	<.0001	<.0001	<.0001
Sex*Size		0.5926	0.5963
Sex*Rank		0.6119	0.6164
Size*Rank		0.9736	0.9744
Sex*Size*Rank			0.9143

Table 7. Sum of Squares Type I-Social Sciences

Source	Pr>F		
	1-way	2-way	Full
Sex	0.1148	0.1015	0.105
Size	0.0002	0.0001	0.0001
Rank	<.0001	<.0001	<.0001
Sex*Size		0.003	0.0034
Sex*Rank		0.7085	0.7151
Size*Rank		0.0103	0.0118
Sex*Size*Rank			0.9989

N-way regression. Noting that sex, size, and rank were significant, we also ran an N-Way factorial regression model using backward elimination to confirm the impact of each of the variables and their magnitude of impact. Per the SS Type II noted above, the interaction terms were removed, and although not as evident in the SS, the sex variable was also removed in the regression model. The results showed only school size and rank were present in the final model with the scale of impact as we predicted with the larger schools adding to one’s income and the lower ranks taking away from income and no interaction effects (different measures at different ranks or school sizes). The regression model results are noted in Table 9. As seen with the estimate (b) values, the higher the rank and large the school (independent of each other), the larger one’s income.

Table 8. STEM Sum of Square Type II

Source	Pr>F		
	1-way	2-way	Full
Sex	0.0344	0.0479	0.0492
Size	<.0001	<.0001	<.0001
Rank	<.0001	<.0001	<.0001
Sex*Size		0.6278	0.6313
Sex*Rank		0.5815	0.5863
Size*Rank		0.9736	0.9744
Sex*Size*Rank			0.9143

Table 9. STEM Regression Results rank and size

Predictor	b	95% Confidence Limits		Pr > |t|	beta	sr ²	VIF
		LL	UL				
Intercept	79,988	68,027	91,949	<.0001	0	.	0
Lecturer/Instructor	-35,822	-45,409	-26,236	<.0001	-0.422	0.121	1.566
Assistant Professor	-22,368	-31,769	-12,966	<.0001	-0.271	0.005	1.589
Associate Professor	-18,991	-29,520	-8,463	0.0004	-0.198	0.002	1.472
Professor	0	.	.	.	.	.	.
Size 1	35,828	25,006	46,650	<.0001	0.475	0.123	2.521
Size 2	12,119	943	23,294	0.0336	0.155	0.010	2.506
Size 3	0	.	.	.	.	.	.

Fit statistic: Adj R2 = 0.6620 Note: beta is the standard regression weights. sr² is the squared semi-partial correlation Type I.

Business

SS type III. This method is only appropriate if there are interaction effects. Our ANOVA showed interaction effects noted in Table 10 for Business faculty, so we used SS Type III. In this case, one’s sex was not significant. The size of the university and one’s rank as well as the interaction term size*rank were significant. The interaction means that at different ranks and different-sized schools the pay differences are not the same. So, a(n) Lecturer/Instructor’s income at a Level 1 school might not be the same magnitude in difference from other professors’ income at a Level 2 or 3 school, etc. To understand the impact of these interactions, we ran N-way regression.

Table 10. Business Sum of Squares type III

N-way regression. The only variable that remained in the model was rank*size, the interaction term as shown in Table 11. Although the income of faculty of the same rank is mostly consistently larger at the larger universities, there is one exception and that is for Lecturers at the largest universities. Although there is consistency for all the other ranks, the very first variable (Lecturer/Instructor 1) should be smaller than the two estimates (b) below it if the model held. But it does not and that is why there is an interaction term. Thus, the one violation to pay is larger at larger schools and higher ranks is that Lecturer/Instructors of Business at the largest schools do not.

Source	Pr>F		
	1-way	2-way	Full
Sex	0.4026	0.2478	0.3332
Size	<.0001	<.0001	<.0001
Rank	<.0001	<.0001	<.0001
Sex*Size		0.2173	0.3112
Sex*Rank		0.5134	0.6236
Size*Rank		<.0001	<.0001
Sex*Size*Rank			0.7076

Table 11. Business Regression Results rank*size

Predictor	b	95% Confidence Limits		Pr > |t|	beta	sr ²	VIF
		LL	UL				
		Intercept	104,015					85,306	122,723	<.0001	0	.	0
Lecturer/Instructor 1	-48,429	38,409	81,800	<.0001	-0.221	0.090	2.823
Lecturer/Instructor 2	-35,932	-16,830	25,466	0.0012	-0.198	0.135	3.646
Lecturer/Instructor 3	-49,379	-37,914	7,212	0.0006	-0.145	0.071	1.758
Assistant Professor 1	35,067	-71,342	-25,516	0.0009	0.235	0.031	4.910
Assistant Professor 2	-4,937	-57,535	-14,330	0.6427	-0.031	0.010	4.410
Assistant Professor 3	-25,748	-77,442	-21,317	0.0367	-0.103	0.024	2.389
Associate Professor 1	60,104	14,465	55,670	<.0001	0.325	0.080	3.566
Associate Professor 2	4,318	-25,854	15,979	0.6882	0.026	0.000	4.112
Associate Professor 3	-15,351	-49,900	-1,596	0.1817	-0.073	0.015	2.992
Professor 1	108,955	87,439	130,470	<.0001	0.608	0.217	3.725
Professor 2	13,535	-6,925	33,996	0.1940	0.094	0.002	5.182
Professor 3	0	.	.	.	.	.	.

Fit statistic: Adj R2 = 0.6620 Note: beta is the standard regression weights. sr² is the squared semi-partial correlation Type I.

Social Science

SS Type III. Social Science disciplines also showed interaction effects, so we used SS Type III for this discipline as well. As with the Business discipline, we had one interaction term of significant concern, size*rank. Unlike the Business discipline, we not only saw size and rank as

significant but also sex. Again, due to the interaction term, running regression allowed us to see what the interaction difference was as well as the magnitude of the parameter estimates.

N-Way Regression. With this regression not only did the rank remain in the model but one interaction term, sex*size. This is the only discipline where the sex variable showed a significant impact in the regression model. Here where we would expect women at medium-sized universities to have a salary between those women at the smaller and the larger-sized universities, they do not. They make less than those at the smallest universities.

Table 12. Social Sciences Sum of Squares type III

Source	Pr>F		
	1-way	2-way	Full
Sex	0.0623	0.002	0.0071
Size	<.0001	<.0001	0.0001
Rank	<.0001	<.0001	<.0001
Sex*Size		0.0148	0.0928
Sex*Rank		0.4681	0.5346
Size*Rank		0.0103	0.0430
Sex*Size*Rank			0.9989

Table 13. Social Sciences Business N-Way Regression rank and sex*size

Predictor	b	95% Confidence Limits		Pr > |t|	beta	sr ²	VIF
		LL	UL				
		Intercept	66,987					61,144	72,829	<.0001	0	.	0
Lecturer/Instructor	-21,601	-27,046	-16,156	<.0001	-0.761	0.136	3.189
Assistant Professor	-16,762	-21,803	-11,721	<.0001	-0.670	0.008	3.519
Associate Professor	-11,307	-16,834	-5,780	<.0001	-0.359	0.012	2.661
Professor	0	.	.	.	.	.	.
Female 1	18,443	12,462	24,425	<.0001	0.492	0.042	2.205
Female 2	10,936	6,022	15,850	<.0001	0.437	0.005	3.335
Female 3	12,702	7,184	18,219	<.0001	0.396	0.061	2.569
Male 1	15,961	7,844	24,077	0.0001	0.250	0.008	1.395
Male 2	10,499	4,438	16,559	0.0008	0.260	0.002	1.954
Male 3	0	.	.	.	.	.	.

Fit statistic: Adj R2 = 0.2501 Note: beta is the standard regression weights. sr² is the squared semi-partial correlation Type I.

Effect Size

In and of themselves these results are interesting, but knowing the effect size in this study also leads to knowing that this research has practical significance. For both size and rank, all the effect sizes were large indicating our conclusions about these two variables for all three disciplines were meaningful. The same could not be said for the sex variable as seen in Table 14.

Table 14. Effect Size

	Size		Sex		Rank	
Business	3.187	(large)	-0.327	(small)	-3.187	(large)
STEM	3.099	(large)	-0.508	(medium)	-3.099	(large)
Social Sciences	4.926	(large)	-0.191	(negligible)	-4.926	(large)

DISCUSSION

Our motivation for this study was to determine if one’s salary was impacted differently in disciplines where they are traditionally more male, more female, or relatively equally represented by sex. Based on our research we felt we should control this study by limiting it to public universities within one state and including variables of university size and faculty rank to limit bias in the data.

Size

The size of the university was significant for all disciplines when considering the Sum of Squares. The larger the university, the more one is paid. The effect size was large for all three disciplines indicating these findings might also be applicable at other institutions.

Rank

Faculty rank was also significant for all disciplines with faculty earning more at higher ranks. This is not consistent with the belief in faculty salary compression.

Sex

A faculty member’s sex was only significant in STEM and Social Sciences, the disciplines where there is typically an imbalance in one’s sex. In business colleges where the proportion of male and female faculty is closer to equal, sex was not a significant factor. Where we wondered if there was a different impact if the discipline was male vs female-dominated, this turned out to not be true with men earning more than women in both STEM and the Social Sciences.

Interactions

The interesting finding was with the interaction terms including size. This interaction further explained what was happening with these variables.

Rank*size. In business disciplines, the non-tenure track faculty (Lecturer/Instructor) at medium-sized universities got paid less than their peers at smaller universities.

Sex*size. In the Social Science disciplines, women at medium-sized universities got paid less than their peers at smaller universities.

With only these two exceptions, this study shows that in general, the larger the university, the higher your rank, and being male all contribute to larger salaries when the sex of the faculty is imbalanced.

Future Work

Impact of COVID-19. Our findings in this study and the impact of COVID-19 in recent years have led us to question if the proportion of women faculty changed since 2019. To answer this question, we look to update our 2018 data with 2021 data to observe the trends and find possible explanations. We will further investigate if there is any gap in the 2021 data. Based on the data we collect, we look to compare the different disciplines.

Other disciplines. This study groups faculty from different colleges to form STEM and Social Science disciplines and combines all faculty from a business college into one discipline. Further research of all faculty including disciplines not included here as well as looking into the disciplines within a business college might reveal imbalances within those disciplines.

Looking broader. This study was limited to one state in the US. An expansion of this study to include either all states from within one region or a representative sample from across the US could not only add to the significance due to a larger sample size but could also make the conclusions more generalizable.

Taking it outside public universities. Where this study solely looked at public universities, controlling for private universities as a variable could add valuable information to differences in public vs private universities. A similar study could be expanded outside universities into public institutions.

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