



Exploratory innovation, exploitative innovation and operational performance: influence of informal social relations in environmental competitiveness

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Abstract

The objectives of this study are to examine the influence of knowledge sharing and inter-departmental connectedness on exploratory innovation, exploitative innovation, and firm's operational performance; the influence of exploratory and exploitative innovations on firm's operational performance; and the moderating effect of environmental competitiveness. The data was collected from the banking industry in Bangladesh through a cross-sectional survey of 241 managers and analyzed through structural equation modeling using SmartPLS software. Findings show that knowledge sharing, and inter-departmental connectedness contribute to develop both exploratory and exploitative innovation as well as enhance firm's operational performance. Moreover, exploratory and exploitative innovation influences a firm's operational performance. Finally, environmental competitiveness negatively affects the relationship of knowledge sharing and inter-departmental connectedness with operational performance. The findings emphasize the flexible and informal social relations among people in creating effective exploratory and exploitative innovation and enhancing firms' operational performance. It suggests that knowledge sharing, and inter-departmental connectedness as an informal and flexible coordination mechanism are more important in predicting operational performance if the level of environmental competitiveness is low.

Keywords Exploratory innovation · Exploitative innovation · Knowledge sharing · Inter-departmental connectedness · Operational performance · Environmental competitiveness

1 Introduction

As the competitive landscape of business in the world is evolving dramatically (Taghizadeh et al., 2020), firms are thriving to adapt to their environment by exploiting existing capabilities and competences or exploring new possibilities (Duodu and Rowlinson, 2019). Both exploring and exploiting knowledge are essential in building beneficial relationships

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with customers and sustaining a firm's competitive advantages (Cegarra-Navarro et al., 2011). Therefore, the idea of exploration and exploitation of knowledge became a dominant research area in the context of innovation, entrepreneurship and organizational learning field (Cegarra-Navarro et al., 2011; Jansen et al., 2006; Limaj and Bernroider, 2019). According to scholars, organizations should be ambidextrous and develop simultaneously exploratory and exploitative innovation to compete (Gibson and Birkinshaw, 2004; O'Reilly and Tushman, 2013). While exploratory innovation explores new possibilities to produce new products and/or services, exploitative innovation exploits old certainties to produce incremental products and/or services (Limaj and Bernroider, 2019). Though both exploratory and exploitative innovation are fundamentally different concept that require very different strategies and structures (Benner and Tushman, 2003; Gabriel Cegarra-Navarro et al., 2011), yet an appropriate balance between both is critical for firms' survival and success (March, 1991; Taghizadeh et al., 2020).

Previous research has asserted that organizational antecedents influence exploratory and exploitative innovation in different ways. For instance, intellectual capital (Duodu and Rowlinson, 2019), absorptive capacity and cultural factors (Limaj and Bernroider, 2019), formal hierarchical structure and informal social relations (Jansen et al., 2006) are influential on both exploratory and exploitative innovation distinctively. However, evidence shows that flexible resources (e.g. knowledge sharing) and informal social relations (e.g. inter-departmental connectedness) better influence both types of innovation (Kamaşak and Bulutlar, 2010; Lusch and Vargo, 2006; Taghizadeh et al., 2020). With regards to knowledge sharing, according to past studies, knowledge is one of the most important resources of an organization and a key building block for innovation process and performance improvement (Shujahat et al., 2019; Wang and Hu, 2020). Knowledge sharing has been defined as a team process allowing team members to share task-relevant ideas, information, and skills with each other (Gao and Bernard, 2018; Srivastava et al., 2006). In organizations, the team integrates individual outputs and solves problems through informal interactions and sharing of expertise (Faraj and Sproull, 2000; Prieto-Pastor et al., 2018). Likewise, inter-departmental connectedness as an overall pattern of informal social relations explains personal linkage between people in an organization and includes a voluntary mode of coordination than hierarchical structure (Tsai, 2002). Inter-departmental connectedness increases opportunities for informal hall talk and helps individuals to combine knowledge and develop new knowledge for innovation (Popa et al., 2017). However, the importance of informal social relations and its significant positive effect on knowledge sharing and innovation has been proven in the past study (Jansen et al., 2006; Tsai, 2002). Although numerous studies have been published in this regard, still a critical question remains obscure and that is how to synchronize these two types of innovation and achieve a firm's performance (Jansen et al., 2006; Li et al., 2010; Limaj and Bernroider, 2019). Therefore, this research argues that knowledge sharing, and inter-departmental connectedness can be two predictive factors, which may facilitate synchronization of both exploratory and exploitative innovation and achievement of superior performance.

From the strategic management point of view and the contingency theory perspective, the effectiveness of innovation and performance depends on environmental aspects. For example, Jansen et al. (2006) examined the moderating role of environmental dynamism and competitiveness on the relationship between types of innovation and firm's performance. Therefore, this study considers environmental competitiveness as a moderating factor and examines how organizations may successfully respond to environmental conditions through exploratory and exploitative innovations. This study aims to provide a better understanding of how organizations can successfully respond to a competitive environment

by practicing exploratory and exploitative innovations. Drawing from organizational learning and strategic management theories, this research indicates that knowledge sharing, and inter-departmental connectedness facilitate exploratory and exploitative innovations in organizations and influence a firm's operational performance. This study further suggests that exploratory and exploitative innovations impact a firm's operational performance. In addition, environmental competitiveness has been proposed to have a moderating effect on these relationships. Focusing on organizational factors, the current study contributes to past studies by examining how knowledge sharing and inter-departmental connectedness influence exploratory and exploitative innovations as well as firm's performance and how organizations successfully respond to environmental conditions. The study was conducted in the context of the banking industry in Bangladesh. Bangladesh is now considered as one of the most emerging economies in the world. Spectacular steady economic growth has grabbed attention of many scholars and practitioners. According to the World Economic Forum (2020), Bangladesh will soon become one of the top ten emerging Asian tigers and will be the 24th largest economy in the world. The literacy rate of the country is 73 percent as of 2018 out of 160 million population (Pervez and Haque, 2020). Banking industry in Bangladesh exist at the top of the financial system with notable importance. Nonbanking financial institutions have also grown but remain small; banks still account for over 90 percent of financial institutions' assets (The World Bank, 2020). Bangladeshi economy mainly counts on banks to finance its economic expansion and advancement (Dutta and Saha, 2021). In keeping with the global trend and issuance of banking license based on the political decision in recent years, the flourishing banking industry in Bangladesh is experiencing intense competition. However, it has been acknowledged by the scholars that the banking industry also supporting the growth of the economy significantly (Rashid et al., 2020). It is suggested that the banking industry in the country requires a wider range of innovation to achieve better performance. Therefore, it warrants an in-depth research from the innovation perspective considering the intense competition taking place in the flourishing banking industry of Bangladesh. Hence, the finding of this study provides new insights by effects of internal and external factors on innovation types and performance. Managers can make appropriate choices and adopt various approaches to foster a favorable environment to the success of innovations and performance.

In the next section, the paper presents the literature review and hypotheses development. After describing the research methodology, the paper presents the analysis part using data collected from 241 bank managers in Bangladesh and deliberates an empirical finding. Finally, the paper concludes with a discussion of the results, implications, and limitations of this study.

2 Literature review and hypotheses development

2.1 Exploratory and Exploitative Innovations

There are two aspects of organizational learning; exploration of new knowledge, skill, and process; and exploitation of existing knowledge, skills, and processes (March, 1991). The notion of exploitation and exploration has been conceptualized and developed as an underlying theme in research on innovation (Jansen et al., 2006; Rothaermel and Deeds, 2004). Exploratory and exploitative innovations use knowledge, skill, and process that are transformed into innovation outcomes (Mueller et al., 2013). Exploratory innovations are

radical innovations and require new knowledge to offer new designs, create new markets, and develop new channels of distribution (Benner and Tushman, 2003). The characteristic of exploratory innovation is a process of searching opportunities that are new to an organization (Guan and Liu, 2016; Zhang and Luo, 2020). Exploratory innovation involves a disruption of existing competencies and existing market linkage, which creates a high level of risk (Mueller et al., 2013). Firms engaged in exploratory innovation pursue new knowledge to develop new products/ services for emerging customers and markets (Benner and Tushman, 2003; Jansen et al., 2006).

On the other hand, exploitative innovations are incremental innovations which are built on existing knowledge to strengthen existing skills, processes, and structures (Benner and Tushman, 2003). The strategy of exploitative innovation is basically built on improvements, refinements, efficiency, and implementation of current skills and processes in an organization (Mueller et al., 2013; Schamberger et al., 2013). Exploitative innovation responds to the real-time environmental conditions through accompanying advances in processes and technologies (Jansen et al., 2006; Kollmann and Stöckmann, 2014). Cost reduction as well as superior satisfaction of customers and markets are targeted in exploitative innovation activities (Jansen et al., 2006). Exploitative innovation increases existing knowledge and skills, expands existing products and services, improves established designs, and increases the efficiency of existing distribution channels (Benner and Tushman, 2003).

2.2 Predictors of Exploratory and Exploitative Innovations

From the study of organization, different organizational forms relate with different strategies and environmental conditions. To achieve successful exploratory and exploitative innovations, firms in dynamic and competitive environments develop more coordination mechanisms and less reliance on formalization and specialization (O'Reilly and Tushman, 2013). However, scholars argue that knowledge sharing and inter-departmental connectedness are effective coordination mechanisms with flexible and informal orientation that have yielded multiple benefits to exploratory and exploitative innovations in organizations (Jansen et al., 2006; Kamaşak and Bulutlar, 2010; Taghizadeh et al., 2020). In this regard, we use knowledge sharing and inter-departmental connectedness to examine their effect on exploratory and exploitative innovations.

2.2.1 Knowledge Sharing

Research in the domain of innovation supports the association between knowledge sharing and firms' innovation performance (Darroch and McNaughton, 2002; Dougherty et al., 2002; Zhang and Luo, 2020). Innovation depends heavily on the new knowledge accumulation, which provides creative solutions in firms (Dougherty et al., 2002). Past studies found that lack of knowledge in organization is one of the main barriers to innovation, particularly in service industries (Storey and Kelly, 2002). Basically, the knowledge-sharing ecosystem brings new ideas in organizations by breaking old thinking patterns. For instance, when knowledge is shared and transferred among people within the organization, the idea of one person or group triggers new and novel ideas in others, which contributes in developing new products or services (Hargadon and Sutton, 1997). In fact, knowledge sharing not only enhances the people knowledge, skill, and experience, it benefits individuals to come up with new ideas and boost their attitude (Wang and Wang, 2012). Once people in an organization share their knowledge with each other, creativity and innovation rates are

enhanced to a greater level (Kamaşak and Bulutlar, 2010). In such environment, employees can quickly respond to the needs of the market and undoubtedly reduce the cost of problem solving (Sher and Lee, 2004). According to Tsai (2001), new knowledge is critical in developing new products or innovative ideas. Knowledge sharing is the most important factor that impacts innovation due to their ambiguous and unique nature within the firm (Teece, 2007). However, in this study, we believe that the effect of knowledge sharing can be better realized if both exploratory and exploitative innovation are considered separately. This is because knowledge sharing forms a basis for the production of new products or services in the case of exploratory innovation, whereas for exploitative innovation, knowledge sharing is used to improve an organization's existing products or services. Thus, considering the above discussion, this research proposes that knowledge sharing is essential for both exploratory and exploitative innovation. Therefore:

H1 Knowledge sharing has a significant positive relationship with exploratory innovation.

H2 Knowledge sharing has a significant positive relationship with exploitative innovation.

2.2.2 Inter-departmental Connectedness

In order to have an exploratory and exploitative innovation climate in a firm, it is necessary to support knowledge sharing and collaboration across firms' functional areas (Popa et al., 2017). It is crucial to promote a positive working environment in organization in order to motivate employees to work together and share knowledge and experiences (Oparaocha 2016; Taghizadeh et al., 2019). Inter-departmental connectedness as the overall pattern of an informal social network in a firm concerns personal linkages among people in a voluntary model of coordination than hierarchical structure (Tsai, 2002). According to scholars, inter-departmental connectedness as an informal coordination mechanism increases opportunities for informal hall talk and supports access to knowledge sources within organizations and further refinement of existing knowledge (Subramaniam and Youndt, 2005). Previous studies suggest that inter-departmental connectedness can be advantageous for developing collaboration networks and cooperation among organization members regarding the implementation of innovations (Jansen et al., 2006; Martinez-Conesa et al., 2017).

Inter-departmental connectedness supports people to combine their knowledge and develop new knowledge for exploratory innovation (Atuahene-Gima, 2003). Further, inter-departmental connectedness assists in establishing legitimacy and adopting exploratory innovation (Subramaniam and Youndt, 2005). Past studies suggest that open communication and decentralization are core factors in fostering innovativeness in organizations (Prakash and Gupta, 2008). In fact, lack of employee empowerment may hinder openness and internal commitment for innovation (Popa et al., 2017). On the other hand, to have exploitative innovation, organizations require to efficiently redesign and refine existing knowledge (Subramaniam and Youndt, 2005). According to previous studies, the advantage of inter-departmental connectedness is in developing trust and cooperation among organizational members (Adler and Kwon, 2002; Jansen et al., 2006; Subramaniam and Youndt, 2005). It permits people to develop a deep understanding on how to implement certain improvements and further refinement of existing products, processes, and markets (Adler and Kwon, 2002; Dyer and Nobeoka, 2000). Therefore, inter-departmental connectedness in organizations can support the enhancement of exploratory and exploitative

innovation by promoting trust and collaboration within the firm's boundaries. Hence, based on these arguments, the following hypotheses are proposed:

H3 Inter-departmental connectedness has a significant positive relationship with exploratory innovation.

H4 Inter-departmental connectedness has a significant positive relationship with exploitative innovation.

2.3 Predictors of Operational Performance

In today's complex and competitive environment, innovation is considered a significant enabler to create value and sustain competitive advantage in organizations (Subramaniam and Youndt, 2005; Taghizadeh et al., 2020; Tidd and Bessant, 2013). Past studies found that organizational innovation plays an important role in a firm's performance and competitiveness (Damanpour and Evan, 1984; Storey and Hughes, 2013). Innovation benefits firms by improving the efficiency and potential value and by bringing new intangible assets into the organization (Wang and Wang, 2012). Researchers found that both exploratory and exploitative innovation are important for competitive advantage and imbalance between them has a negative effect on firms performance (Nunes et al., 2006; Soto-Acosta et al., 2018). Innovation enables firms to achieve operational efficiency and increase service quality by cultivating atmosphere of innovation, enhancing the capability of innovation, managing the organizational system, and widening the R&D in the firms (Hsueh and Tu, 2004; Parasuraman, 2010). Usually, innovative firms are more successful to develop new capabilities and respond to customers' needs which leads to performance improvement (Calantone et al., 2002; Tidd and Bessant, 2013). In a highly competitive environment, introducing new products or services or processes is crucial in order to respond quickly to competitors (Boyd and Bresser, 2008; Smith, 2011). Therefore, innovation activities assure quicker responses to the environment by launching new products that eventually improve firms' performance (Tidd and Bessant, 2013). In fact, exploratory and exploitative innovations improve firm performance differentially (Auh and Menguc, 2005; Li et al., 2010). To measure effectiveness and efficiency, both exploratory innovations and exploitative innovations have a significant positive effect on performance (Auh and Menguc, 2005). Exploratory innovations enhance competitiveness in the long run, while exploitative innovations increase efficiency in the short-term (March, 1991). In financial institutions, exploratory innovation is much required in the current dynamic and competitive financial world. Financial institutions often come up with new products or services in order to capture a new market share. Often, financial institutions like banks experiment and commercialize products and services that are completely new to banks. For example, providing service for remitting foreign currency through mobile apps and donation to national disaster. Bringing in such exploratory innovative product or service, it would enhance the operational performance of the bank. On the other hand, exploitative innovation is also essential for the banks to thrive in the market. Banks usually refine the provision of existing products and services, or regularly implement small adaptations to existing products and services or in some cases, introduce improvements to existing products and services for the local market. For example, offering a customized deposit scheme for a customer segment can be considered a type of exploitative innovation. Such regular refinement, adaption of product or services would lead to achieving better operational performance. Hence, it is logical to

expect that exploratory and exploitative innovation would play a vital role in achieving the operational performance of the banks. Therefore, the following hypotheses are presented to be tested:

H5 Exploratory innovation has a significant positive influence on firms' operational performance.

H6 Exploitative innovation has a significant positive influence on firms' operational performance.

Knowledge sharing, in this study, has been proposed to have impact on operational performance. In knowledge management processes, knowledge sharing is the common thread (Wang and Hu, 2020). Knowledge creates valuable intangible assets in organizations to create and sustain competitive advantages (Teece, 2007). According to previous studies, knowledge sharing is the backbone of organizational learning and results in many benefits to an organization (Taghizadeh et al., 2018; van Woerkom and Sanders, 2010). It helps organizations by creating opportunities for problem solving and generating efficiencies, which improves the success chances of an innovation and sustains competitive advantages (Lin, 2007). Effective knowledge sharing has been found to have a strong positive impact on organizational performance (Kucharska and Erickson, 2019). According to past studies, organizational knowledge sharing has been associated with employee competencies that contribute to organizational performance (Hsu, 2008). Knowledge sharing affects performance in various ways (Du et al., 2007) through the improvement of business process, product and service offerings of a firm (Law and Ngai, 2008). Exchange of information, knowledge, or sharing skills among the organizational member is important in financial institutions. In the financial sector, information and knowledge is very crucial for the operation of the financial system (Abbas et al., 2019). In the service industry particularly, information and knowledge are building blocks (Paschen et al., 2020). Within the service industry, financial sector is heavily dependent on the information and knowledge through exchange of information and knowledge sharing as it deals with the monetary system (Al-Dmour et al., 2020). Other sectors such as telecommunication, healthcare sectors also draw similar attention for information and knowledge (Kassavou and Sutton, 2018) as the financial sector does. Hence, it is expected that employees working in banks would share knowledge among the team members to enhance the overall knowledge about the banking system. As team members share their special knowledge and expertise with one another, and they share their special knowledge about how to perform the team task, and tell other members about it, this exchange and sharing of knowledge would contribute towards enhancing the quality of the operation and the responsiveness of the customers of the banks. Hence, it is expected that if employees' knowledge is shared among each other, it would improve the operational performance of the banks. Therefore, we propose that:

H7 Knowledge sharing has a significant positive influence on firms' operational performance.

In addition, this research has proposed to examine the impact of inter-departmental connectedness on operational performance. Many studies have been conducted to examine the effects of inter-departmental connectedness on innovation climate (Popa et al., 2017), types of innovations (Jansen et al., 2006), product quality (Menon et al., 1997), and knowledge

sharing (Tsai, 2002). However, few studies have examined its effect on firms' performance. Inter-departmental connectedness is a structural dimension of social relations that focus on the extent of interaction between individuals across functional departments (Jansen et al., 2006; Menon et al., 1997). Positive inter-departmental connectedness allows for quick exchange of customer and market information as employees can discuss things directly and solve issues related to firms' operations (Menon et al., 1997). According to scholars, interactions among people in organization provides channels to exchange information among members (Tsai, 2002). Such interactions among employees from diverse department may enable firms to offer better-quality products, reduce cost of offering, and increase productivity level as compared to their key competitors. In the financial institutions, like banks, there are several departments that are distinct from other organizations. For example, in addition to core functional areas of the banks, there are departments such as fraud management and credit management department. While inter-departmental employees can easily access any type of communication, employees feel more comfortable to exchange views and decisions with employees in other department. These activities are assumed to have a positive impact on the operational performance of the banks. Hence, this study proposes that inter-departmental connectedness influences firms' operational performance significantly. Drawing on this literature, this study hypothesizes that inter-departmental connectedness leads to superior operational performance. Thus:

H8 Inter-departmental connectedness has a significant positive influence on firms' operational performance.

2.4 Role of Environmental Competitiveness

Based on the contingency theory, a firm's innovation strategies are dependent on external and internal factors (Huizingh, 2011; Jansen et al., 2006), and fit between strategic resources and environment impact firms' performance positively (Venkatraman and Prescott, 1990). Environmental competitiveness is an important contingency factor that influences innovation strategies while delivering performance (Prajogo and Oke, 2016). Environmental competitiveness refers to the degree of intense competition in an external environment (Matusik and Hill, 1998), and the degree of competition and the number of areas in which there is competition (Miller, 1987). Environmental competitiveness has been associated with high pressures for efficiency and lower process (Popa et al., 2017) that forces firms to operate on tight margins and little organizational slack (Zahra, 1996). Highly competitive environment has an effect on costs and prices, which leads to organizational transformation (Prajogo and Oke, 2016).

Firms try to protect their market share against competitors in a competitive environment by means of different types of innovation (Damanpour and Gopalakrishnan, 2001). In environmental competitiveness, outcomes of exploratory innovation tend to be diffused rapidly (Levinthal and March, 1993). According to scholars, environmental competitiveness reduces available resources for exploratory innovation and creates high risk and high cost innovation for organizations (Miller, 1987; Zahra, 1996). On the other hand, past studies highlight that in environmental competitiveness, exploitative innovation is likely to enhance firms performance (Lumpkin and Dess, 2001). Environmental competitiveness allows exploitative innovation to offer better products and services to current customers and building stronger customer loyalty (Jansen et al., 2006). However, there are contradictory findings in past studies. For instance, Li et al. (2010)

found that environmental competitiveness enhances exploratory innovation outcomes but weakens exploitative innovation outcomes. Furthermore, Jansen et al. (2006) found that the interaction between exploratory innovation and environmental competitiveness does not decrease financial performance, but the interaction effect between exploitative innovation and environmental competitiveness is positive and significant. Drawing on the above discussion, we propose the following hypothesis:

H9 Environmental competitiveness moderates the relations between (a) exploratory innovation and operational performance, and (b) exploitive innovation and operational performance.

In addition, this research proposes that the effect of knowledge sharing and inter-departmental connectedness on operational performance can be moderated by environmental competitiveness. According to scholars in environmental competitiveness, firms facing high pressures to produce high quality products with lower price to be ahead of their competitors (Popa et al., 2017). In such conditions, the effect of knowledge sharing and inter-departmental connectedness on operational performance of firms can be affected with these pressures. In knowledge sharing, employees share task-relevant ideas, information, and skills with each other (Srivastava et al., 2006) to solve problems through informal interactions and sharing of expertise (Faraj and Sproull, 2000). Similarly, in inter-departmental connectedness, employees form personal linkage for informal hall talk and help individuals to combine knowledge and develop new products (Atuahene-Gima, 2003; Jansen et al., 2006; Tsai, 2002). However, while firms are under pressure of intense competition, it may not be possible for employees to have informal and flexible interaction. Further, it has been noted that knowledge sharing depends on a number of factors such as environmental factors (Nguyen et al., 2019). In a highly competitive environment, employees are reluctant to share knowledge because they feel a sense of threat to their competitive advantage (Ryu et al., 2003). As it is a voluntary behavior, successful knowledge sharing can be difficult to achieve in environmental competitiveness (Ryu et al., 2003). However, to enhance competitiveness, cooperation among employees is necessary to allocate resources effectively and efficiently and identify the people management practices most likely to foster knowledge flows (Cabrera and Cabrera, 2005). Therefore, drawing from the above arguments, this research proposes that in a competitive environment, the social and informal interaction among employees can be affected while delivering performance. Therefore, we propose the following hypotheses:

H10 Environmental competitiveness moderates the relations between (a) knowledge sharing and operational performance, and (b) inter-departmental connectedness and operational performance.

Following the above discussions and drawing from organizational learning, strategic management point of view, and the contingency perspective, the paper developed the research framework (Fig. 1) and analyzed the effect of knowledge sharing and inter-departmental connectedness on exploratory and exploitative innovation. Further, it investigates the effect of exploratory innovation, exploitative innovation, knowledge sharing, and inter-departmental connectedness on operational performance considering the moderating role of environmental competitiveness.

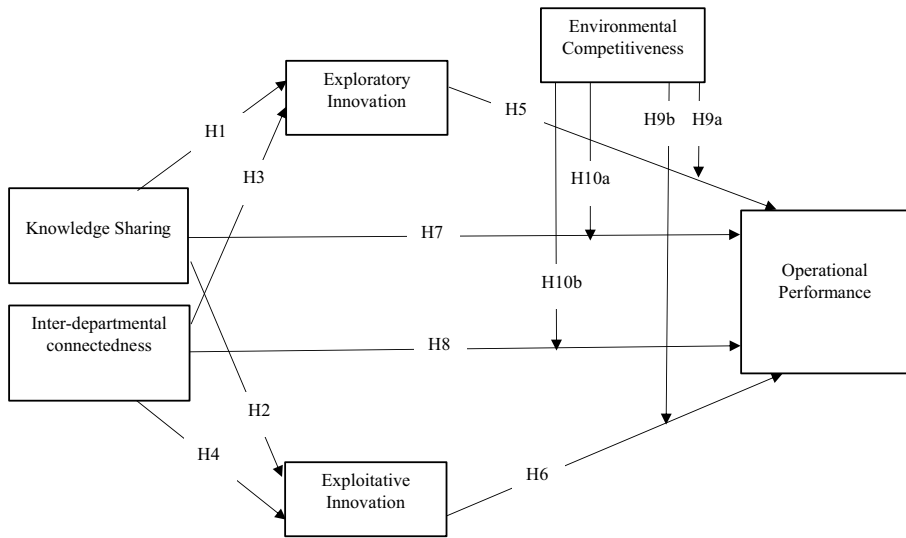


Fig. 1 Research framework

3 Methodology and Analysis

The research model has been empirically tested in the context of the banking industry in Bangladesh. All commercial banks (57) operating in Bangladesh were the population of this study. The sample frame is the branches operating in the capital city of Dhaka, Bangladesh, with A and B class classification following CAMELS rating (an international bank-rating method). Through a structural survey instrument using purposive sampling method, managers of new service development, business development, marketing, and research and innovation departments were targeted to participate in this study. A total of 500 questionnaires were distributed within the sample frame and 241 questionnaires were received. Appendix A shows the demographic profile of respondents. The measurement items were adapted from past studies using a five-point Likert scale, ranging from 1 = strongly disagree to 5 = strongly agree. Knowledge sharing with four items adapted from Faraj and Sproull (2000) and Srivastava et al. (2006). Inter-departmental connectedness with five items adapted from Jansen et al. (2006). Exploratory and exploitative innovation each with seven items adapted from Jansen et al. (2006). Operational performance with six items adapted from Wang and Wang (2012). And environmental competitiveness with four items adapted from Jansen et al. (2006).

The extent of common method bias was assessed with Harman's one-factor test and correlation matrix method. Harman's one-factor test was performed by including all items in a principal component factor analysis recommended by Podsakoff and Organ (1986). Evidence of this study indicates that the first factor accounted for 38.42 per cent of the cumulative variance, which is lower than the recommended 50 per cent threshold. Further, the results show that six factors explain 62.19 per cent of the cumulative variance, which is higher than the suggested value of 50 per cent. Also, we ran a correlation matrix test as suggested by Bagozzi et al. (1991) to determine whether the constructs have extremely high correlation (more than 0.90) or not. The highly correlated variables are evidence of common method bias, which usually results in extremely high correlations. The results show

that none of the constructs were so highly correlated (highest correlation is $r=0.735$). Therefore, the common method bias is not an issue in this study.

Structural equation modelling (SEM) is used to test the research objectives, and to analyse the measurement and structural model (Ringle and Wende, 2005). SEM is a second-generation technique, and many researchers have been using this technique to surmount the weakness of first-generation methods. SEM allows researchers to integrate unobservable variables measured indirectly by indicator variables (Chin, 1998; Hair et al., 2017). Unlike first-generation techniques, SEM allows the modelling of multiple independent and dependent constructs, besides enabling researchers to analyse complex models (Gefen et al., 2000). There are two primary methods for estimating the relationships in a SEM-CB-SEM (covariance-based) and PLS-SEM (variance-based) approach. PLS is the mostly used software for the variance-based approach. The goal of CB-SEM is theory testing, theory confirmation, and the comparison of alternative theories. PLS-SEM is the preferred method when the research objective is theory development and explanation of variance (predication of constructs). The goal of PLS-SEM is to predict key target constructs or identify key driver constructs (Hair et al., 2013). As the aim of this study is to investigate new relationship among variables and predict key target constructs, SmartPLS software has been considered to be the most suitable.

The results of this study have been derived from the assessment of measurement model and structural model using SmartPLS software. Following Hair et al. (2017), the measurement model was evaluated by convergent validity and discriminant validity as a rule of thumb for model evaluation. Factor loadings, composite reliability (CR) and average variance extracted (AVE) were used to assess convergent validity. A total of three items were dropped due to low factor loading (less than 0.60). The values of CR and AVE exceeded the recommended values of 0.70 and 0.50, respectively. Table 1 shows the results of convergent validity.

The discriminant validity using Fornell and Larcker (1981) criterion was checked by comparing the correlations between variables and the square root of the AVE for that particular variable. It is the degree to which items differentiate among constructs or measure distinct concepts. As shown in Table 2, the square root of the AVE was higher than the correlation values in the row and the column, signifying adequate discriminant validity. Thus, satisfactory discriminant validity of the measurement model was confirmed.

The structural model has been assessed through standard β , t-values, the R^2 value, the effect sizes (f^2) and the predictive relevance (Q^2), using bootstrapping method (5,000 resamples) suggested by Hair et al. (2017) (Table 3). The results of structural model show knowledge sharing have a positive effect on exploratory innovation with $\beta=0.457$, $p<0.01$ (H1), and exploitative innovation with $\beta=0.521$, $p<0.01$ (H2). Similarly, inter-departmental connectedness has a positive effect on exploratory innovation with $\beta=0.257$, $p<0.01$ (H3), and exploitative innovation with $\beta=0.219$, $p<0.01$ (H4). Furthermore, exploratory innovation with $\beta=0.334$, $p<0.01$ (H5) and exploitative innovation with $\beta=0.269$, $p<0.01$ (H6) has a positive and significant effect on operational performance. In addition, knowledge sharing with $\beta=0.126$, $p<0.05$ (H7) and inter-departmental connectedness with $\beta=0.186$, $p<0.01$ (H8) have a positive and significant effect on operational performance. The results are shown in Table 3.

The R^2 value of exploratory innovation is 0.387, exploitative innovation is 0.429, and operational performance is 0.584. To have the value of f^2 (effect size), it is also essential to check the change in the value of R^2 (Hair et al., 2017). Table 3 exhibits the f^2 values for different predictors in relation to a particular endogenous variable of the study. The effect size of 0.02, 0.15, and 0.35 represent small, medium, and large effects respectively.

Table 1 Results of the convergent validity

Variable	Item	Loading	CR	AVE
Knowledge sharing	KS1	0.857	0.932	0.774
	KS2	0.879		
	KS3	0.891		
	KS4	0.892		
Inter-departmental connectedness	IDC1	Dropped	0.809	0.586
	IDC2	0.791		
	IDC3	Dropped		
	IDC4	0.739		
	IDC5	0.766		
Exploratory innovation	EXPLOR1	0.780	0.931	0.660
	EXPLOR2	0.822		
	EXPLOR3	0.795		
	EXPLOR4	0.805		
	EXPLOR5	0.867		
	EXPLOR6	0.871		
	EXPLOR7	0.737		
Exploitative innovation	EXPLOIT1	0.745	0.903	0.572
	EXPLOIT2	0.749		
	EXPLOIT3	0.757		
	EXPLOIT4	0.800		
	EXPLOIT5	0.764		
	EXPLOIT6	0.783		
	EXPLOIT7	0.690		
Environmental competitiveness	EC1	0.790	0.829	0.618
	EC2	0.744		
	EC3	0.822		
	EC4	Dropped		
Operational performance	OP1	0.802	0.894	0.584
	OP2	0.787		
	OP3	0.675		
	OP4	0.778		
	OP5	0.732		
	OP6	0.804		

Finally, this study assessed the predictive relevance of the model through the blindfolding procedure (Stone-Geisser's Q^2) to assess the research model's capability to predict. Based on the results, the Q^2 values of exploratory innovation ($Q^2=0.235$), exploitative innovation ($Q^2=0.228$), and operational performance ($Q^2=0.308$) is more than 0, suggesting that the model has sufficient predictive relevance.

In this study, H9a and H9b predict that environmental competitiveness moderates the relationship of exploratory and exploitative innovation with operational performance. The findings show that there is no moderating effect of environmental competitiveness in these relationships. In addition, H10a and H10b predict that environmental competitiveness

Table 2 Discriminant validity of the constructs (Fornell and Larcker Criterion)

		1	2	3	4	5	6
1	Inter-departmental connectedness	0.766					
2	Environmental competitiveness	0.407	0.786				
3	Exploratory	0.476	0.338	0.812			
4	Exploitative	0.469	0.445	0.739	0.756		
5	Knowledge sharing	0.480	0.371	0.580	0.626	0.880	
6	Operational performance	0.530	0.351	0.693	0.680	0.576	0.764

Note: Below the diagonal are the values of correlation between constructs; whereas the bold values of the diagonal are the square root of Average Variance Extracted (AVE) of the constructs indicating the highest in any row or column

moderates the relationship of knowledge sharing and inter-departmental connectedness with operational performance. The findings show that the moderating effects exist negatively (see Table 3 and Interaction Graph in Figs. 2 and 3). Interaction graphs indicate that the positive and significant effect of knowledge sharing and inter-departmental connectedness with operational performance will be weakened if environmental competitiveness is high. Before the interaction effect of the moderators, the R^2 value for operational performance was 0.584, and after the interaction effect the R^2 has changed to 0.614. Thus, H10a and H10b were supported.

4 Discussion

Although prior research has examined organizational antecedents on exploratory and exploitative innovation, the uniqueness of the current study is to examine the effect of flexible and informal behaviors of organizations on exploratory and exploitative innovation that lead to operational performance of firms in environmental competitiveness.

Findings of this study reveal that knowledge sharing has a significant and positive effect on both exploratory and exploitative innovation. These results highlight the importance of knowledge sharing in the banking industry to engage in exploratory and exploitative innovation. These results are in line with past studies, which revealed the importance of knowledge sharing on innovation activities (Kamaşak and Bulutlar, 2010). Due to the ambiguous and unique nature of knowledge sharing within the firm (Teece, 2007), it forms a basis for the generation of new products or services and eventually improve existing products or services. When knowledge is shared among people within the organization, it can provide creative solutions in firms, because the idea of an individual can be a novel idea to others. By breaking conventional state, in knowledge sharing environments, employees can quickly respond to the needs of the market quickly and reduce the costs of internal processes.

Regarding inter-departmental connectedness, we found a positive relationship between inter-departmental connectedness and both exploratory and exploitative innovation. Past studies also found that connectedness has positive effect on exploratory and exploitative innovation (Jansen et al., 2006). Inter-departmental connectedness can support the enhancement of exploratory and exploitative innovation, because it creates an environment that people can trust and collaborate within the firm. In fact, according to scholars, the benefit of inter-departmental connectedness is in developing trust and cooperation among

Table 3 Results of the structural model

Hs	Path relationship	Std. Beta	SE	t-value	Decision	R ²	f ²	Q ²
H1	Knowledge sharing → Exploratory innovation	0.457	0.072	6.369**	Supported	0.387	0.262	0.235
H2	Knowledge sharing → Exploitative innovation	0.521	0.059	8.873**	Supported	0.429	0.366	0.228
H3	Inter-departmental connectedness → Exploratory innovation	0.257	0.065	3.926**	Supported		0.083	
H4	Inter-departmental connectedness → Exploitative innovation	0.219	0.061	3.624**	Supported		0.065	
H5	Exploratory innovation → Operational performance	0.334	0.077	4.320**	Supported		0.112	
H6	Exploitative innovation → Operational performance	0.269	0.091	2.968**	Supported		0.065	
H7	Knowledge sharing → Operational performance	0.126	0.075	1.669*	Supported	0.584	0.021	0.308
H8	Inter-departmental connectedness → Operational performance	0.186	0.056	3.319**	Supported		0.055	
	<i>Moderating effects</i>							
H9a	Exploratory innovation * Environmental competitiveness → Operational performance	-0.117	0.084	1.396	Not supported			
H9b	Exploitative innovation * Environmental competitiveness → Operational performance	-0.128	0.08	1.606	Not supported			
H10a	Knowledge sharing * Environmental competitiveness → Operational performance	-0.185	0.056	3.301**	Supported	0.614		
H10b	Inter-departmental connectedness * Environmental competitiveness → Operational performance	-0.129	0.072	1.792*	Supported			

** $p < 0.01$, * $p < 0.05$

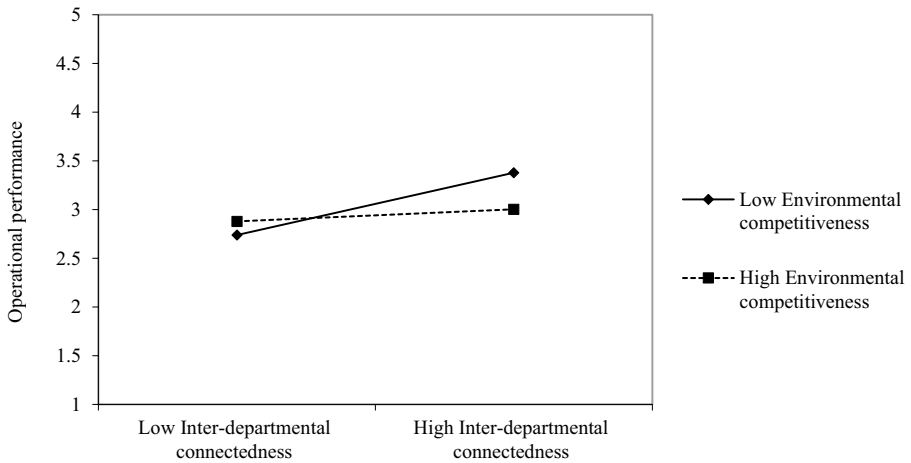


Fig. 2 Moderating effect of environmental competitiveness on the relationship between knowledge sharing and operational performance

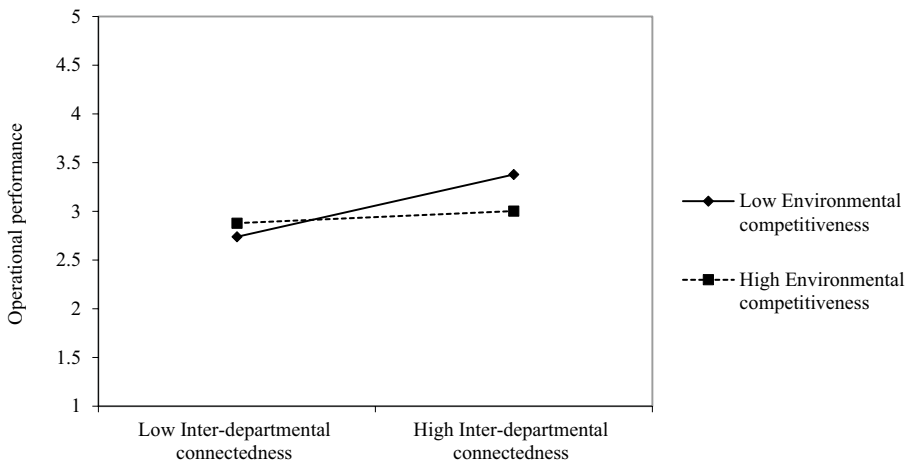


Fig. 3 Moderating effect of environmental competitiveness on the relationship between inter-departmental connectedness and operational performance

organizational members (Adler and Kwon, 2002; Jansen et al., 2006; Subramaniam and Youndt, 2005). Once trust and collaboration have been formed through open communication among the employees, it fosters innovativeness in organizations, allowing them to efficiently design new ideas and refine existing knowledge.

Our study found that both exploratory and exploitative innovation have significant effects on operational performance of firms. Consistent with previous studies, innovation activities and its type are main factors in enhancing different types of performance in organizations (Nunes et al., 2006; Soto-Acosta et al., 2018; Taghizadeh et al., 2020). The results of the study show that the advantages of exploratory innovation to operational performance are

greater ($\beta=0.334$) than that of exploitative innovation ($\beta=0.269$). This result suggests that if the services are being offered in the banking industry are totally new, accept demands from the customer that go beyond existing services, utilize new opportunities and distribution channels, and regularly search for new clients in new markets, banks would enjoy better operational performance.

In addition to that, findings show that knowledge sharing, and inter-departmental connectedness have instrumental role on operational performance of firms. Knowledge sharing is the backbone of organizational learning, which brings many benefits to an organization (Taghizadeh et al., 2018; Teece, 2007; van Woerkom and Sanders, 2010). Knowledge sharing can contribute to opportunity creation for problem solving and efficiencies to have sustainable competitive advantages. In fact, effective knowledge sharing strongly influences organizational performance (Kucharska and Erickson, 2019). However, it must be highlighted that this study has revealed that inter-departmental connectedness gives more benefits to operational performance compared to knowledge sharing. Inter-departmental connectedness focuses on the extent of interaction between individuals in an organization (Jansen et al., 2006; Menon et al., 1997). Interactions among people in organizations provides channels to exchange information about quality development, productivity, and cost management, which leads to be ahead of their key competitors. In line with previous studies (e.g. Menon et al., 1997), this study emphasizes that inter-departmental connectedness allows employees to exchange customer and market information and solve issues related to firms' operations.

Regarding the moderating effect of environmental competitiveness, this study found that there is no moderating effect of environmental competitiveness on the relationship between both exploratory and exploitative innovation and operational performance. In the literature, there are inconsistent findings regarding the moderating role of environmental competitiveness. Li et al. (2010) found that environmental competitiveness has positive effects on exploratory innovation but weakens exploitative innovation outcomes. Also Jansen et al. (2006) found that the interaction between exploratory innovation and environmental competitiveness does not decrease financial performance, but the interaction effect between exploitative innovation and environmental competitiveness is positive and significant.

However, we found that environmental competitiveness negatively moderates the relationship between knowledge sharing and operational performance and between inter-departmental connectedness and operational performance. Meaning that when there is low level of competitiveness in the environment, knowledge sharing, and inter-departmental connectedness increase the operational performance of firms. Drawing from the literature, in highly environmental competitiveness, firms are under pressures of offering high quality products and lowering the price of these products to compete (Popa et al., 2017). Under these pressures, it may not be possible for employees to have interaction and informal hall talk to combine knowledge and develop new products. When organizations have relatively strong competitors, employees face struggle to have informal and flexible interaction according to scholars, employees are reluctant to share knowledge because they feel a sense of threat to their competitive advantage (Ryu et al., 2003).

5 Implication

5.1 Theoretical Implications

The theoretical implications of the current research will be beneficial to the academic scholars and researchers who wish to work in the domain of organizational learning, strategic management perspective, and contingency point of view. It seeks to determine the effects of internal and external factors on both exploratory and exploitative innovation with performance. Our findings suggest that flexible and informal relationships among people can influence the formulating exploratory and exploitative innovation and enhancement of operational performance. Firms' resources such as knowledge sharing, and inter-departmental connectedness are important factors for successful implementation of innovation types, which significantly impacts operational performance of firms. From the literature, the effect of inter-departmental connectedness on firms' performance has been less understood with limited results. Thus, this study can contribute to the literature by examining the significant and positive role of inter-departmental connectedness on firms' operational performance. This study has also established the moderating role of environmental competitiveness and found that the significant effect of knowledge sharing and inter-departmental connectedness on operational performance relies on low level of competitiveness in the environment.

5.2 Practical Implications

There are several practical implications of the findings for better management and implementation of exploratory and exploitative innovation with operational performance for the banking industry in Bangladesh. Based on the positive impact of knowledge sharing and inter-departmental connectedness on exploratory and exploitative innovation as well as operational performance, firms could consider giving priority to the development of forming an environment where people inside the organization informally interact with each other to talk and share their ideas with each other. Our findings support the importance of knowledge sharing and inter-departmental connectedness and suggest managers to focus on these practices systematically. Managers may develop shared and connected mechanisms within their organizations to increase an exploratory and exploitative innovation in order to compete in the market. Knowledge sharing and inter-departmental connectedness as key resources for competitive advantage has been emphasized in our study, which provides an outline to the managers on how to increase the specificity and leverage them for improving exploratory and exploitative innovation.

Our findings show that knowledge sharing, and inter-departmental connectedness as an informal and flexible coordination mechanism are more important in predicting operational performance if the level of environmental competitiveness is low. However, managers should create an environment during a highly competitive environment in order to enhance operational performance rate, otherwise they fall behind competitors to offer new products or services. Managers should identify and capitalize on opportunities in a highly competitive environment and offer suitable and superior new services. They can build appropriate strategies in order to respond to rapid changes in the market and customers in such an environment.

6 Conclusions, Limitations and Future Research

The aims of this study were to examine the influence of knowledge sharing and inter-departmental connectedness on exploratory innovation, exploitative innovation, and firm's operational performance; the influence of exploratory and exploitative innovations on firm's operational performance; and the moderating effect of environmental competitiveness in the context of banking industry in Bangladesh. We found that knowledge sharing, and inter-departmental connectedness contribute in developing both exploratory and exploitative innovation and in enhancing a firm's operational performance. Further, we found that exploratory and exploitative innovation influence firms' operational performance. In addition, environmental competitiveness negatively affects the relationship of knowledge sharing and inter-departmental connectedness with operational performance.

Like other empirical studies, this research suffers from certain limitations, which can be addressed in future research studies. This research considers a cross-sectional study of factors affecting exploratory and exploitative innovation, but these influences may change over time. A longitudinal study could have enhanced the findings. Also, other determinants may also exist in different contexts and in future studies, researchers may want to extend this research by considering some other contextual issues in order to determine the relationships of organizational factors and exploratory and exploitative innovation with performance. Furthermore, this study has been conducted in the banking industry, and future studies may want to examine this research model in other service industries as well.

Appendix

See Table 4.

Table 4 Demographic profile of respondents

Variable	Percent	
Age	Less than 40 years old	42
	41 to 60 years	54
	Above 60 years old	4
Gender	Male	82
	Female	18
Education level	Bachelor	9
	Postgraduate	90
	Professional degrees	1
Work experience	1–5 years	62
	6–8 years	10
	9–11 years	10
	above 12 years	20
Work experience in the current branch	1–5 years	65
	6–8 years	8
	9–11 years	9
	12 years and above	18

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Conflict of interest The authors have no conflicts of interest to declare that are relevant to the content of this article.

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