The influence of knowledge management processes on FinTech innovation: Lebanon evidence

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Abstract: This study aims to examine the influence of knowledge management process on FinTech innovation through the moderating role of managers’ demographic characteristics (age, sex, education, experience, and position) in commercial banks operating in Lebanon. To accomplish this aim, a conceptual framework based on knowledge-based theory and literature review was developed. The data for this research was collected through a self-administered questionnaire with 181 respondents. The target respondents were managers of commercial banks in Lebanon. The empirical findings of the study suggest that the practice of knowledge management functions practice has a positive and significant relationship with FinTech innovation. The findings also provide support for the moderating effect of only two demographic characteristics of bank managers: experience and position on the relationship between knowledge management and FinTech innovation in commercial banks in Lebanon. The study findings may aid future researchers in their quest to understand the inherent relationships that lie between the constructs’ questions and provide a platform for banking managers in their efforts to improve their innovation strategies through knowledge management. Furthermore, research recommendations, limitations and future directions are discussed in the last sections.

Keywords: knowledge management; acquisition; integration; utilisation; FinTech innovation; Lebanon.


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Introduction

Today, the powers of innovation and worldwide rivalry have made a transformation that urges organisations to look for better approaches to seek new ways to reinvent themselves and gain competitive advantage. More prominent accentuation is currently being set on advancement because of the hypercompetitive questionable climate where organisations exist. There is no doubt that innovation is the engine by which organisations can sustain their competitive advantage. Innovation means that firms should master the process of changing routines and become flexible to all changing circumstances. Thus, organisations must continuously try to differentiate their products and services to outperform others in business industry. Continuous innovation requires a well-planned system of knowledge management (KM) that enables the organisation to excel in developing new products and services. Knowledge can be described as an intangible asset which creates the core competence of an organisation and develops the organisational norms and values which would support the acquisition, integration and utilisation of knowledge among its employees, which are all necessary and have a profound effect on innovation (Turulja and Bajgorić, 2018).

It was argued that the importance of the relationship between KM and competitive advantage emanates from that organising knowledge empowers employees in organisations to enhance their performance in accomplishing their tasks and the activities (Kamya et al., 2010). Furthermore, innovation represents the key factor for business success irrespective of organisations type (Rahimli, 2012). Using knowledge leads to learning, which is the core of innovation. According to Fazili and Khan (2016), KM is seen as an important prerequisite of innovation. In high-tech industry organisations, the role of knowledge acquisition and innovation in the development of a new product or service should not be underestimated. Furthermore, Dahiyat (2015) argues that innovation in product and service development is facilitated by knowledge acquisition and dissemination. Today’s business organisations are living in a dynamic, uncertain environment, in which they experience accelerated changes, which creates an intensive need for new innovative products and services. In such circumstances, survival is conditioned upon quality, knowledge, experience, technology, creativity, innovation among many other capabilities. Creation of innovation depends on the knowledge gained
and its commercialisation and transformation into productive knowledge. Efficient management of productive knowledge results in innovation development in organisations (Elmorshidy, 2018).

An examination of prior research indicates that most previous studies focused on KM business process reengineering, best practices in KM and the effect of KM on business performance rather than the effect of KM on Fintech innovation (e.g., Raudeliūnienė et al., 2018). For example, Byukusenge and Munene (2017) examined the effect of the KM process on business performance. The study’s results indicated that KM and business performance are positively correlated. Furthermore, the effect of knowledge sharing on innovativeness, human resources utilisation, and financial performance was investigated by Črbová and Mateškovičová (2019) in the Czech Republic. The findings revealed a positive correlation between knowledge sharing and each of employees’ engagement, organisational innovations and the perceived knowledge-sharing benefits. Other studies theoretically examined the relationship between KM and innovation in non-service companies (Girniene, 2013; Boyes, 2016; Wang and Kwek, 2018). Despite the growing recognition of the importance of KM contribution to the promotion of innovation, most of the existing studies have not made clear guidance on special knowledge processes that are believed to have greatest effects (Bueno et al., 2008). Further, research on the interaction between KM processes and innovation is highly needed (Andreeva and Chianto, 2011; Dahiyat, 2015). An understanding of the intricacies associated with the knowledge creation process can help in explaining the roles of knowledge acquisition, integration, and application in this process and how they complement each other. The lack of such an understanding, as Mutinda (2017) and Dahiyat (2015) point out, has contributed to problems in developing and exploiting useful knowledge, especially in knowledge-intensive organisations, like commercial banks.

However, studies that have examined such relationship in developing countries are rarely available, particularly in the Lebanese business environment context. Bank industry in Lebanon has witnessed intense competition owing to increased international financial and technological changes. This implies that banks need to enhance their level of Fintech innovation and maintain sustainable advantages in an environment that continues to change. Greater use of technology in banks is allusive to an industry leveraging KM, and this is ideal for this study. Banks have realised the crucial role of KM in gaining an edge in this competitive field. Disruptive innovation, on the other hand, holds potential in empowering the bank industry to face unprecedented challenges reflected in the decline of the value provided to clients and shareholders, through innovative delivery services/technologies that replace outdated ones. These innovations are neither imitative nor incremental; however, existing services/technologies should be substituted by one with more benefits; namely, those that are more valuable, more accessible and more affordable; thereby making them available for much larger segments of customers which might be previously ignored by current competitors (Bolen et al., 2009; Wessel and Christensen, 2012). Therefore, based on the above, this study has attempted to validate and examine the impact of KM functions (acquisition, integration, and utilisation) empirically on Fintech innovation via the moderating role of managers’ demographic characteristics (age, sex, education, experience and position) in the context of bank industry in Lebanon.
2 Theoretical background

2.1 Knowledge management

KM refers to a process which is associated to new knowledge generation, transfer sharing of both existing and new as well capturing, storing and utilising knowledge, accompanied by measuring the impact of knowledge on organisational performance (Cheng and Leong, 2017). KM is a very important key to an organisation’s success (Kianto et al., 2016). It is a set of practices used by organisations to represent, create, identify, and distribute knowledge for learning and reuse across organisations. However, it is closely related to organisational learning initiatives. Knowledge is a resource, and with effective management of this resource, firms can extract more forms of resources. KM also plays an important role in converting resources into capabilities, and that is what is meant by its supporting function (García-Fernández, 2015).

It is argued that KM is considered as an integrated with numerous benefits, mainly summarised in promoting collaborative environment within organisations to capture and share existing knowledge and creating opportunities to generate new knowledge, in addition to providing the appropriate tools for an organisation apply its knowledge in order to realise its mission, vision and goals in an effective way (Don-Serge, 2019). Agbim et al. (2014) stated that KM should be considered in order to create value and sustainable competitive advantage for the firm. From an organisational point of view, knowledge is defined as the knowledge captured about products, customers, processes and many more. Other researchers define KM as a set of function that creates knowledge, manages the flow of knowledge to ensure that it is used effectively and efficiently for the long-term success of the organisation (Du Plessis, 2007). Organisational culture and structure affect the KM functions in the organisation. The structure influences the communication among employees in the organisation. When the structure is low t, employees are empowered to develop tacit knowledge which, when codified, becomes the explicit knowledge which can be stored in the knowledge base mainly used by the organisation for updating and taking decisions. Along with KM infrastructure, an innovation of new ways of managing knowledge plays an essential role in maintaining the quality of knowledge. The main KM functions:

1 **Knowledge Acquisition:** Knowledge acquisition can be defined as the mechanism used for collecting information and creating knowledge internally and externally from different sources (Bratianu, 2015). Segarra-Ciprés et al. (2014) state that “knowledge acquisition refers to the successful transfer of existing knowledge to others, meaning that new knowledge has been created, and the receiver will be able to acquire it”. That information could be termed knowledge to the receiver, only if it has been processed and incorporated into the existing knowledge base; then it can be said that knowledge is acquired (Jantunen, 2005). Knowledge acquisition and subsequent utilisation are influenced by cognitive, communication and social factors (Beesley and Cooper, 2008). Knowledge is by itself a strategically valuable resource that an organisation can acquire and the application of knowledge is its usage for the production of products/services, which requires the combination of many areas of specialised knowledge (Girish et al., 2015).
Other researchers suggest that knowledge acquisition includes some activities such as: locating and accessing knowledge from external sources, as well as extracting, collecting and gathering knowledge of relative importance from those external sources and capturing it. Captured knowledge is organised by distilling, refining, orienting, interpreting, packaging, and assembling it into usable representations (Evans et al., 2014; Gonzalez and Martins, 2017). Organised knowledge is transferred to a processor that immediately uses it or internalises it within an organisation for subsequent use (Chen et al., 2015). Knowledge acquisition may be carried via several processes; for example: through learning and that is by observing other organisations, as well as grafting knowledge-possessing components, finally by intentional search and monitoring. Jantunen (2005) argues that “knowledge-acquisition capabilities consist of processes and mechanisms for collecting information and creating knowledge from internal and external sources”.

Having a successful knowledge acquisition process is key to an organisation’s overall performance and financial accountability (Chen et al., 2015). It plays an important role in enabling the knowledge integration process for the organisation as well, which at the end gives it its unique competitive advantage. In today’s rapidly changing business environment, organisations must continually try to acquire new knowledge and integrate it into its existing knowledge base (Bishop et al., 2008). In general, the importance of knowledge acquisition in innovation is recognised; nevertheless, it is not so bright how directly effective knowledge-acquisition capabilities are reflected in an organisation’s performance. It may have a more indirect than a direct role in promoting or enhancing innovation. A firm should always sense opportunities in order to make use of them (Jantunen, 2005).

**Knowledge integration**: Knowledge integration is defined as the synthesis of individuals’ specialised knowledge into situation-specific systemic knowledge (Hoffmann et al., 2017). Knowledge integration is also referred to as the integration of individuals’ specialised knowledge to create organisational value. It is also considered as the pooling and recombination of individuals’ tacit knowledge to create group-level knowledge (Kapoffu, 2014). Knowledge integration is the process of creating, transferring, sharing and maintaining knowledge. The value of knowledge increases when it is shared with and transferred to others (Yang, 2005). Knowledge integration is also a way of identifying how new and previously acquired knowledge interact together while incorporating new knowledge into a knowledge base, existing knowledge (Rundquist, 2012). Knowledge integration is a fundamental process within an organisation that translates the raw knowledge into actionable knowledge through understanding the business context and gaining the benefits of knowledge in creating a competitive advantage. In the process of enhancing new product/service performance, knowledge integration depends on how members of an organisation integrate their individuals’ knowledge. Useful knowledge has become more and more important, and ideas should be used; thus, innovators of such ideas must be able to integrate those (Celadon, 2014).

**Knowledge utilisation**: Knowledge utilisation refers to the application of embodied knowledge to particular problems and classes of problems, with a view to the production of results (Abubakar et al., 2017). Knowledge utilisation impacts the creation of sustainable competitive advantages because of its ambiguity and
uniqueness to the firm and the fact that knowledge becomes embedded in organisational processes (Alosaimi, 2016). Generally speaking, an organisation with an advanced knowledge utilisation capability is quick to respond to any signals it receives, and the knowledge utilisation capabilities show how an organisation could effectively exploit the acquired knowledge in the form of new and improved products and services (Jantunen, 2005). The ultimate objective of KM processes is knowledge utilisation. A vital benefit of knowledge utilisation is innovation. Some researchers argue that knowledge utilisation includes how effectively firms can exploit acquired knowledge in the form of new valuable products and services.

3 Fintech innovation

Innovation is defined as intruding novel production factors into the production system process (Rajapathirana and Hui 2018). In other words, innovation is associated with introducing new techniques, methods, techniques, or processes into the production chain in order to provide remarkable benefits and advantages to customers in terms of products and services (Edwards-Schachter, 2108). When we talk about financial innovation in the broad sense, it is evident that it encompasses, establishing new financial institutions, technologies, instruments and tools, processes, products and services. Examples are online banking, phone banking, and different information and communication technology (ICT) applications (Dayadhar, 2015). Gomber et al. (2018) argued that the term Fintech innovation includes a wide variety of novel financial software programs business, products, and services, aiming at enabling customers to interact and communicate with financial institutions more quickly and efficiently. Something similar was stated by Korir et al. (2015). They indicated that Fintech innovation has to do with introducing new tools to be utilised by financial institutions in order to raise the level of effectiveness and efficiency of the services offered by these institutions to their customers. Digital finance covers a wide range of financial fields. Examples are payments, remittances, savings and investments, personal financial management, trade and invoice finance. Fintech innovative services can be made available to large firms, SMEs and individuals.

According to Klapper et al. (2016), Fintech innovation also encompasses diverse financial processes such as capital market activities, banking system connectivity, credit scoring, assets securitisation, risk management and trade processing. It also extends to cover other financial processes, like middle- and back-office reporting, customer service, collections and recovery as well as the compliance with the so-called anti-money laundering-know your customer (AML-KYC).

World Bank Group (2018) indicated the importance of utilising web correspondence and implemented budgetary transactions. According to the Asian Development Bank (2016), digital remote tools are very beneficial and encompass electronic fund transfer, mobile money, card payments and e-money. Fintech Services (DFS) are basically about sparing cash, getting to credit and protection, and performing exchanges through advanced channels like cell telephones, cards, PCs, tablets, et cetera. Alt et al. (2018) investigated Fintech innovation (DFS) and emphasised the benefits of using these services which are based on utilising smart telephones, cards, PCs and tablets to perform the financial exchange. It can be argued that financial institutions, particularly banks, have improved their performance and profitability, relying on financial innovations (Scott et al., 2017). Banking has witnessed a real revolution in performed financial transactions,
as stated by Yin and Zhengzheng (2010), who found out that Chinese commercial banks have remarkably enhanced their financial operations by utilising Fintech innovations. It was revealed that the Tunisian banking industry has benefited from the positive, significant relationship between return on assets and financial product innovations (Mabrouk and Mamoghli, 2016).

In this study, Fintech innovations can be grouped as new products, such as subprime mortgages or services, internet banking, and others. Fintech services (DFS) are significant financial resolutions for cultivating financial inclusion (Frame and White, 2014; Buckley and Malady, 2015; Akhisar et al., 2015). DFS provides services to the underprivileged using advanced skills, digital platforms and electronic money models (Scott et al., 2017; David-West et al., 2018; Nguena, 2019).

4 Literature review

Several scholars have widely discussed the relationship between KM and technological innovation (e.g., Waribugo et al., 2016; Talat, 2018; Kör and Maden, 2013). Most researchers have agreed that the process of innovation depends heavily on the knowledge and the way of managing it. Today, KM becomes an essential managerial task that helps organisations in shaping a sound innovation strategy. KM has been recognised as a tool to assist an organisation in identifying gaps in knowledge and providing ways to fill up these gaps to aid organisational innovation (Akram et al., 2011). Through KM, managers can use pre-programmed models based on integrative knowledge of past experiences and ask for updated information while considering alternative solutions and stimulating innovative proposal. It was found that knowledge utilisation was reflected in the organisation’s innovative practices (Jantunen, 2005).

According to Plessis (2007), KM functions, knowledge acquisition and integration, have been regarded as the outlets of knowledge which are essential for knowledge innovation and utilisation (Yu et al., 2017). It was found that knowledge acquisition and integration are more important for innovation than knowledge utilisation, as having the most influence on the creation of sustainable competitive advantages (Darroch and McNaughton, 2002). It is argued that Knowledge acquisition, conversion and application assist in empowering the organisation to innovate newer and higher quality products and services. According to Lee and Yang (2000), knowledge, innovation, and integration form the core development of new products and services. Huang and Li (2009) and Chen and Huang (2009) argued that in organisations, innovation is affected by KM processes. According to Lin (2007), knowledge acquisition is associated with using existing knowledge as well as with capturing new knowledge. Lin (2007) argued that knowledge acquisition leads the organisation to improve their ability to efficiently perform their operations and raise organisational learning on their way to achieve their goals. On the other hand, Valdez-Juárez et al. (2016) stated that knowledge creation is essential for innovation and competitiveness and is considered a critical organisational success.

Huang and Li (2009) and Chen and Huang (2009) stressed the impact of KM processes on administrative and technical innovations. According to Chen and Huang (2009), knowledge acquisition from both internal and external knowledge sources leads
to increase the capability of each employee in an organisation of transforming the knowledge acquired into new knowledge in a process referred to as knowledge generation. As Amir-Aslani (2009) explains, acquisitions of technological knowledge support in biotechnological corporations. This will, in turn, lead to accumulate technologically and create new capabilities that contribute to raising the quality of new products. Knowledge creation has been investigated by Costa and Monteiro (2016) to determine its role in organisational innovation through studying the correlation between knowledge creations and sharing with absorptive capacity as a mediating variable. The findings revealed an impact of knowledge creation on innovation with a partial mediating role of absorptive capacity in that relationship.

As revealed by previous research, it is impossible for an organisation to create knowledge unless it involves its individuals and provide them with all necessary resources for knowledge creation (e.g., Obeidat et al., 2016; Hoffmann et al., 2017). As such, knowledge creation is perceived as a process of knowledge innovation carried out by individuals who possess two dimensions; the conversion of tacit into explicit knowledge, as well as knowledge creation entities, such as individuals and group who are deemed to be decisive actors in knowledge innovation. Furthermore, product innovation is a new technology, or a combination of technologies introduced according to market needs (Amalia and Nugroho, 2011). In high-tech industrial organisations, knowledge integration and innovation are decisive factors contributing to the development of high-quality product and services, where knowledge innovation and integration are facilitated by knowledge acquisition and utilisation during developing new products and service (Dahiyat, 2015).

KM processes have been found to influence organisational innovation, as stated by Dahiyat (2015). According to Kör and Maden (2013) administrative and technical innovation is dependent upon KM processes as well as upon organisational innovativeness, thus leading to increase innovation. Furthermore, organisational innovativeness acts as a partial mediating variable in the relationship between KM processes and administrative innovation. In light of the previous literature review, the research hypothesis can be formulated as follows:

H1. The KM process (acquisition, integration, and utilisation) has a significant effect on Fintech innovation.

In order to achieve successful KM implementation and technological innovation, organisations need to determine the role of the managers’ characteristics; however, studies that empirically and specifically examined the impact of managers’ demographic characteristics on the relationship between practising KM functions and product innovation have rarely been available. Harem and Al-Saae’d (2006) indicated that KM practices were influenced by the manager’s characteristics (age, experience, education position). Ababneh and Edwan (2008) argued that the attitudes of mangers toward practising KM are influenced by their experience and position factors. Also, Ababneh and Edwan’s study (2008) showed that KM has a strong positive correlation with organisational innovation and that managers’ demographic variables have a significant impact on practising each KM dimension. However, previous studies showed mixed results regarding the relationship between Km practising and demographic factors.
For example, Ismail and Yusof (2009), Ojha (2005) and Watson and Hewett (2006) showed that age, sex, education and position do not affect knowledge utilisation behaviour, while Gumus (2007) indicated that education and position were important. Damanpour and Schneider (2008) argued that educated managers are more likely to use sophisticated and diverse approaches to problem-solving and decision making because the newness of innovation creates a sense of uncertainty. Educated managers tend to have the ability to acquire information to reduce that uncertainty which would facilitate the adoption of technological innovation. Accordingly, researchers argue that managers’ demographic variables could influence the relationship between practising KM and FinTech innovation in the context of Lebanese commercial banks. Therefore, the following hypothesis was suggested:

H2 Managers’ demographic variables (age, sex, education, experience, and position) are positively moderating the effect of the KM process on FinTech innovation.

5 The research model

This study is based on investigating the relationship between KM functions (acquisition, integration and utilisation) and FinTech innovation in two ways. This research is based on knowledge-based theory (Grant, 1996) as well as financial innovation theory (Silber, 1983). The knowledge-based theory is assumed that knowledge as an intangible assets resource is an essential strength whose proper utilisation could go a long way in offering long term sustainable competitiveness. An important aspect of this theory is that the primary source of competitiveness is found within the application of knowledge and not just the possession of knowledge. In the other hand, financial innovation theory viewed that improving corporate performance is the key factor for financial institutions to engage in FinTech innovation through the efficiency of delivery service (Silber, 1983). Innovation harnesses the ICT capabilities to create new banking services and new media for offering service.

Therefore, effective KM supports the conversion of all other resources into capabilities, and they contribute to the extended run survival of an organisation, organisations with useful KM functions are likely to make better use of resources and innovation and so will exhibit superior outcomes. Knowledge integration and innovation have been the central part of the process of innovation (Dahiyat, 2015). Theoretical background and knowledge-based theory, as well as the relevant literature on KM and innovation, were reviewed and integrated to develop a conceptual framework to guide this study. The proposed framework has tied together with the components of KM functions (acquisitions, integration, and utilisation) which are postulated to the extent of performing of KM functions by commercial banks. These significant functions are mainly derived from previous studies. In this research, the variable of primary interest ‘the dependant variable’ is FinTech innovation. The variance in the dependent variable is explained by the independent variables (KM acquisition, KM integration and KM utilisation) and the moderating variables (managers’ demographic characteristics; age, sex, education, experience and position). These hypothetical relationships are diagrammed in Figure 1.
Figure 1  The research’s model

6 Research methodology

This research aims to examine the influence of the KM functions (acquisitions, integration, and utilisation) on Fintech innovation through the moderating role of managerial experience and position in commercial banks operating in Lebanon. Accordingly, the public banking sector was chosen as the population for this study, which mainly consisted of all the sixty-five (65) commercial banks listed in Association of Banks in Lebanon (ABL, 2020). Each of the 65 commercial banks was invited to participate in the research questionnaire-based survey, through contacting the human resource department in each of these banks. Forty out of the sixty-five (65) banks agreed to participate, which represented 61.5% of the whole population. The unit of analysis consisted of knowledge workers who held managerial positions in each of the participating banks, including those in the top management level (i.e., divisional /branch manager/ administrative level), those in the middle management level (i.e., head of department/executive level), and those in the lower management level (i.e., chief officer), who was targeted by the survey, since KM functions in terms of knowledge acquisition, integration and utilisation are undertaken collectively through ‘organisation-wide’ efforts rather than being the sole or individual responsibility of a specific work unit or person. The same rationale applies in the case of Fintech innovation. Two hundred (5*40 = 200) questionnaires were distributed, i.e., five questionnaire forms for each bank, where161 questionnaire forms were returned with a response rate of 80.5%.

The questionnaire’s content (measures) was mainly selected and adopted from relevant previous studies. The independent variables ‘KM functions’ were measured using a 5-point scale developed by Huang and Li (2009), Obeidat et al. (2016), Kör and Maden (2013) with Cronbach’s alpha of 0.85. The dependent variable ‘Fintech innovation’ was measured using a 5-point scale developed by Girniene (2013), Boyes (2016), Ramona-Diana and Bolisani (2016), Elmorshidy (2018) and Kör and Maden (2013) with a reliability of 0.78. The moderating variables “manager’s demographic characteristics (age, sex, education, experience and position)” were measured using an
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An ordinal scale developed by Scott et al. (2017), David-West et al. (2018) and Mabrouk and Mamoghli (2016) with 0.86 Cronbach’s Alpha of 0.86. For construct validation, the questionnaire content was modified to the practice of Lebanon business culture context based on the results of a pilot study and feedback from five professional academic staff members in this field. In this study, 42.8% of the respondents (managers) were in the age group between 25 and 35 years, and in terms of their education, about 57% of the respondents have bachelor’s degree, while 46.5% of them have an experience of fewer than ten years and about 54.6% of them were acting as lower-level managers in Lebanon’s commercial banks.

6.1 The extent of performing KM functions among commercial banks in Lebanon

The extent of performing KM functions (knowledge acquisitions, knowledge integration and knowledge utilisation) by commercial banks in Lebanon was measured. Mean values, standard deviations and t-test were employed to determine whether commercial banks in Lebanon perform these main functions of KM. Findings are shown in Table 1 indicate that the extent of performing KM functions taken together is considered to be moderate (i.e., 72.4% or 3.72), since their means are more than the mean of the scale, which is 3 (mean of the scale = Σ Degrees of the scale 1 + 2 + 3 + 4 + 5 / 5 = 3). It appears that ‘knowledge acquisition’ is the most profoundly important component performed by commercial banks in Lebanon.

<table>
<thead>
<tr>
<th>Knowledge management function</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Sig. (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge acquisition</td>
<td>3.8397</td>
<td>0.052</td>
<td>0.000</td>
</tr>
<tr>
<td>Knowledge integration</td>
<td>3.5813</td>
<td>0.236</td>
<td>0.000</td>
</tr>
<tr>
<td>Knowledge utilisation</td>
<td>3.4397</td>
<td>0.026</td>
<td>0.000</td>
</tr>
<tr>
<td>Average usage</td>
<td>3.6202</td>
<td>0.217</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 1 The extent of practicing KM process by commercial banks

Table 2 The extent of existing Fintech innovation in commercial banks

<table>
<thead>
<tr>
<th>Digital financial innovation</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Sig. (two-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Our bank releases new Fintech innovations (product or service) regularly</td>
<td>4.0909</td>
<td>0.75277</td>
<td>0.000</td>
</tr>
<tr>
<td>Our bank adapts existing Fintech innovations to meet specific customer requirements</td>
<td>3.9835</td>
<td>0.80605</td>
<td>0.000</td>
</tr>
<tr>
<td>Our bank has invested heavily on Fintech innovations</td>
<td>3.9917</td>
<td>0.77991</td>
<td>0.000</td>
</tr>
<tr>
<td>Our bank always tries to be the first in marketing its Fintech innovation</td>
<td>3.9669</td>
<td>0.83600</td>
<td>0.000</td>
</tr>
<tr>
<td>Our bank incorporates technologies into new Fintech innovations</td>
<td>3.3140</td>
<td>1.07264</td>
<td>0.000</td>
</tr>
<tr>
<td>Average usage</td>
<td>3.8294</td>
<td>1.0021</td>
<td>0.000</td>
</tr>
</tbody>
</table>
6.2 The extent of Fintech innovation among commercial banks in Lebanon

Mean values, standard deviations and t-test are also employed to determine whether Fintech innovation into being each exists among commercial banks in Lebanon. Findings are shown in Table 2 indicate that the extent Fintech innovation being in practice is considered to be moderate (i.e. 76.6% or 3.83), since all the mean sare more than the mean of the scale, which is 3 (mean of the scale = Σ Degrees of the scale 1 + 2 + 3 + 4 + 5 / 5 = 3).

7 Data analysis

7.1 Factor analysis findings

The aim of using the principal component analysis is in order to reduce the number of variables in each KM function (i.e., acquisition, integration and utilisation) in order to facilitate further regression analysis. PCA is also deemed suitable for overcoming multicollinearity problems. In this study, data was checked to determine whether it is appropriate for factor analysis. Then, the factor analysis findings have been tested using eigenvalues, interpretability and internal consistency, as suggested by Hair et al. (2010). Items having eigenvalues above (1) and factor loadings under (0.40) have been determined. Thereby, items having a weak or no relationship to each other are ignored (Hair et al., 2010).

Table 3 KMO and Bartlett’s test

<table>
<thead>
<tr>
<th>KMO and Bartlett’s test</th>
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</thead>
<tbody>
<tr>
<td>Kaiser-Meyer-Olkin measure of sampling adequacy</td>
</tr>
<tr>
<td>Bartlett’s Test of Sphericity</td>
</tr>
<tr>
<td>DF</td>
</tr>
<tr>
<td>Sig.</td>
</tr>
</tbody>
</table>

Table 4 Total variance explained

<table>
<thead>
<tr>
<th>Component/factor</th>
<th>Rotation sums of squared loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Eigenvalue</td>
</tr>
<tr>
<td>1</td>
<td>4.150</td>
</tr>
<tr>
<td>2</td>
<td>1.608</td>
</tr>
<tr>
<td>3</td>
<td>1.169</td>
</tr>
</tbody>
</table>

In this study, KM was measured using (15) items, as presented in Table 6. An inspection of the correlation matrix indicates that all the correlations were above the acceptable level of 0.40. Subsequent KMO and Bartlett’s test resulted in a significant level of probability (P > 0.000) and a high KMO statistic of (0.794), confirming that all the factor analysis could be carried out, as (79.0%) of the variance in the data can be explained by this construct, as presented in Table 4.
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The results of the principal component analysis in Table 4 indicate that three factors could be extracted from the variables of KM functions. The first factor, which accounts for (21.812%) of the variance with loadings ranging from 0.56 to 0.82, can be identified as ‘knowledge utilisation’ factor. The second factor, which explains 17.682% of the variance with loadings ranging from 0.46 to 0.82, can be labelled as ‘knowledge acquisition’ factor and the third one, which accounts for (13.786%) of the variance can be named as ‘knowledge integration’ factor. The combination of these factors accounts for (53.28%) of the total variance in the questionnaire data as can be shown in Table 5.

Table 5
Main factors underlying the KM process

<table>
<thead>
<tr>
<th>Code</th>
<th>Items (variables)</th>
<th>Loadings</th>
<th>Communality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Factor (1): knowledge utilisation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Our bank effectively manages different sources and types of knowledge</td>
<td>0.823</td>
<td>0.684</td>
</tr>
<tr>
<td>C5</td>
<td>Our bank applies available knowledge to improve its performance</td>
<td>0.749</td>
<td>0.575</td>
</tr>
<tr>
<td>C4</td>
<td>We change our practices when customer feedback gives us reason to change</td>
<td>0.662</td>
<td>0.515</td>
</tr>
<tr>
<td>C3</td>
<td>Our bank utilises available knowledge in improving services provided to its customers</td>
<td>0.599</td>
<td>0.575</td>
</tr>
<tr>
<td>C2</td>
<td>We can respond rapidly to competitors’ actions</td>
<td>0.561</td>
<td>0.425</td>
</tr>
<tr>
<td></td>
<td><strong>Factor (2): knowledge acquisition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>Our bank actively observes and adopts the best practices in our sector</td>
<td>0.828</td>
<td>0.694</td>
</tr>
<tr>
<td>A5</td>
<td>Our banks obtain knowledge from different market sources: customers, partners. etc.</td>
<td>0.622</td>
<td>0.504</td>
</tr>
<tr>
<td>A2</td>
<td>Our bank continuously gathers financial information on our operations and operational environment</td>
<td>0.511</td>
<td>0.335</td>
</tr>
<tr>
<td>A4</td>
<td>We have assessed our know-how capital</td>
<td>0.494</td>
<td>0.530</td>
</tr>
<tr>
<td>A3</td>
<td>Our development activities are based on examined market needs</td>
<td>0.462</td>
<td>0.450</td>
</tr>
<tr>
<td></td>
<td><strong>Factor (3): knowledge integration</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>We exchange knowledge among employees to achieve our goals with little time and effort</td>
<td>0.809</td>
<td>0.680</td>
</tr>
<tr>
<td>B3</td>
<td>Cooperative agreements are in place to facilitate knowledge integration between our bank and the other banks in Lebanon</td>
<td>0.738</td>
<td>0.558</td>
</tr>
<tr>
<td>B4</td>
<td>Acquired project-related knowledge has been integrated</td>
<td>0.711</td>
<td>0.548</td>
</tr>
<tr>
<td>B1</td>
<td>Teams have been established strictly for knowledge integration</td>
<td>0.592</td>
<td>0.480</td>
</tr>
<tr>
<td>B5</td>
<td>We promote the sharing of information and knowledge among team members and various units</td>
<td>0.498</td>
<td>0.458</td>
</tr>
</tbody>
</table>

In statistics, multicollinearity is a phenomenon in multiple regression analysis; it arises if there is a high level of correlation (positive or negative) between two or more independent variables. Multicollinearity can be assessed by the most widely used measures: tolerance and variance inflation factor (VIF), which is the proportion of
variance in the independent variable that is not explained by its relationships with the other independent variables. Hair et al. (2010) stated that the minimum cut-off value for tolerance is typically (0.10); that is, a tolerance value less than 0.10 should be investigated further. On the other hand, the VIF determines how much the variance of regression coefficients is inflated by multicollinearity problems, noting that (VIF) value is favourable when being less than 5 and in more relaxed criteria when being less than 10 (Hair et al., 2010).

From this perspective, the multicollinearity test for the three main factors (knowledge acquisition, knowledge integration and knowledge utilisation) was accomplished, where all (VIF) values were less than 5 and less than 10), while tolerance values were more than (0.10). Consequently, there is no collinearity within the collected data, which reinforced the model by avoiding the problem of having interchangeable beta values between independent variables and indicates that there was no bias.

8 Testing of hypotheses

This part of the study focuses on testing the study hypotheses, which were developed to assess the relationships between independent and dependent variables. Multiple regression was used in order to accept or reject the research hypotheses. Two regression analyses were performed to determine the relationships between the independent variables and the dependent variable, as well as the effect of the moderator. Interaction testing can show the moderator effect (Hair et al., 2010). A moderator is a variable that strengthens or weakens the relationship between dependent and independent variables. Statistically, moderation is an interaction between the independent variable and moderator, on the relationship with the dependent variable (Hair et al., 2010).

Multiple regressions enable to test the effect of many different factors (independent variables) on a particular outcome (dependent variable) at the same time. In the beginning, this study used the model summary, which consists of ‘coefficient of determination ($R^2$)’ to measure how much that independent variables (knowledge acquisition, knowledge integration and knowledge utilisation) can justify from the problem in the dependent variable (product/service innovation). $R^2$ falls between 0 and 1. Higher values of $R^2$ improved the regression model fit with the observations. Furthermore, analysis of variance (ANOVA) was used to assess the model fit and its overall significance in order to test the hypotheses (H1 and H2).

8.1 The first hypothesis

H1 There is a significant relationship between KM functions (acquisition, integration and utilisation) and Fintech innovation.

After conducting a multiple regression test to examine the correlation, the relationship between the variables ($R$) is 0.733, which means that there is a significant relationship between the three main factors (functions) of KM and Fintech innovation. The $R^2$ value indicates that the three factors (acquisitions, integration and utilisations) are responsible for 51% of the change in the level of innovation in commercial banks. Adjusted R square value of this study was 0.497, which is less than the R square value of 0.537, as shown in Table 6. Since adjusted R square values are always less than or equal to R square, this
The influence of knowledge management processes on FinTech innovation

means that if the model had been fitted with the participation of the whole population rather than those who responded to this study, there would be (0.537–0.525) less variance in the model outcome.

**Table 6** Model summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R square</th>
<th>Adjusted R square</th>
<th>Std. the error of the estimate</th>
<th>ANOVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.733*</td>
<td>0.537</td>
<td>0.525</td>
<td>0.39771</td>
<td>Sum of squares Df Mean square F Sig.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21.494 3 7.165 45.296 0.000</td>
</tr>
</tbody>
</table>

Note: *Predictors: (constant), acquisition, integration and utilisation)

By implementing the level of significance (0.05) to reject or accept the first hypothesis; the F-value for the collected primary data was 7.165, which is significant at the level of p < 0.05 (sig. = 0.000), meaning that there is a statistically significant relationship between the KM functions (acquisition, integration and utilisation) on FinTech innovation.

**Table 7** Coefficients for variables

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardised coefficients</th>
<th>Standardised coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Beta</td>
<td>Std. error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>2.127</td>
<td>0.211</td>
<td>10.083</td>
<td>0.000</td>
</tr>
<tr>
<td>Acquisition</td>
<td>0.153</td>
<td>0.041</td>
<td>0.268</td>
<td>3.690</td>
</tr>
<tr>
<td>Integration</td>
<td>0.291</td>
<td>0.044</td>
<td>0.493</td>
<td>6.678</td>
</tr>
<tr>
<td>Utilisation</td>
<td>0.107</td>
<td>0.046</td>
<td>0.155</td>
<td>2.320</td>
</tr>
</tbody>
</table>

Note: *Dependent variable: innovation

The second part of Table 7 demonstrates T and sig. Values, which give a rough indication of the relationship of each independent variable with the dependent variable. For instance, a big absolute (T) value and a small (p) value indicate that a predictor variable is having a large effect on the criterion variable.

**8.2 The second hypothesis**

H2 Managers’ demographic characteristics (age, sex, education, experience and position) are significantly moderating the relationship between KM process and FinTech innovation.

Moderators are variables that can modify the relationship directly between independent and dependent variables. Hierarchal regression analysis was performed to examine the moderation effect of the respondents’ demographic characteristics (age, education, and
experience and position) on the relationship between the independent variables and the
dependent variable. It shows that: R square = 75.3 means that 75.3% of the variation in
the dependent variable is explained by the independent variables and p = 0.00 <0.01
which is very significant, implying that the model is adequate. Table 8 shows managers’
demographic characteristics (age, sex, education, experience and position) effect as
moderators for the relationship between KM and Fintech innovation.

Based on the results, only two managers’ demographic characteristics; position and
experience were found positively significant (p ≤ 0.05) as moderators with R square
change of 0.016 and 0.020, respectively. However, age and education were found as
insignificant as moderators in the relationship between KM and Fintech innovation.
Therefore, H2 is partially accepted. This result implies that managers’ experience and
position factors could improve the prediction level (the rate of explanation) of the
relationship between KM and Fintech innovation. The explanation power has increased
from 0.73 to 0.76, with the existence of these two demographic factors.

Table 8  Hierarchical regression results of the effects of managers’ demographic characteristics
as moderators

<table>
<thead>
<tr>
<th>Selected variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge management</td>
<td>0.733***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.737**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td>0.738***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position</td>
<td></td>
<td></td>
<td>0.747***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td></td>
<td></td>
<td></td>
<td>0.760***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.763***</td>
<td></td>
</tr>
<tr>
<td>R Square</td>
<td>0.537</td>
<td>0.542</td>
<td>0.544</td>
<td>0.558</td>
<td>0.5780</td>
<td>0.583</td>
</tr>
<tr>
<td>Adjusted R square</td>
<td>0.525</td>
<td>0.527</td>
<td>0.529</td>
<td>0.539</td>
<td>0.578</td>
<td>0.556</td>
</tr>
<tr>
<td>R square change</td>
<td>0.005</td>
<td>0.006</td>
<td>0.016</td>
<td>0.020</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td>F sig. change</td>
<td>45.296</td>
<td>1.292</td>
<td>1.298</td>
<td>4.058*</td>
<td>5.469*</td>
<td>1.162</td>
</tr>
<tr>
<td>Sig.</td>
<td>0.000***</td>
<td>0.258</td>
<td>0.288</td>
<td>0.046*</td>
<td>0.021*</td>
<td>0.283</td>
</tr>
</tbody>
</table>

Notes: *p ≤ 0.05; **p ≤ 0.01; ***p ≤ .001

9 Results discussion

This study aims to explore the effect of KM functions (processes) upon Fintech
innovation via the moderating role of bank managers’ demographic characteristics (age,
sex, education, experience and position) in commercial banks operating in Lebanon.
Testing of the research hypotheses has led to results and conclusions that can be
compared with previous general findings and observations. Three factors were extracted
from the 15 items of KM functions, which were:
1  knowledge acquisition
2  knowledge integration
3  knowledge utilisation and subsequently used to answer the research questions by
using multiple regression analysis.
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This result is consistent with previous research (e.g. Darroch, 2005; Zaim et al., 2019).

The first objective of this study is to explore to which extent commercial banks operating in Lebanon are applying KM functions to enhance product/service innovation. The findings indicate that the extent of performing/applying the KM functions of

1. knowledge acquisition
2. knowledge integration
3. knowledge utilisation by commercial banks operating in Lebanon is considered moderate (i.e. 72.4% or 3.52).

Since their mean is more than the mean of the scale, which is 3 (mean of the scale = $\frac{1 + 2 + 3 + 4 + 5}{5} = 3.00$), it appears that the ‘knowledge acquisition’ is the most profoundly important component performed by commercial banks in Lebanon as presented in Table 3. This implies that there are some variations among commercial banks operating in Lebanon in terms of their level of applying KM processes (functions). This might be because the adoption of KM systems in commercial banks in Lebanon is still in an early stage. In other words, commercial banks in Lebanon are merely preoccupied with technology infrastructure, failing to focus on KM practices or advanced tools. The second objective of this study was to explore to what extent FinTech innovation exists among commercial banks operating in Lebanon. The findings indicate that the extent of FinTech innovation among commercial banks operating in Lebanon is considered good (i.e. 76.6% or 3.83), since their mean is more than the mean of the scale, which is 3 (mean of the scale = $\frac{1 + 2 + 3 + 4 + 5}{5} = 3.00$). This implies that FinTech innovation among commercial banks is varied, which might be due to the high intensity of competition in the banking industry. This result is supported by many previous studies such as Lilly and Juma (2014) and Akram et al. (2011).

The third objective of the study was to identify the strength and direction of the impact of KM functions on FinTech innovation. Findings indicate that there is a moderate and positive relationship between KM functions and FinTech innovation. Furthermore, knowledge acquisition, knowledge integration and knowledge utilisation are showing significant relationships with innovation. These functions are contributing to the enhancement of innovation in the banking industry. The literature also confirms that KM has found a significant and robust relationship between KM and FinTech innovation. The results indicate that KM practices are positively associated with innovation as generally suggested by the KM literature (e.g., Zheng, 2005; Jantunen, 2005; Bishop et al., 2008; Byukusenge et al., 2016; Nawab et al., 2015; Kör and Maden, 2013). This could be attributed to the fact that information technology is used and that there is some form of knowledge being acquired and distributed by commercial banks operating in Lebanon. In today’s ‘banking industry environment, which is characterised by rapid and continuous changes, empirically analysing KM and innovation concepts is critical because of the importance of these concepts in creating competitive advantages.

The fourth objective was to examine the effect of bank managers’ demographic characteristics (age, sex, education, experience and position) as a moderating factor in the relationship between KM and FinTech innovation. The findings of the study indicate that only two managers’ demographic characteristics; experience and position play important roles as moderating factors in the relationship between KM functions and level of FinTech innovation in commercial banks of Lebanon, while age, sex and education do not. This
result implies that managers with higher experience and position positively improve the prediction of the relationship between KM functions and Fintech innovation in commercial banks in Lebanon, while age, sex and education were found irrelevant. This result is supported by previous studies, such as Mohyeldin and Suliman (2001).

10 Research contributions and limitations

This study has contributed to the extent of KM and innovation literature by providing the following participation. First, the study has investigated the unexplored impact of KM on Fintech innovation among commercial banks operating in Lebanon as a developing country. Second, this study is considered, to the best of the authors’ knowledge, the first to test the impact of KM on Fintech innovation among commercial banks via the moderating effect of demographic characteristics (age, sex, education, experience and position) within the context of Lebanon’s business environment. Previous research on this area is heavily concentrated in western countries.

In this study, the importance of KM functions and Fintech innovation is demonstrated. Besides, the study contributes to the literature and knowledge-based theory by empirically analysing the relationship between KM functions and Fintech innovation. Through managing knowledge effectively, commercial banks can improve Fintech innovation. Therefore, KM functions (i.e., knowledge acquisition, integration and utilisation) have been considered effective means of enhancing product innovations. Additionally, moderating factors show the importance of experience and position of bank managers in explaining the relation between KM functions and Fintech innovation.

Based on the research findings, the study concludes that KM functions play an important role in enhancing the Fintech innovation of commercial banks in Lebanon. KM is seen as an important attribute to increase innovation. Therefore, managers of commercial banks in Lebanon should understand and develop a better way of implementing an overall KM which is composed of acquisition, integration and utilisation. These correlated and complementary functions should not be considered in isolation, but rather should be integrated and combined to enhance Fintech innovation in commercial banks. The managers of commercial banks of Lebanon should improve knowledge acquisition in their organisations. They should apply intellectual capital development and knowledge dissemination to a higher extent because of their high influence on Fintech innovation. The managers of commercial banks of Lebanon should integrate and fully utilise KM in order to develop and enhance the effectiveness of Fintech innovation in their organisations. Hence, managers in commercial banks need to recognise the importance of effective KM practices in an arrangement in order to enhance their level of Fintech innovations. Even though the important findings of this study, there are a few impediments ought to be considered in any attempt to generalise these discoveries, since the target of the consider was restricted to commercial banks working in Lebanon as a developing country. Because of this study has cultural context, it is recommended for future studies to be extended on other types of service sectors, therefore that we could see the differences between impacts of KM function on innovation on new entry companies and a new environment. Therefore, for improving the level of reliability and validity, further research is needed to be conducted on other population.
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