

# Beyond profitability: ICT investments and financial institutions performance measures in developing economies

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## Abstract

**Purpose** – The national and global digital transformation makes investments in information and communications technology (ICT) by financial institutions a necessity, not only for gaining a competitive advantage but also for expanding their knowledge and learning about their customers. This study assesses the business value of ICT investments by financial institutions using a mixed-method approach.

**Design/methodology/approach** – This study adopted a mixed-method approach. First, financial data were gathered from Omani banks' annual financial reports and through a longitudinal quantitative analysis in order to assess the value of ICT in financial institutions' profitability performances. Second, a Delphi qualitative approach was utilized in order to further assess how top managers view the impact of ICT investments in different aspects of business. We used an extended balanced scorecard (finance, customer, internal process and learning and growth) and a sector perspective to address how future ICT investments can offer value that goes beyond traditional metrics of profitability.

**Findings** – The results of the longitudinal study demonstrated significant evidence of the impact of ICT investment on finance performance indicators; ICT value is significantly positive. Furthermore, the results indicated that there is an acceptable consensus among business and ICT managers that ICT is linked to performance indicators beyond financial; ICT value is linked also to customer indicators, internal process indicators and learning and growth indicators in addition to sector indicators.

**Originality/value** – ICT is vital for a diversified and knowledge-based economy, especially for developing countries, because modern banking and financial institutions are relatively new in economies such as those that had previously relied on cash and informal financing institutions. Therefore, continued ICT investments face challenges and may not succeed. Most of the existing literature on ICT value has focused on tangible financial performance indicators. The financial evaluation of intangible performance indicators of ICT investments still remains a problematic area of high relevance to decision-makers. The present study provides an integrated assessment that enables financial institutions to develop their strategies and assessments in terms of ICT investments and to go beyond typical, tangible financial profitability indicators. Furthermore, it integrates assessment indicators that are beyond organizations themselves and reaches sectors and countries. This type of investigation is limited in the literature yet important for the financial sector as it is highly integrated by nature and critical to the development of a nation's economy.

**Keywords** ICT, ICT value, Financial institutions, Balanced scorecard, ICT investments

**Paper type** Research paper



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## Highlights

- (1) The national and global digital transformation makes the investments in information and communications technology (ICT) in financial institutions a necessity and not only a competitive advantage.
- (2) Continued ICT investments in banks may face challenges and may not succeed.
- (3) This study provides an integrated assessment that enables financial institutions to develop their strategy and assessment in terms of ICT investments.
- (4) ICT investments can offer value that goes beyond traditional metrics of profitability.

## 1. Introduction

Information and communications infrastructure is one of the main pillars of the knowledge-based economy, according to the World Bank (World Bank, 2012). Today, information and communications technology (ICT) plays a crucial role in the performance and competitiveness of individuals, organizations, governments and economies. The digital revolution of technology and the Internet has resulted in drastic and rapid changes in finance and banking sectors (Appiahene *et al.*, 2019). For instance, the banking sector has been undergoing a rapid transformation due to progressive economic reforms, changing demographics and fast-paced technological developments and innovations (Appiahene *et al.*, 2019; Valaei, 2019). Insurance companies are also adopting technological changes to improve their efficiency and innovation and to gain a competitive advantage (Harris and Katz, 1991; Sha and Singh, 2015). The literature shows that there is a significant relationship between sophisticated strategic information systems and strategic performances in the banking context (Yazid and Kofarnaisa, 2019). One driver of financial technology, or fintech, is the integration of several technologies to restructure flows of financial information through competitive and cooperative mechanisms (Gozman *et al.*, 2018).

The Omani government has recognized the crucial role of ICT in the development of the nation's individuals, organizations and economy. This recognition has been illustrated, first, in Oman's Vision 2020 project and then in the Vision 2040 project for the national economy. Accordingly, massive ICT investments worth millions of Omani rials have been made at the governmental and organizational levels to improve the competitiveness, efficiency and productivity of Omani organizations and the country's economy. As in any other nation, the financial institution sector is one of the major sectors in Oman. In 2010, the financial sector contributed 4% to the national GDP. Oman's Vision 2020 aims to diversify the economy and reduce reliance on the oil sector, thus increasing financial institutions' contributions to national GDP by 8% (Bank Muscat, 2012). With high local Internet and mobile broadband penetration and the development of broadband and fiber optic infrastructure, the establishment of secure e-payment infrastructure in Oman (ITA, 2015; TRA, 2015) and the popularity of electronic and mobile applications in the banking sector, electronic services are considered not only a competitive advantage but also a necessity by several Omani banks. Investments in ICT by financial institutions are illustrated by the early adoption of ATMs and plastic cards as well as the latest adoption of e-applications and mobile applications, and, more recently, cloud computing and blockchain infrastructure, digital currency and so forth in several major financial institutions in Oman.

However, the productivity of ICT investments has been a major concern of ICT and economic (especially financial) research since the productivity paradox of ICT investment was raised by economist Stephen Roach in 1987. Roach (1987) concluded that the tremendous increase in computerization has had little effect on productivity and economic performance (Brynjolfsson and Hitt, 1998). However, until now, the business value of ICT investments has

been one of the major research issues for information systems (IS) researchers, according to recent literature reviews (Devaraj and Kohli, 2001; Schryen, 2013; Sabherwal and Jeyaraj, 2015), and more empirical studies are needed to provide conclusive evidence. Despite the potential of ICT investments for financial institutions, there is still significant evidence that several information-system implementation projects face challenges and end in failure (2018). The intangible benefits are equally important for decision-makers. However, the financial evaluation of intangible benefits to be gained from ICT investments continues to be a problem area of high relevance to decision-makers (Oesterreich and Teuteberg, 2018). Incorrect decisions can result in many years of ineffective ICT that can affect efficiency, productivity and profitability, not to mention customer service and sector and national competitiveness. There are numerous ICT opportunities that require careful consideration in order for current investments to be able to exploit future opportunities such as blockchain infrastructure, digital currency, mobile trading and global transactions.

Therefore, this study aims to establish an integrative perspective in order to assess ICT value on the performance of financial firms. First, the study aims to provide an evidence of the value of ICT investments in financial institutions in Oman based on the typical tangible financial profitability performance indicators highlighted by the literature. Second, the study aims to reveal critical ICT value measures that have the most value for stakeholders and go beyond tangible profitability indicators and beyond organizational boundary using an extended balanced scorecard (BSC). Thus, the need to enhance the performance of Omani organizations with huge investments in ICT is indispensable (Al-Busaidi, 2016; Al-Rahbi, 2008). A limited number of studies have assessed the impact of ICT investments on financial institutions in Oman at a firm level. Only two qualitative studies were conducted in the banking sector (Khalfan and Alshawaf, 2004; Al-Hajri, 2008). There are very limited quantitative studies; a study on customers' adoption of online banking was conducted by Riffai *et al.* (2012). However, assessing the value of these ICT investments is of greater importance for firms, especially financial institutions, as well as for-profit organizations and, consequently, the country. With huge investments in ICT, a periodic assessment of its benefits and costs is critical for its continuing adoption, for future ICT investments and for strategic ICT planning (Schryen, 2013). Several electronic services are integrated across the financial sector. Financial institutions play various roles in the operational and legal aspects of electronic funds transfer (Marszk and Lechman, 2018). Research indicates that there can be a significant relationship between sophisticated, strategic information systems and strategic performances in financial institutions such as banks (Yazid and Kofarnaisa, 2019).

The following sections provide background literature about financial institutions and their importance; prior studies on ICT value, research direction, methodology, analysis and results; and, finally, discussion and conclusion.

## 2. Literature review

### 2.1 *The role of financial institutions*

With a worldwide presence, financial institutions are considered a country's prime source of finance. Financial institutions are responsible for financial resource allocation to intended participants (Jureviciene and Pupelyte, 2013). Christophers (2015) emphasized the need to view financial markets as more than places and platforms and, rather, as the interaction of the institutions.

The existence of financial institutions has an immense impact on a nation's economy and can tell us a lot about its economic situation. For instance, Jain (2013), Houston (2000) and Eryigit (2016) have indicated that growth of the economy comes as a result of a stable and developed financial system. Financial institutions can work as a proactive measure to prevent financial crises in countries (Eryigit, 2016). Another positive view is that financial institutions

provide a tremendous number of opportunities for job seekers (Jain, 2013; Houston, 2000; Eryigit, 2016). Furthermore, they tend to allow more room for competitiveness that, in turn, leads to improved innovation in the market (Houston, 2000).

The health of banks and other financial institutions has a major impact on national economies and the world economy. Revenue estimates from Oman's financial institutions reached 35 million OMR in 2015 (Ministry of Finance, 2015). Domestic credit provided by financial sectors (% of GDP) measures credit provided to various sectors on a gross basis, except for credit for the central government. In 2014, the average credit contribution to GDP around the world was 173.6%, including 50.8% in the Middle East and North Africa, 159.3% in the European area and 41.18% in Oman (World Bank, 2016a, b).

### 2.2 ICT investments and applications in financial institutions

The term *information system (IS)* is frequently used interchangeably with *information technology (IT)* or *information and communications technology (ICT)*. Schryen (2013) adopted a holistic view of IS as “the entire infrastructure, organization, personnel, and components for the collection, processing, storage, transmission, display, dissemination, and disposition of information” (p.140).

Nowadays, financial institutions are undergoing restructuring in the form of new transactions and distribution systems (Marszk and Lechman, 2018; Yazid and Kofarnaisa, 2019). As a result, banks are investing heavily in ICT infrastructure to compete with their counterparts (Yazid and Kofarnaisa, 2019).

The use of IT in financial institutions (FIs) has become a necessity rather than a competitive advantage, and FIs have been investing heavily in ICT to improve their services including ATMs and electronic and mobile banking, ETF, digital currency and big data analytics. In terms of assessing ICT investments at the firm level, researchers have used a variety of indicators, such as ICT asset capital in terms of hardware (computers, fax machines, note-counting machines and packet-counting machines), software, networks and IT labor; or ICT systems/applications in terms of ATMs and point of sale (POS) devices, electronic fund transfers, clearing house automated payments (CHAPS), electronic purses, automated check sorters, Internet banking, mobile banking, telebanking, electronic debit and credit cards, executive information systems, electronic data interchange (EDI), decision support system (DSS), electronic customer relationship management, e-sourcing and social media.

### 2.3 Business value of ICT investments

Linking ICT investments to a firm's performance has been the focus of a great deal of attention. Classic studies identified several areas where ICT adds business value based on different theoretical models. Hitt and Brynjolfsson (1996) indicated that IT returns can be related to productivity, profitability and customer value, and several researchers followed this assessment. Similarly, in their book, *The IT Payoff: Measuring the Business Value of Information Technology Investments*, Devaraj and Kohli (2001) indicated that IT investments had been measured by profitability (cost-benefit analysis and return on investment), productivity (efficiency and quality) and customer value. However, based on their BSC, Kaplan and Norton (1993) proposed an assessment of multiple perspectives: the financial perspective, customer perspective, internal business perspective and innovation and learning perspective. Later, Schryen (2013) based a business-value assessment on production- and process-oriented models, proposing the assessment of ICT value based on its impact on productivity performance, market performance and accounting performance.

Most studies of ICT investment value have focused on the banking sector and some on insurance companies. Moreover, most of the studies of ICT business value on banks'

FINANCIAL PERSPECTIVE		
Category	Indicator	References
Profitability	ROA	Khaled and Bani-Ahmad(2019) ; <b>Dinh <i>et al.</i> (2015)</b> ,Farouk and Dandago (2015), Binuyo and Aregbeshola (2014); Salimi <i>et al.</i> (2013), Onay and Ozsoz (2013), Leckson-Leckey <i>et al.</i> (2011), Ciciretti <i>et al.</i> (2009),Dandapani <i>et al.</i> (2008), Ahmad (2006), Zhu <i>et al.</i> (2004),Chowdhury (2003), Navarrete and Pick (2002)
	ROE	Khaled and Bani-Ahmad(2019); Abofaied(2017); <b>Dinh <i>et al.</i> (2015)</b> , Farouk and Dandago (2015); Onay and Ozsoz (2013), Al-Smadi and Al-Wabel (2011), Leckson-Leckey <i>et al.</i> (2011),Bou-Wen (2007), Ahmad (2006), Chowdhury (2003), Navarrete and Pick (2002)
	ROI	Abofaied(2017); Edwin (2014)
	NPM	Farouk and Dandago (2015), Binuyo and Aregbeshola (2014), Onay and Ozsoz (2013)
	EPD	Farouk and Dandago (2015)
	Revenue	Budd and Budd (2011), Ugwu <i>et al.</i> (2000)
	Stock return	Ciciretti <i>et al.</i> (2009)
	Profitability/net income	Abofaied(2017); Onay and Ozsoz (2013), Neirotti and Paolucci, (2007), Swierczek <i>et al.</i> (2005),Chang-Soo and Davidson (2004), Chowdhury (2003), Navarrete and Pick (2002)
	Productivity	Ruhul <i>et al.</i> (2010), Osabuohien (2008), Swierczek <i>et al.</i> (2005)
	Loans	Appiahene <i>et al.</i> (2019), Onay and Ozsoz (2013), Ahmad (2006), Chowdhury (2003)
Productivity	Deposits	Ahmad (2006), Chowdhury (2003); Appiahene <i>et al.</i> (2019)
	General business efficiency	Safari and Yu (2014); Ruhul <i>et al.</i> (2010),Budd and Budd (2011)
	Capital expenditure	Ho and Mallick (2010)
	Non-interest expenses NIE/A	Onay and Ozsoz (2013), Ho and Mallick (2010), Shu and Strassmann (2005);
	Non-interest income NONI/A	Dinh <i>et al.</i> (2015),Onay and Ozsoz (2013),
	Operating expenses	Dinh <i>et al.</i> (2015), Adeoye and Omoregie (2013), Ou <i>et al.</i> (2009), Ho and Mallick (2010), Dandapani <i>et al.</i> (2008); Chang-Soo and Davidson (2004).
	Asset Management Rate	Adeoye and Omoregie (2013), Ou <i>et al.</i> (2009)
	Operating cost ratio	Harris and Katz (1991), Neirotti and Paolucci (2007)
	Labor cost/payroll	Ho and Mallick (2010), Chang-Soo and Davidson (2004), Neirotti and Paolucci, (2007)
	Interest expenses	Shu and Strassmann (2005)
Efficiency	Labor marginal product	Shu and Strassmann (2005)
	labor productivity	Chang-Soo and Davidson (2004)
	Administrative expenses	Chang-Soo and Davidson (2004)
CUSTOMER PERSPECTIVE		
	Indicators	References
	Market share	Omar <i>et al.</i> (2012) , Ho and Mallick (2010), Neirotti and Paolucci, (2007), Bou-Wen (2007), Ugwu <i>et al.</i> (2000)
	Customer services	Omar <i>et al.</i> (2012), Edwin (2014), Kaleem and Ahmad (2012), Idris <i>et al.</i> (2013 ), Abofaied(2017), Khaled and Bani-Ahmad(2019)
INTERNAL PROCESS PERSPECTIVE		
Category	Indicators	References
	Operation management	Edwin (2014), Kaleem and Ahmad (2012), Aduloju(2014)
	Improved speed of business operations	Kaleem and Ahmad (2012), Osabuohien (2008), Abofaied(2017)
	Number of employees	Zhu <i>et al.</i> (2004); Abofaied(2017)
	Number of full service locations	Zhu <i>et al.</i> (2004)
LEARNING AND GROWTH PERSPECTIVE		
Category	Indicators	References
	New products and services	Omar <i>et al.</i> (2012), Chen and Tsou( 2007)
	Growth in assets	Dandapani <i>et al.</i> (2008)

Table 1.  
ICT value indicator in  
financial institutions

Note(s): Bold-styled reference means increasing impact; gray-styled reference refers to decreasing impact, non-bold and non-gray-styled reference means no impact

performance have focused on financial measures (profitability and productivity/efficiency) as indicated in Table 1. The most common profitability measures are return on asset (ROA), return on equity (ROE), net profit margin (NPF) and profit/net income, whereas the most common productivity measures are non-interest expenses (NIE/A), non-interest income (NONI/A) and operating cost rate.

In terms of the impact of ICT investment on financial institutions including banks and insurance companies, the literature demonstrated numerous conflicting results. Several positive impacts included Iranian banks' ROA (Salimi *et al.*, 2013), Nigerian and Taiwan banks' operating-costs rates and asset management rates (Adeoye and Omoregie, 2013; Ou *et al.*, 2009), Lebanese banks' customer satisfaction and production (Hilal, 2015), Asia-Pacific banks' profitability (Swierczek, 2005) and South African banks' cost-efficiency variables (Binuyo and Aregbeshola, 2014). IT has had a positive influence on the productivity and efficiency of Nigerian insurance companies, but the Nigerian economy is not ready for such technological change due to its weak infrastructure and power supply (Ugwu *et al.*, 2000). The results of Edwin's (2014) study of Nigeria found that ICT has improved the operations of banks; instead of long queues, ATM and online banking have been introduced. In addition, ICT has improved customer service and justified ROI.

Several studies of developed countries also identified positive impacts of ICT investments. Shu and Strassmann (2005), in the United States, indicated that ICT investments add more value to the labor marginal product compared to non-interest expenses, interest expenses and labor costs. Bou-Wen (2007) showed that IT investments in the USA (in terms of numbers of personal computers, mainframes and LANs) had a positive impact on banks' performances – represented by ROE, Tobin's *q* and market-to-book value – and total value created (economic value added and market value added). Ruhul *et al.* (2010) found that, in Australia, ICT expenditures have a significant positive effect on banks' technical efficiency. In Italy, Internet banking showed a good ROA and stock return (Ciciretti, 2009). Chowdhury (2003) investigated ICT value in Australia, Hong Kong, Japan, Malaysia, New Zealand, Singapore, South Korea, Taiwan and Thailand, where findings showed that IT capital and IT labor had positive impacts on both bank profitability and productivity.

By contrast, several studies have reported the productivity paradox or mixed results in investing in ICT. In Jordan, Ahmed (2006) studied an Arab bank that showed a positive return in terms of productivity (loans, deposits and net income) and profitability with regard to ROE and ROA behind the investment in IT capital, whereas investment in IT labor showed either no contribution or a negative contribution to Nigerian banks, which saw a negative impact on bank performance with regard to ROA, ROE and EPS (Farouk and Dandago, 2015). In another study, Internet banking had a positive impact on branch profits, deposits, credit and non-interest income and non-interest expenses; however, Internet banking in Turkish banks had a negative impact on the profitability ratios of ROA, ROE and INTINC (Onay and Ozsoz, 2013). In Jordan, it was found that e-banking did not result in profit with regard to ROE because of the expenses related to infrastructure, maintenance and training (Al-Smadi and Al-Wabel, 2011). Insurance companies in Nigeria were investigated to study the impact of investments on different types of information technology systems and electronic application services (time savings, error-rate reduction, improved speed of service delivery, competitive advantage, market segmentations, high revenue and forecasting) according to Aduloju (2014). Harris and Katz (1991) evaluated organizational performance in terms of operating-cost efficiency ratio versus IT expense ratio and IT cost-efficiency ratio; they found that the intensity of IT investment was linked with insurance company performance.

In developed countries, several studies demonstrated mixed results or a productivity paradox in ICT investment. Zhu *et al.* (2004) indicated that, in the USA, the overall impact of technology (with regard to network systems) was positive; they indicated that ROA was independent of network system variables. Dandapani *et al.* (2008) found that Internet banking



in the USA had a negative impact on operating expenses, but a positive impact on asset growth and no impact on ROA. In the UK, [Ho and Wu \(2009\)](#) found that IT expenditures (for hardware and software) had a negative impact on non-interest expenditures, other operating expenses, revenue and prices (hence, profitability), but no impact on market share. In insurance companies in Italy, [Neirotti and Paolucci \(2007\)](#) assessed IT investments linked to productivity (net premium written per employee (PR), loss ratio (LR), expense ratio (ER)) and profitability; their study indicated that IT boosted the company's productivity but did not improve its competitive advantage in the market or its profitability ([Neirotti and Paolucci, 2007](#)).

In summary, the business value of ICT investments in financial institutions based on a BSC approach can be related to financial value, customer value, internal process value and learning and growth value. [Table 1](#) presents the BSC indicators for assessing the business value of ICT and supporting references from financial institutions. In conclusion, first, the literature indicated in [Table 1](#) illustrates that that IS productivity research has continued to report conflicting results in developing and developed countries. Second, [Table 1](#) indicates that most of the studies have focused on financial performance indicators, but limited studies have focused on internal process perspectives, customers' perspectives and learning and growth perspectives – most of these assessed performance indicators are tangible in nature. Third, the literature indicates a lack of studies with regard to Oman and Gulf Cooperation Council (GCC) countries that assess the general value of ICT investment from a firm's perspectives. Thus, the study's first aim is to quantitatively assess the value of ICT investment in FIs in Oman. Then, the study aims to provide quantitative evidence of the value of ICT investment on financial organizations. Furthermore, the study will go beyond tangible finance performance indicators and establish integrated organizational performance measures related to other internal and external performance dimensions.

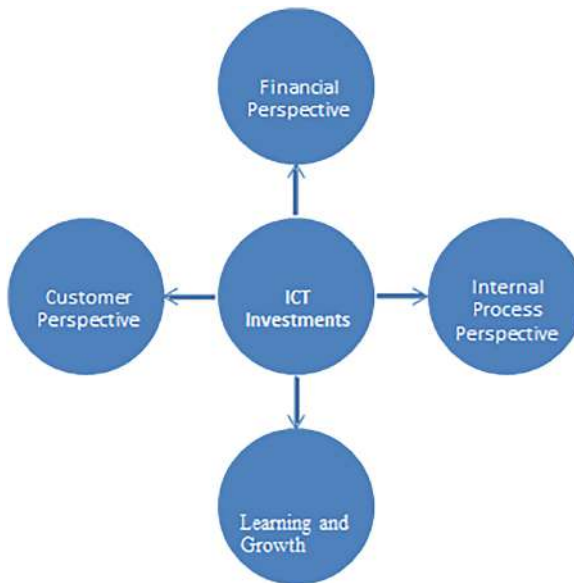
### 3. Study direction

This study aims to develop a framework to assess the business value of ICT investments in financial institutions from firms' perspectives based on a BSC's four general perspectives (finance, customer, internal processes and learning and growth). The use of BSC for financial institutions offers several benefits as it provides a way to measure performance and develop strategic objectives and performance measures to translate a business's strategy into actions. The below figure, which is modified from [Kaplan and Norton \(1993\)](#), illustrates the study direction. The study aims to identify the financial, customer, internal processes and learning and growth indicators that have been impacted by ICT investments. According to [Kaplan and Norton \(1993\)](#), the application of a BSC varies based on the organization's vision and strategy, and indicates that these four performance perspectives are interrelated.

As indicated in [Table 1](#), most of the previous studies' metrics were focused on performance-based accounting measures and were very limited with regard to other aspects of business performance. The intangible benefits of ICT are of great importance to firms' decision-makers ([Oesterreich and Teuteberg, 2018](#)). In developing economies, the business value of financial institutions is measured through several metrics (not just profitability-based measures); these broader sets of metrics capture social and growth objectives (see [Figure 1](#)).

### 4. Research design

The study adopted two research methods. The first was a longitudinal data analysis of the related data available on the secondary source (annual financial reports). However, due to limited data, a second method, a qualitative Delphi study, was adopted to provide more data and an integrated and comprehensive view of the value of ICT in the financial sector. [Figure 2](#) illustrates the sequence of the research design.



Source(s): Modified from Kaplan and Norton, 1993

**Figure 1.**  
The value of ICT  
investment based on  
balanced scorecard



**Figure 2.**  
The study research  
design sequence

#### 4.1 Quantitative longitudinal study data collection

The quantitative study aims to provide an evidence of the value of ICT investments in financial institutions in Oman based on the typical tangible financial profitability performance indicators highlighted by the literature. This study's analysis used secondary data (available financial reports such as income statements and balance sheets, from 2001 to 2017) from financial institutions listed in Oman's Muscat Securities Market (MSM). In the MSM, the financial sector is classified as banking, investment, finance and insurance subsectors (MSM, 2019). There are currently 8 banks, 5 finance companies, 13 investment companies and 10 insurance companies. However, most of the non-banking companies have not listed any information about ICT value, and only three banks reported ICT value from 2001. Thus, the study included the records of only four banks and one investment company that have reported ICT value from 2008 to 2017. ICT was labeled in these financial reports as "Hardware and Software" or "Computer Equipment" as part of total assets.

#### 4.2 Delphi study data collection

This Delphi study aims to reveal critical ICT value measures that go beyond profitability indicators and beyond organizational boundary. Data were collected from information technology and business managers in financial institutions in Oman listed on MSM. For instance, on MSM, the financial sector is classified as banking, investment, finance and insurance subsectors (MSM, 2019). There are currently 8 banks, 5 finance companies, 13 investment companies and 10 insurance companies.



The study was conducted through two rounds of a Delphi study: round 1, selection, and round 2, ranking. Delphi studies have been used for concept/framework development (Okoli and Pawlowski, 2004), and this is “a methodical and interactive research method that is useful for gathering the opinions of a panel of independent experts concerning a specific subject” (Skinner *et al.*, 2015, p. 32). The Delphi study has been highly used in information systems research as it offers several advantages including building consensus, pulling together the collective wisdom of participants and validity, as the content is driven by panelists (Skinner *et al.*, 2015). The Delphi method has been utilized in various formats with regard to number of rounds, group size and nature of feedback (Rowe and Wright, 1999). It has four core elements: anonymity, iteration, controlled feedback and aggregation of group responses (Rowe and Wright, 1999). One of the most frequently adopted designs is the one developed by Schmidt (1997), which consists of brainstorming, selecting and ranking; however, the brainstorming round is frequently omitted if the literature provides a sufficient list of items.

The questionnaire included a list of 48 ICT performance indicators highlighted in the literature. This list of factors is related to different aspects of a BSC (financial value, customer value, internal process value and learning and growth value) in addition to several sector values according to the literature. Participants were asked to rate the impact of ICT value on each of the listed performance indicators in his/her organization based on a five-point Likert-type scale: (1 = very negative, 2 = negative, 3 = neutral, 4 = positive and 5 = very positive). The performance indicators are listed randomly. Participants were also asked to identify any other performance indicators not included in the list. In qualitative research, which aims to determine the importance or screening of items, a Likert scale can be used to gather experts’ opinions. The five-point or seven-point Likert scale is common (Habibi *et al.*, 2014, p. 10). In addition to the main research question, the questionnaire includes demographic questions (age, gender, experience, etc.) and inquiries about the status of a list of ICT applications and technologies (based on this scale: not adopted, big failure, failure, neutral, success and big success).

#### *4.3 Delphi study experts’ profiles*

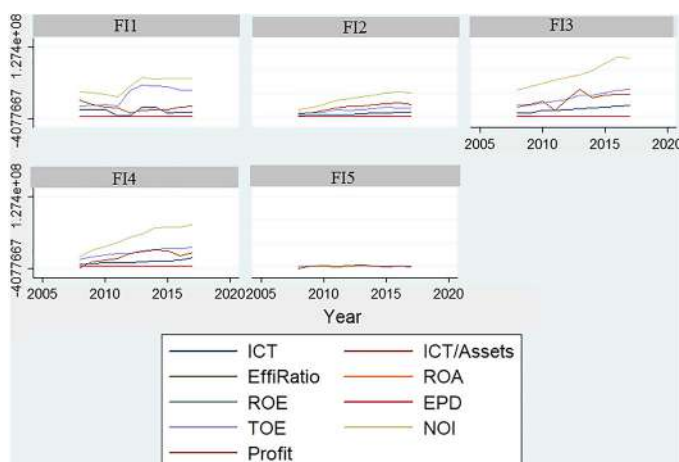
In a Delphi study, participants are not chosen randomly but rather selected and identified based on their knowledge of the investigated subject area (Okoli and Pawlowski, 2004). The panel can be as small as three or four members, such as those surveyed by Gustafson *et al.* (1973) and Fischer (1981), and as large as 100 members (Okoli and Pawlowski, 2004).

Approximately 35 participants (business and IT managers/deputies from financial institutions) participated in round 1 of the Delphi study. About 42.86% of the participants were IT managers/deputies, whereas 57.14% were business managers and deputies/CEOs. Approximately 82.86% were male and 17.14% were female. In regard to age, 8.57% of the participants were in their 20s, 48.57% in their 30s, 25.71% in their 40s, 14.29% in their 50s and 2.86% were older than 59. Almost half, 48.57%, had master’s degrees, whereas 51.43% had a BSc degree. With regard to work experience in the financial sector, 5.71% of participants had fewer than five years; 22.86% had 5–10 years; 37.14% had 11–5 years, 25.71% had 16–20 years and 8.57% had more than 20 years of experience in the financial sector. With regard to categories of finance, 45.71% participants were in the banking industry, 22.86% in finance, 14.29% in insurance and 17.14% in investment. All participants indicated that they were involved with ICT investments in their organizations.

## **5. Analysis and findings**

### *5.1 Longitudinal quantitative analysis*

A longitudinal data analysis was conducted on 10 years of data collected from five financial institutions using STATA software. Figure 3 shows the indicator values in these five institutions. Table 2 represents the results of ICT impacts on performance indicators with no time lag, a one-year lag and a two-year lag. Analysis was conducted on ratios and non-ratio



**Figure 3.**  
Investigated  
performance indicators  
(2007–2017) trends in  
five FIs

	Total operating expenses(TOE) ( <i>R</i> -sq = 0.6436)	Net operating income(NOI) ( <i>R</i> -sq = 0.8159)	Profit ( <i>R</i> -sq = 0.6704)
ICT value (with concurrent impact)	(1.69; 0.000)	(4.69; 0.000)	(1.53; 0.000)
ICT value (with 1 year lag impact)	(1.81; 0.000)	(4.44; 0.000)	(1.53; 0.000)
ICT value with 2 years lag impact)	(1.36; 0.000)	(3.59; 0.000)	(1.64; 0.000)

**Note(s):** Number in parenthesis represent (coefficient, *p*-value)

**Table 2.**  
Longitudinal analysis  
results for non-ratio  
indicators

indicators. Table 2 demonstrates the results of non-ratio indicators and the impacts of ICT value on operating costs, operating income and profit. The results indicate that ICT value is significantly positively correlated with total operating expenses (TOE), net operating income (NOI) and profit with no time lag, a one-year lag and a two-year lag.

Table 3 demonstrates the results of ratio indicators: the impact of ICT ratio (ICT value/total assets) on efficiency ratio (non-interest expenses/net income), return on assets (ROA) and return on equity (ROE). The results indicate no significant correlation between the ICT ratio and the firm's performance ratios: efficiency ratio, ROA and ROE in no time lag, a one-year lag and a two-year lag. The direct impact of ICT value on these ratios was also found not to be significant.

	ROA <i>R</i> -sq = 0.7014	ROE <i>R</i> -sq = 0.2004	EPD <i>R</i> -sq = 0.0055	Efficiency ratio <i>R</i> -sq = 0.8007
ICT/Assets (with concurrent impact)	(1.06; 0.615)	(4.97; 0.150)	(−129.61; 0.657)	(69.49; 0.106)
ICT/Assets (with 1 year lag impact)	(0.66; 0.786)	(4.06; 0.319)	(152.20; 0.663)	(53.86; 0.189)
ICT/Assets (with 2 years lag impact)	(0.57; 0.849)	(1.63; 0.754)	(1.77; 0.997)	(60.53; 0.228)

**Note(s):** Number in parenthesis represent (coefficient, *p*-value)

**Table 3.**  
Longitudinal analysis  
results for ratio  
indicators

### 5.2 Delphi study analysis

The aim of the Delphi study was to assess the top managers' views of the impacts of ICT investments on other aspects of the businesses besides profitability and financial aspects. [Figure 4](#) presents a list of ICT applications; participants assessed the success and failure of these. As indicated below, participants indicated that all the presented applications had been successful.

### 5.3 Selection round of Delphi study

The objective of this round is to identify the top performance indicators with which participants agreed; the goal of this round is to narrow down the list of items to a reasonable and manageable number for the ranking round, as recommended by [Schmidt \(1997\)](#).

[Table 4](#) demonstrates that the top-rated 16 of the 48 presented performance indicators were related to finance, customers, internal processes and learning and growth based on a balanced scoreboard method and extended to sector performance indicators.

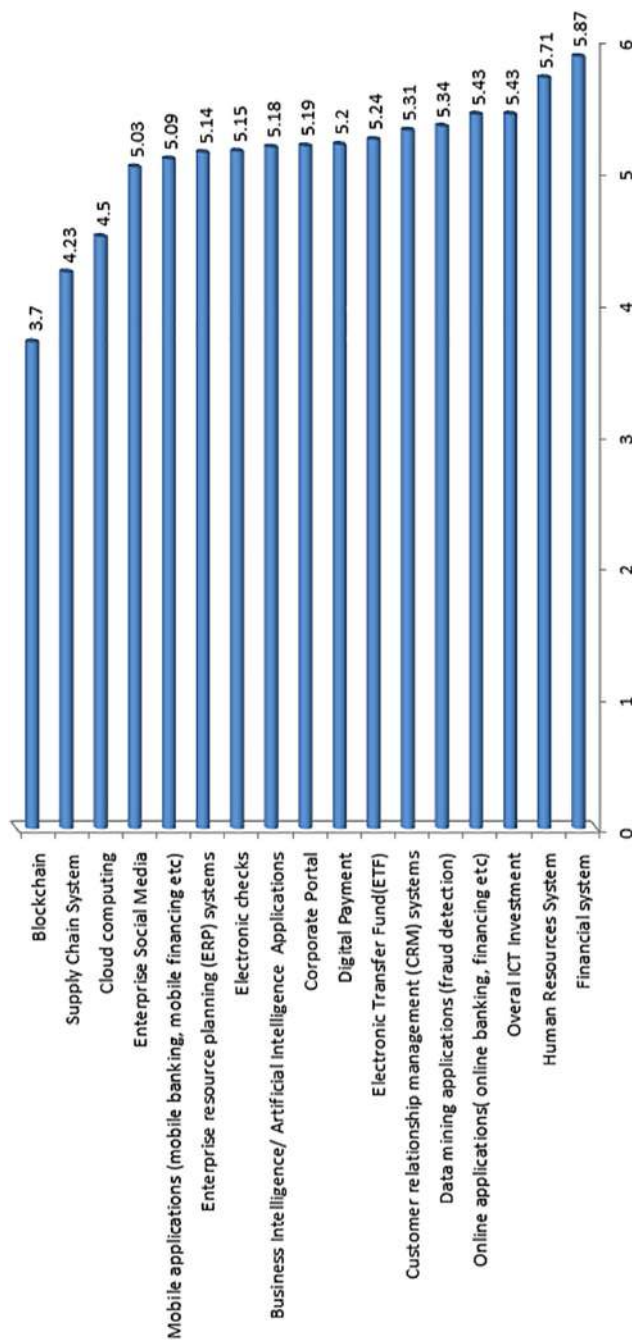
### 5.4 Ranking round of the Delphi study

Round 2 of the Delphi study was analyzed by reporting the mean rank and standard deviation and Kendall's *W* (rank order correlation coefficient), as suggested by [Schmidt \(1997\)](#). The objective of the Delphi study is to obtain a reliable consensus from a group of experts ([Dalkey and Helmer, 1963](#); [Okoli and Pawlowski, 2004](#)). Kendall's coefficient of concordance (*W*) is recognized as the best metric to measure agreement in non-parametric rankings ([Schmidt, 1997](#)). According to [Schmidt \(1997\)](#), Kendall's *W* values are from 0 (no consensus) to 1 (perfect consensus). Here, Kendall's *W* value is 0.47 (as indicated in [Table 5](#)), which is considered acceptable.

Round 2 (the ranking round) indicated that the top 16 impact or performance indicators of successful ICT investment in financial institutions are related to the customer perspective (enhanced customer services and improved customer privacy, retention and loyalty), the financial perspective (improved revenue, improved employee productivity, general business efficiency, improved efficiency ratio and improved ROA), the internal process perspective (improved quality of business operations and improved speed of business operations), the sector perspective (improved sector competitiveness and integration) and the learning and growth perspective (new products and services, overall organizational growth and enhanced organization learning).

The Delphi study results revealed that managers in financial institutions consider the most top-listed value of ICT investments are enhanced customer services (Rank 1) and improved customer privacy (Rank 2), not profitability and financial indicators (the top-assessed indicators in the literature). Such results emphasize that financial sector in developing countries are also customer-focused. Researchers (such as [Edwin \(2014\)](#) and [Omar et al. \(2012\)](#)) in developing countries indicated that ICT improves customer service. Also, in financial sectors in particular, ensuring customers' privacy has been identified as a challenge in financial transactions ([Khalfan and Alshawaf, 2004](#)). Thus, ICT investments are considered valuable if it enhances customers' privacy. Other customer indicators among the top 16 are improved customer retention (Rank 13) and loyalty (Rank 15).

In terms of tangible finance indicators, managers in financial institutions consider several aspects of the business finance as highlighted by the literature in [Table 1](#) including: (1) profitability indicators such as improved revenue (Rank 3) and ROA (Rank 6), (2) efficiency indicators such as improved efficiency ratio (Rank 4) and improved general business efficiency (Rank 14) and (3) productivity indicators such as improved employees productivity (Rank 4).



**Figure 4.**  
ICT applications  
success in financial  
institutions

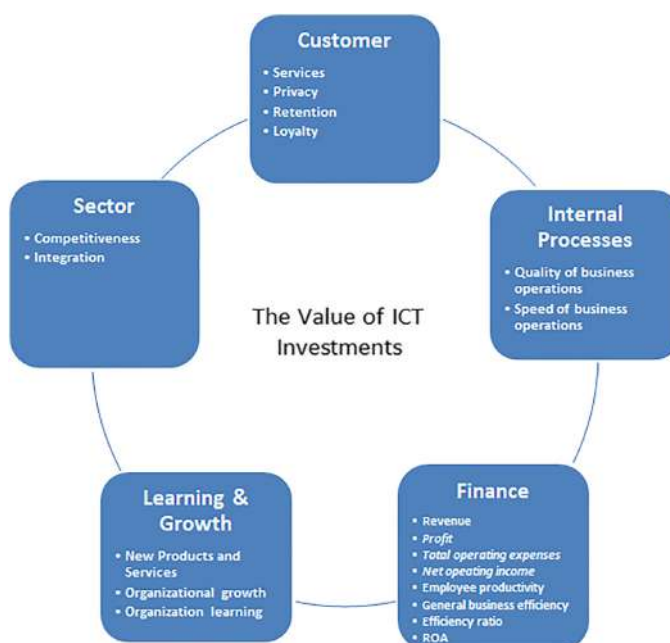
**Table 4.**  
Results of selection  
round (All financial  
institutions)

Rank	Performance indicator	AVG	Rank	Performance indicator	AVG
1	Customer services	4.17	25	Improved employees work efficiency	3.89
2	Customer privacy	4.12	26	Organization innovation	3.89
3	Efficiency ratio	4.09	27	Growth in assets	3.86
4	Sector competitiveness	4.09	28	Employees learning	3.86
5	Return on assets(ROA)	4.06	29	Employee innovation	3.86
6	Improved quality of business operations	4.03	30	Labor productivity	3.83
7	Revenue	4.03	31	National Innovativeness	3.83
8	New products and services	4.03	32	Stock return	3.82
9	Organization learning	4.03	33	Labor cost/payroll	3.80
10	Productivity	4.00	34	Number of full-service locations	3.80
11	Improved speed of business operations	4.00	35	Return on Equity(ROE)	3.79
12	Overall organization growth	4.00	36	Asset Management Rate	3.79
13	Sector integration	4.00	37	Sector standardization	3.79
14	General business efficiency	3.97	38	Operating expenses/operating cost rate	3.77
15	Customer loyalty	3.97	39	Total assets	3.74
16	Customer retention	3.97	40	Total loans	3.71
17	Improved employees work effectiveness (performance quality)	3.94	41	Number of employees	3.67
18	Return on investment(ROI)	3.94	42	Total deposits	3.63
19	Profitability /Net income	3.94	43	Net profit margin (NPM)	3.62
20	Market share	3.91	44	Capital expenditure	3.62
21	Sector operation	3.91	45	Administrative expenses	3.59
22	Sector innovation	3.91	46	Earnings per share (EPS)	3.54
23	National digital culture	3.91	47	Non-interest income NONI/A	3.53
24	National economy	3.91	48	Non-interest expenses NIE/A	3.48

**Table 5.**  
Round 2 ranking  
results

Rank	Performance indicators	AVG	STDDEV
1	Improved customer services	2.33	2.80
2	Improved customer privacy	4.50	4.81
3	Improved revenue	5.83	1.33
4	Improved efficiency ratio	6.50	5.21
5	Improved quality of business operations	6.50	4.32
6	Improved return on assets(ROA)	6.83	4.02
7	Improved sector competitiveness	7.50	4.72
8	New products and services	7.50	3.15
9	Improved speed of business operations	7.50	3.94
10	enhanced organization learning	8.83	4.17
11	Improved overall organization growth	10.17	2.23
12	Improved employees productivity	10.33	3.88
13	Improved customer retention	12.67	3.72
14	Improved general business efficiency	12.83	2.40
15	Improved customer loyalty	13.00	3.22
16	Improved sector integration	13.17	2.64
	Kendal <i>W</i> value =	0.47	

Furthermore, other top-listed ICT performance indicators related to BSC internal process and learning and growth dimension. In terms of internal process indicators, managers top-listed improved quality of business operations (Rank 5), and improved speed of business operations



**Figure 5.**  
ICT investments value  
integrative model

(Rank 9). Researchers (such as Kaleem and Ahmad (2012), Aduloju (2014) and Abofaied (2017)) in developing countries also underlined these business internal processes indicators. For instance, Aduloju (2014) indicated that electronic application services helped insurance companies save time and reduce error-rate. In terms of learning and growth, managers consider the most valuable performance indicators of ICT are related to new products and services (Rank 8), enhanced organization learning (Rank 10) and overall organizational growth (Rank 11). The literature is very limited in terms of assessing the impact of ICT on organization growth and learning.

Going beyond the standard BSC dimensions and beyond organizational boundary, the Delphi study revealed that sector performance indicators are among top-listed indicators of ICT value. Managers consider improved sector competitiveness (Rank 7) and improved sector integration (Rank 16). Even though these indicators are rarely empirically investigated as the value of ICT investment, this finding is very critical for financial institution. The development and the rise of fintech are to enhance sector integration, cooperation and competitiveness (Gozman *et al.*, 2018). Thus, many ICT investment opportunities require careful consideration so that current investments are able to exploit future opportunities such as blockchain, digital currency, mobile trading, big data and global transactions that enhance the sector competitiveness and integration. This is very critical for developing countries that aim to relay on financial institutions to diversify their economies.

### 5.5 The study integrative model

Figure 5 demonstrates the integrated model of assessing business value of ICT investments in financial institutions. Thus, the value of ICT investments goes beyond finance and profitability performance. Stakeholders highly value how it impacts customers, in the first place, and how it enhances organizations' internal processes and learning and growth.



Furthermore, for financial institutions, the values of ICT investments go beyond the organizational boundary; stakeholders top-listed sector's competitiveness and integration. The model does not indicate interrelationships between these dimensions. For instance, enhanced internal processes and customer value may enhance the business finance and learning and growth, which consequently will further enhance the sector competitiveness and integration.

## 6. Conclusion

### 6.1 Summary findings

Financial institutions are critical for any national economy as well as for the global economy, and for developing countries; the financial sector is one of the most promising sectors. This study aimed to establish an integrative perspective to assess the value of ICT for the performance of financial firms based on a BSC: finance, customer, internal process and learning and growth. This study is needed to assess what aspects of financial institutions have the greatest value to stakeholders in Oman. With huge investments in ICT, a periodic assessment of the benefits and costs of ICT is indispensable for continuing such investments and for strategic and operational ICT planning. Several electronic services are integrated across the financial sector.

Based on a literature review, the study developed a comprehensive list of performance indicators related to BSC categories: finance, customer, internal process and learning and growth. The study also utilized two methods (a quantitative longitudinal study and a qualitative Delphi study) to provide evidence of the value of ICT investments in Oman's financial institutions that go beyond typical, tangible financial profitability indicators, and beyond organizations themselves and reaches sectors and countries.

The results of the longitudinal study demonstrated significant evidence on the impact of ICT investment on financial performance indicators; ICT value is significantly positively correlated to total operating expenses (TOE), net operating income (NOI) and profit in no time lag, a one-year lag and a two-year lag. Thus, even though an increase in ICT investment may be linked to an increase in operating expenses, it is also associated with increases in the net operating income and profit. The study was unable to confirm the significance of ICT investment on ratio financial performance indicators (ROA, ROI, EPD and efficiency ratio).

Comparing the results of this study's quantitative analysis to previous research, the findings are consistent with several previous studies. First, in terms of increasing the impact of ICT investment on operating expenses, the results were consistent with the findings of [Chang-Soo and Davidson \(2004\)](#) in Korea and [Dandapani et al. \(2008\)](#) in the USA. However, they were inconsistent with the findings of [Ou et al. \(2009\)](#) in Taiwan, [Ho and Mallick \(2010\)](#) in the UK and [Adeoye and Omeregbe \(2013\)](#) in Nigeria. IT expenditures, operating expenses and profits are greater for banks with a high level of IT ([Chang-Soo and Davidson \(2004\)](#)). In addition, [Dandapani et al. \(2008\)](#) found that the operating costs of credit unions providing web access were significantly higher than those of credit unions that did not have web account offerings; thus, it can be seen that ICT can increase operating costs. Second, with regard to the significant positive impacts of ICT on net operating income and profitability, this study's results are consistent with those of [Swierczek et al. \(2005\)](#) in Asian-Pacific countries, [Chang-Soo and Davidson \(2004\)](#) in Korea, [Chowdhury \(2003\)](#) in developed Asian-Pacific countries and [Navarrete and Pick \(2002\)](#) in Mexico, but they are inconsistent with the findings of [Neirotti and Paolucci \(2007\)](#) in Italy. In terms of profitability ratios (ROA and ROE), this study's results are consistent with [Ahmad \(2006\)](#) in Jordan, who found an insignificant impact of ICT on banks' profitability (ROA, ROE). With regard to EPD, the present study's results are inconsistent with those of [Farouk and Dandago \(2015\)](#), who conducted a study of Nigerian banks. With regard to efficiency ratio, the study's results are consistent with those of [Harris and Katz \(1991\)](#), who found no impact. The results of this study suggest that, even

though higher ICT investments might result in higher operating costs, they also result in higher net income and, consequently, profit. However, it may take time to detect enhanced financial ratios (e.g., ROA, ROE, EPD and efficiency ratios) from these investments.

The Delphi method applied in this study has extended the findings of the quantitative analysis and revealed more impacts of ICT investment on organizational performance beyond profitability measures. Top managers of financial institutions agreed that the top value of ICT investment is related, first, to improved customer perspective (enhanced customer services and improved customer privacy, customer retention and customer loyalty). Customers are becoming more powerful, and customer-focused strategy is becoming the strategy that enables competitive advantage for several organizations, especially service-based organizations such as the financial institutions. The adoption of ICT in financial institutions has brought improvement in customer base, mass customization, product innovation, convenience in money access and transactions anytime and anywhere (Idris, *et al.*, 2013 in Nigeria; Abofaied, 2017 in Libya; Khaled and Bani-Ahmad, 2019 in Jordan). Financial institutions focus on assuring customers' privacy through several technologies such as biometrics, smart cards and multiple authentication mechanisms (Nasri and Charfeddine, 2012). Thus, enhancing customers' services and maintaining customers' privacy in financial transactions are crucial to enhance customers' loyalty and retention (Fonseca, 2014). Second, financial perspective (improved revenue, improved employee productivity, general business efficiency and improved ROA) and, third, internal process perspective (improved efficiency ratio, improved quality of business operations and improved speed of financial operations) were also top-valued by top managers of financial institutions. Even though the quantitative analysis was unable to detect enhanced financial ratios (e.g. ROA and efficiency ratios) from ICT investments in Oman financial institutions, the Delphi study, which assessed the top managers' views of the impacts of ICT investments, revealed that top managers considered that enhanced financial ratios (e.g. ROA and efficiency) are among top expected values of ICT investment. However, managers should not over-rely on these financial ratios measures as it may take time to significantly detect the impact of ICT investment on financial ratios such as ROA and efficiency ratios (Al-Busaidi and Al-Muharrami, 2016). This issue has been one of the major research issues in the IS literature (Devaraj and Kohli, 2001; Schryen, 2013; Sabherwal and Jeyaraj, 2015). Fourth, learning and growth perspective (new products and services, overall organizational growth and enhanced organization learning) are also considered top-listed values of ICT investments by top managers. ICT enables improvement in business operations and innovativeness, and consequently competitive advantage. Also, ICT enhances innovation in the form of new products and services as in Omar *et al.* (2012) in Pakistan and Chen and Tsou (2007) in Taiwan. Fifth, in addition to an internal BSC four-performance dimension, this study revealed that top managers considered sector perspective (such as improved sector competitiveness and integration) as expected value from ICT investment. Organizations in the financial sector need to adopt information technologies to maintain a competitive advantage (Al-Jabri and Al-Abdulahadi, 2016). Also, electronic services foster sector integration, cooperation and competitiveness across the financial sector such as in the electronic funds transfer (Gozman *et al.*, 2018; Marszk and Lechman, 2018). Figure 5 illustrated an integrated model for researchers and practitioners to assess the value of ICT investments and its impact on different aspects (customers, finance, internal processes and learning and growth) of the institutions, and the sector.

### 6.2 Implications for researchers and practitioners

This study provided several implications for researchers. The literature thus far has focused mainly on assessing the value of ICT investment on financial organizations' financial performance and, primarily, tangible profitability performance. The results of the present

study revealed more performance indicators related to the customer perspective, internal processes perspective and learning and growth perspective, in addition to the sector perspective. Thus, the value of ICT investment goes beyond tangible profitability measures. Furthermore, comparing the results of this study to previous studies in developed and developing countries, the results suggest that the value of ICT investment on organizational performance may vary even in the same developing region. [Kaplan and Norton \(1993\)](#) suggested that the BSC performance indicators may vary from one organization to another, depending on their business visions and strategies. Therefore, more empirical studies are needed before any conclusions about the value of ICT for financial institutions for developing versus developed countries can be made.

The study also provided useful insights for practitioners. The quantitative analysis revealed that ICT investment is resulting in improved net income and profit, even though it is increasing operating expenses; therefore, managers should not be overly concerned about investing in ICT and should adopt it where it generates value. The Delphi study has revealed that top-level managers greatly value the impact of ICT on customers' enhanced services and improved customer privacy, retention and customer loyalty. This result confirms that the financial sector is a customer-focused sector, and as such, investing in ICT technologies that enhance customer services should be given high priority. Furthermore, in addition to the impact of ICT on internal business processes' speed and quality, these managers also rated the value of ICT for organizational learning and growth highly. Another important finding of this study is that the value of ICT goes beyond financial organizations' performances; ICT investment also impacts sector integration and competitiveness. Researchers ([Appiahene et al., 2019](#)) indicated that the digital revolution of technology and the Internet has made drastic and rapid changes in the finance and banking sector, and a development of fintech is the integration of several technologies to enhance sector integration, cooperation and competitiveness ([Gozman et al., 2018](#)). Enhancing the integration of the financial sector in Oman is also considered highly valuable for leveraging this sector to be a major contributor to the national diversification vision.

In conclusion, operation and strategic ICT investments result in strategic and operational value. This study contributes to the literature by providing evidence for the value of ICT investments in FIs in a developing country. For practitioners, the study provides insights about the value of ICT beyond profitability metrics, which can be used as a periodic assessment of the benefits and costs of ICT investment for continuing investments. This is critical for strategic and operational ICT planning. The study also provides an integrated perspective on the value of ICT investments in under-investigated areas and from diverse financial institutions. In addition, this integrated perspective is crucial for fostering a country's development in the financial sector. The results indicated that stakeholders believe that ICT investment improves financial sectors' competitiveness and integration. The Delphi study was useful for reaching consensus among top stakeholders (managers) of the financial sector in Oman. Moreover, the study provides integrated assessment metrics that can be adopted by other organizations in Oman to assess ICT value beyond tangible profitability, and beyond organizational boundary, to justify their investments and to enable financial institutions to develop their strategies and assessment with regard to ICT investment.

### *6.3 Limitations and future research*

This study has several limitations. First, some FIs did not report ICT value, which limited the number of firms included in the longitudinal study. The study adopted a qualitative Delphi approach, which may limit its external validity and, thus, its generalizability. Also, this study focuses on general ICT to gain an overall perspective of ICT investments in financial institutions; future research might investigate the impact of each type of ICT investment on different types of business performance. In addition, cross-cultural investigation in the

Middle East and across the globe will provide further significant insights into the value of ICT investments in financial institutions. More detailed research is also needed to understand how to leverage ICT investments to provide the expected returns. Furthermore, the study did not investigate the factors (such as business strategy, size and type) that may moderate the impact of ICT investments on the revealed performance indicators; further studies are needed to add insights in this area. Finally, the study did not assess the interrelationships between the BSC dimensions, as suggested by Kaplan and Norton (1993); hence, future research with such investigations will provide better insights.

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