The reciprocal mediating effect of digitalization and BSC on their relationship with firm performance

Rola Samy Nowar
Associate Professor – Cairo University

Abstract:

Research objective This research aims to examine the impact of reciprocal mediating effect of digitalization and Balanced Scorecard (BSC), as one of the most commonly used management accounting innovation, on their relationship with overall performance of business firms, and to examine the effect of innovation strategy on firm digitalization level.

Research method: Data is collected through a Survey conducted in the first half of 2022 on business firms, excluding financial institutions like banks, insurance companies and other financial establishments. A sample was selected that included 500 profit-making firms from various sectors, service and industrial, and the response rate reached 44 %, while the usable rate reached 36.4 %. Simple regression analysis is used to test the relationship between innovation strategy and digitalization, and Process Macro model for SPSS is used to test the reciprocal mediating effect of digitalization and BSC on their relationship with firm performance.

Research results: results indicated that futuristic innovation strategy affect digitalization level within firms. Furthermore,

statistical analysis results revealed that, although BSC significantly affect firm performance, yet, there is neither significant mediating role of BSC on the relationship between digitalization and firm performance, nor there is a significant mediating role of digitalization on the relationship between BSC and firm performance.

Added value: Few studies examined the reciprocal mediation effect of digitalization proxied by information technology (IT) systems and management accounting innovations proxied by BSC on their relationship with overall performance of business firms. Few studies addressed the application of BSC, within Egyptian firms, first in their relationship as a mediating variable between IT systems and the overall performance of business firms, and its role in assessing the innovation ability of firms. And second, in their relationship as an exogenous variable - and not as mediating variable - with IT systems and the overall performance of businesses.

Research limitation: research limitations were mostly related to the empirical study, where the research sample did not include financial institutions, also the sample selection method, which was chosen in a non-probabilistic manner, but it may not really represent all population units, and this may be due to lack of a reliable database for selecting the sample in a probabilistic manner. This is in addition to the fact that all of the sample units represented profit-seeking business firms, which means that the

results may be generalizable only in relevance to this category of business firms. Another limitation lied in the bias of survey respondents toward favoring the application of techniques they were part of its decision-making process. This led to high multicollinearity between model variables.

Keywords: managerial accounting innovations; balanced scorecard; digitalization; information technology; firm performance; Process Macro Model.

1. Introduction and historical background

Industrial Revolutions along its earlier stages, First Industrial Revolution/ Steam Engines and Second Industrial Revolution/Electricity and Assembly Line Production, represent major turning points in the accounting discipline in general, and management accounting in particular. With the advent of the Third Industrial Revolution, the "Digital Information Revolution", which spanned from 1970 to the 1980s of last century, and spanned from the 1980s to the middle of the second decade of the current century in parallel with the beginning of the Fourth Industrial Revolution, where the invention of the computer and the transmission of the first message via the internet, and the intervening of computers in majority of manufacturing, communications, and education fields. Since then, the intellectual shift in management accounting literature has begun to be directed towards strategic management

accounting, and strategic management accounting has been initiated by Simmonds (1981). Strategic managerial accounting has been met with acceptance as a result of the leveled criticisms against traditional managerial accounting techniques due to the information it can provide to management that leads to undermined production. This incomplete or inaccurate information can cause undesirable consequences on the productivity of business firms, as indicated by Goldrat (1983), and confirmed by Cooper and Kaplan (1988) by indicating that traditional managerial accounting techniques are no longer valid for the modern manufacturing environment, because production processes and methods have changed. It is worth noting that the activity-based costing (ABC) method is considered the first innovation in management accounting that appeared, and that was in 1988 by Cooper and Kaplan (1988).

The Fourth Industrial Revolution is based on electronic production systems, which aim to link the physical and virtual production worlds. The Fourth Industrial Revolution (or Revolution in Digital Operations) combines digital transformation processes with the integrated value and products chains. In addition to this, information technology (IT), machines and people are connected and interact in real time, which leads to the creation of a manufacturing and flexible method, along with efficient use of resources. Therefore, integrated data analysis represents one of the drivers of the fundamental value of the Fourth Industrial

Revolution. The Fourth Industrial Revolution, which was explicitly announced in the middle of the second decade of the current century, and specifically in 2016, didn't shed implications yet on management accounting and its innovations, and the question that could arise in this field is: Do traditional and innovative management accounting techniques satisfy the information requirements of the Fourth Industrial Revolution that enables business firms achieve sustainable performance?

Added to challenges of Fourth Industrial Revolution phase, COVID-19 pandemic crisis has brought in just a few months ' time, about years of change in the way companies in all industries and across different regions conduct business. Business firm have accelerated the digital transformation of their internal process, customer and supply-chain interactions by several years ahead. To stay competitive in this new business and economic environment, companies had to speedily meet the pressing new demands on them. In addition, the greatest shifts that occurred during the crisis such as, changing customers' needs, increased used of advanced technology, increase in remote working, new needs for online services, and increasing migration of assets from tangibility to the cloud zone, are perceived to stick through the long-term recovery from the pandemic effects.

In summary, if the Third Industrial Revolution represents simple digital transformation, then the Fourth Industrial

Revolution Coupled with pandemic crisis experienced worldwide, represent creative digital transformation challenge which, despite its reliance on infrastructure and technologies of the Third Industrial Revolution, proposes new ways so that IT becomes an integral part of the business community that must be prepared to keep pace and deal with the available opportunities and challenges related to this technological revolution in order to achieve the maximum benefit from the information that this revolution will release in the business firms. This information would guide the decision-making process at all administrative levels, consolidate effective communication between the various departments, the firm's ability to deal with the surrounding environment, and thus enhance the firm's competitiveness and leadership in the business community.

The use of managerial accounting started at the beginning of the last century in response to changes in the production environment at that time, when Du Pont company in 1903 applied the rate of return on investment (ROI) as a financial indicator to assess performance, as well as the usage of planning budget systems by General Motors company in the 1920's for the purposes of planning the firm activities. Since the emergence of management accounting until mid-1980s of the last century, cost accounting and managerial accounting systems were subject to development and improvement to meet large and stereotyped production systems that didn't prevail before the Industrial Revolution, then the shift from manual labor

systems to mechanization and machine-oriented manufacturing (Kaplan, 1984).

Hopwood (1976) is considered from the first authors in management accounting literature who called for the necessity for its development to keep pace with the changes and innovations in the modern business environment. Simmonds (1981) may be considered the first to respond to Hopwood (1976)'s call for the need to develop managerial accounting systems, when he pointed out to the inadequacy of traditional managerial accounting techniques for the decision-making process, and Simmonds (1981) introduced strategic managerial accounting, and since the early 1980's, accounting literature that addresses either the conceptual or the empirical side of strategic management accounting has increased. Despite that increase in accounting literatures in the field of strategic management accounting, yet, it is difficult to have an agreed upon definition of strategic management accounting, authors have attributed this to the lack of an agreed upon definition in management accounting literature of what the strategy is although the beginning of the emergence of the strategy as a concept was in the sixties of the last century (Nowar, 2017, Kaplan, 1984).

The beginnings of the direct relationship between cost and management accounting systems and the performance of joint-stock companies in the United States can be traced back to the

literature handled by many researchers since the beginning of the sixties until the early eighties of the last century, this literature that showed the role of cost and management accounting system in developing and improving the performance of transportation, industrial and distribution companies during the period from 1850 to 1925 (Kaplan, 1984). In addition to those initial studies that dealt with the direct relationship between cost and management accounting systems and the performance of business firms, many studies have examined the relationship between management accounting systems and their innovations and the performance of business firms. Prior studies addressed that relationship through studying the direct or indirect impact of management accounting systems and their innovations on business firms' performance. In relevance to the direct impact of management accounting innovations on the performance of business firms, a group of studies revealed the direct relationship between the application of the balanced scorecard as a management accounting innovation and firm performance (Dahou and Hacini, 2018; Bassi & McMurrer, 2007; Bassi et al., 2004; Westphalen, 1999; Johanson et al., 1999; Liao et al., 2006; Huselid & Barnes, 2003; Butler, 2006; Pandey, 2005; Manoj et al., 2005; Kaplan & Norton, 2006). In further consideration to the relationship between the BSC and firm performance, accounting literature pointed to the indirect impact of the implementation of BSC on firm performance, where

Dahou and Hacini (2018) pointed to this indirect impact through intellectual capital management.

The Institutional Theory provides an explanation to how new ideas spread within organizations, and how the resulting unified institutional structure and practices across organizations gain its legitimacy whether by memetic isomorphism (through copying between organizations), or coercive legitimacy (by societal enforcement), or normative legitimacy (through professional enforcement). Thus, some studies pointed that the institutional theory can be the perspective through which digitalization could be studied. Institutional theory can outline how IT advances, digital infrastructures development, and managerial practices changes are all interrelated, and in turn lead to the gradual replacement of human insights with big data, automation, and quantitative analyses. Institutional theory suggests that revolutionary digital transformations may necessitate that firms' management adapt their interrelated practices to the changing dynamic way of doing business. Studying transformation from an institutional perspective is about how the new digitally-oriented institutional arrangements gain its legitimacy, spread across organizations, and are supported by associated changes in existing policies, norms, and managerial techniques (Hinings et al., 2018; Schildt, 2022). The researcher adopts the institutional theory to explain how BSC, as a strategic management accounting tool, can

be used to assess the innovation ability of firms for more rational decision regarding investment in digital transformation.

Digitalization is the impact that digital innovations and technologies have on organizations' operational processes and way of doing business providing new opportunities to generate revenue and create value. Organizations operating traditionally are greatly affected and witnessing massive changes by digital transformation. All vital areas in an organization, whether accounting, marketing, finance, production, sales, or human resource areas, are becoming more data oriented which in turn requires investing in digital transformation (Webb, 2020). Management accounting needs to keep pace with technological advances such as that of telecommunications and internet, IT, and the divergent data generated by surrounding digital economy. In the era of digitalization, management accounting should utilize techniques that handle big data and sophisticated information and assist managers in planning operational and strategic decisions required for the growth and sustainable performance of business firms (Bhimani, 2020).

Due to the increasing competition in business markets, forces of globalization, and advances in technology, strategic planning became crucial so that traditional management accounting can assist firms' management meet the divergent business challenges. Since business firms' success and sustainable performance

became dependent strategic planning and proper implementation of strategies, advanced techniques of management accounting emerged, and being more strategy oriented, they were called strategic management accounting techniques. (Wickramasinghe & Alawattage, 2007). Strategic management accounting reflects the strategy orientation of business firms by emphasizing the linkage between firms' strategies and management functions and activities, strategic management accounting techniques produce strategic cost information that leads to firms' competitive advantage, and considering the dynamic business environment which is characterized by the advanced use of IT. Therefore, the design and implementation of management accounting in a business firm considers and reflects to a great extent any transformational phase of business firms.

As for the changing role of management accountant and switching from record-keeping and reporting role to business partnering role, and with respect to the digital transformation era business firms are witnessing, management accountants should focus on long-term value creation, strategy formulation and planning, using technology in analysis, and data visualization (Lawson, 2019).

In light of what has been mentioned above, it is important nowadays to evaluate firms' innovation ability and the impact of its innovation strategy on the digitalization of its operations and

the resulting impact of digitalization on firm performance. The purpose of the paper is to examine the impact of reciprocal mediating effect of digitalization and management accounting innovations represented by BSC on their relationship with overall performance of business firms, and to examine as well the effect of innovation strategy on firm digitalization.

The next sections will discuss the literature review across three aspects, first the digitalization and firm performance, next it addresses the application of BSC in the literature, then it will discuss the relation among digitalization, BSC, and firm performance. The following section covers the research method followed by data analysis section, and finally the conclusion and future research section.

2. Literature Review

This section deals with prior studies that deals with the main variables of the current research, not in an individual manner, but rather in an integrative, relational, and causal way; i.e., studying the correlative or causal relationship between one main variable and the other main variable, and finally the studies that discusss the relation among the three variables, and the direction of these relationships as well. Accordingly, prior studies are classified into four sections: the first covers those studies dealt with the relationship between the firm's innovation strategy and

digitalization. The second covers those studies dealt with the relationship between digitalization and the performance of business firms, the third covers those studies that dealt with the application of BSC in literature, and the fourth covers studies that dealt with the relation among digitalization, BSC, and performance of business firms.

2/1. The relationship between innovation strategy and digitalization

Innovation strategy and digitalization are two critical elements that organizations must embrace to remain competitive in today's business environment. Innovation strategy is the process of identifying new ideas and executing them to create value for customers, while digitalization refers to the integration of digital technology into all aspects of business operations. An efficient innovation strategy is crucial for organizations to identify potential areas for digitalization. By investing in research and development, organizations can identify emerging trends and technologies that can be incorporated into their operations to create new products and services. As stated by Bouncken and Kraus (2018), innovation is the "foundation of digitalization," and it provides a pathway for organizations to adopt new technologies and integrate them into their operations. For example, a company that develops a mobile application that allows customers to interact with their products through

augmented reality technology is more likely to stay competitive than a company that does not embrace such innovation (Goncharuk & Kremenetska, 2019).

Innovation strategy and digitalization can improve efficiency and enhance the customer experience. By using digital technology to streamline processes and automate manual tasks, organizations can increase efficiency and reduce costs. According to Hopp and Lukas (2019), digital innovation strategy can help organizations diagnose and improve digital product and service innovation. For example, investing in artificial intelligence technology can help companies predict customer preferences and personalize their experience (Westerman et al., 2014). By enhancing the customer experience, companies can improve loyalty and increase revenue.

Innovation strategy provides organizations with the tools and resources needed to execute a successful digital transformation. By aligning digitalization efforts with their innovation strategy, organizations can ensure that they are investing in the right areas and avoiding costly mistakes. As Kagermann, Wahlster, and Helbig (2013) state, a successful digital transformation requires a long-term strategic vision, and innovation strategy provides organizations with that vision. For instance, a company that invests in a digital innovation lab can experiment with new ideas

and technologies in a controlled environment, reducing the risk of costly mistakes.

In conclusion, the impact of innovation strategy on digitalization is significant. By embracing innovation strategy, organizations can identify new opportunities, improve efficiency, enhance the customer experience, and provide the necessary tools and resources for a successful digital transformation. Through this approach, organizations can stay ahead of the competition and succeed in a rapidly changing business environment. By utilizing the works of Bouncken and Kraus (2018), Goncharuk and Kremenetska (2019), Hopp and Lukas (2019), Kagermann, Wahlster, and Helbig (2013), and Westerman et al. (2014), it is clear that innovation strategy and digitalization are interconnected and organizations must strive to achieve a balance between the two to remain competitive in today's business world.

2/2. The relationship between Digitalization and firm performance

Several studies have examined the relationship between information and communications technology, representing digital transformation tools, and the performance of business firms of all types. During the early stages of the emergence of IT systems, the automation stage of business firms' transactions, studies that dealt with the relationship between these IT systems and firm

performance did not provide a single direction for this relationship, but the results of these studies varied. On one hand, a group of these studies indicate that there is no empirical or statistical evidence that investment in IT systems has a positive impact on the overall performance of business firms (Hunter and Timme 1986; Loveman 1993; Weill and Olson 1989; Markus and Soh, 1993). On the other hand, another set of studies provide evidence of a proved relationship between investing in IT and business firm performance (Weill, 1992; Wooldridge and Floyd, 1990; Harris and Katz, 1991). The performance is measured based on a set of both financial and non-financial measures, including: the return on assets as a financial measure (Weill, 1992; Floyd and Wooldridge, 1990; Weill, 1992; Harris and Katz, 1991), the rate of growth in sales (Weill, 1992; Harris and Katz, 1991), worker productivity; measured by dividing the number of workers in non-productive activities by net sales, the rate of change in this last measure (Weill, 1992), ratio of net profit to sales (Harris and Katz, 1991).

It should be noted that many of the accounting literature that dealt with the concept of IT before the mid-nineties of the last century, address IT from the organizational perspective of the IT department inside the firm, and do not address it from the perspective of the indirect impact of IT systems concept on the performance of the firm, whether in its financial or non-financial aspect (DeSanctis and Poole, 1994).

The relationship between IT management systems and business firm performance has been covered by accounting literature since mid-1990s. Although these studies differ in terms of indicators or metrics relied upon in measuring the performance of the firm, not few of them agree that there is a positive relationship between IT management systems and between both financial and non-financial performance of business firms (Kallunki et al., 2011). Cabello-Medina et al. (2011) indicates that there is a positive relationship between IT management systems and the performance of business firms measured by three indicators: Competitiveness, Innovation in activities and products, Productivity. The impact of IT management systems on the three indicators taken as a measure of the performance of business firms came through the logical analysis of the results, where the study indicated that through an effective information management process, the availability of this information may lead to innovations through which new goods / services are obtained Hence, the possibility of opening and identifying new markets, in order to support the firm's competitive position.

Some prior studies use Balanced Scorecard to measure the relationship between IT mechanisms and the financial and non-financial performance of the enterprise (Wu et al., 2015). On the other hand, other studies address measuring the relationship between IT and the organizational performance of the organization aside from financial and non-financial performance.

Sirisomboonsuk et al. (2018) uses six indicators to measure the performance of the firm: efficiency of operations, adherence to the implementation set timetable, adherence to planning budgets, amount of work achieved, quality of work, extent to which the desired goals were achieved. Ako-Nai and Singh (2019) measure business firm performance on sustainability, and sustainability means, in the context of this study, a positive impact on the performance and benefits of endogenous and exogenous Stakeholders (employees, customers and suppliers). The study concludes that boards understanding of the value of IT leads to achieved results beyond material and financial returns, to include the competencies acquired by stakeholders from the use of IT. In the same direction, Khalil and Belitski (2020) study indicate a positive relationship between IT and firm performance measured on the basis of a set of indicators: competition, sales, productivity, consistently with the indicators used to measure performance in many of the studies that covered the relationship between IT and the performance of business firms (Weill, 2004; Weill and Ross, 2004; Wu et al., 2015).

2/3. The BSC applications in literature

The following part in literature illustrates the adoption of BSC as performance measurement tools by some studies and its usage to evaluate innovation activities in other studies.

2/2/1. BSC and firm performance paradox

Adopting an effective strategic management accounting technique is assumed to lead high firm performance. Developed by Kaplan and Norton in 1992, after studying 12 firms for one year, the BSC approach came to the business environment as a tool to improve management assessment of real time organizational performance, more effective operational adjustments, and effective implementation of organizational strategy, and improve financial and non-financial performance. As quoted by Kaplan & Norton (1992, p.71):

"BSC is like the dials in an airplane cockpit gives managers complex information at a glance".

It links a firm strategy to its performance. It links performance indicators of three aspects of an organization along with its financial aspect; namely, the customer aspect, internal business processes aspect, and learning and growth aspect as measures of overall organization performance.

Kaplan and Norton (1996a, b) believed that BSC balance external and internal and long term and short-term factors through balancing the critical success factors of four perspectives of the business, and thus BSC acts as a strategic tool used to formulate strategy, organize operations and communicate operations with stakeholders. The BSC uses cause and effect

linkages between strategic goals and performance measures in the four perspectives to aligns the organization to the strategy by translating the strategy to clear operational terms (Gumbus, 2005). Quickly the BSC gained practitioners acceptance as an integrated strategic management tool that translates strategy into action. As indicated by Rigby & Bilodeau (2009), more than half of the business firms worldwide by 1998 used BSC. Although the fact that BSC adoption rate has dropped in recent years, yet the BSC has remained a comprehensive tool for performance measurement across different settings (Rigby & Bilodeau, 2018; Fatima & Elbanna, 2020).

Despite the wide variety of performance measurement systems (PMSs), yet, the BSC has remained the only PMS on top of most widely used PMSs (Rigby & Bilodeau, 2018). BSC has been the focus of more accounting studies in literature than other PMSs (Hasan & Chyi, 2017). Table 1 presents the variant PMSs employed in literature as indicated by Garengo et al. (2005).

Table 1. Performance Measurement Systems Models by Garengo et al. (2005)

	Performance Measurement Matrix (Keegan et al. 1989)	Performance Pyramid System (Lynch and Cross, 1991)	Balanced Scorecard (Kaplan and Norton, 1992, 1996)	Integrated Performance Measurement System (Bititci et al. 1997)	Performanc e Prism (Neely et al. 2002)	Organisational Performance Measurement (Chennell et al. 2000)
Strategy Alignment	•	•	•	O	O	O
Strategy Improvement		•	•	•	•	
Focus on Stakeholders				•	•	•
Balance	•	•	•	•	•	•
Dynamic Adaptability				•	•	
Process Oriented		O	O	•	•	•
Depth	•	•	•	•	•	•
Breadth		•	•	•	•	•
Causal relationships		•	•	O	•	
Clarity and simplicity	•			O	•	O
Vertical	•	•	•			
Balanced	•	•	•	•	•	•
Horizontal				•	•	•

• fully present O partially present

Resource: This table was adapted from Patrizia Garengo, Stefano Biazzo and Umit S. Bititci (2005). Performance Measurement Systems in SMEs: A Review for a Research Agenda, *International Journal of Management Review*, 7 (1), 37.

According to Kaplan & de Pinho (2003), Since the BSC was introduced as an integrated performance measurement tool, it became widely utilized by business firms, and massively discussed in literature. Öncü et al. (2013) determine the effects of financial innovation on Turkish firms' performance by applying the BSC. According to their study, the financial dimension of

BSC determines firms' goals based on financial objectives, the customer dimension determines a firm's goals based on customer satisfaction criteria, the internal business processes dimension determines firm's goals based on developing the internal business processes that maintain customer satisfaction, and that the learning and growth dimension determines firm's goals based on providing the financial structure, internal business processes, and customer processes that achieve the firm's growth and sustainable performance.

According to a survey addressed to BSC users in 2005, majority of user reported that BSC improved profits, and operating performance (DeBusk & Crabtree, 2006). Hoque (2004) indicates that the practice of the BSC in practice is mostly by large-sized firms, yet the improved performance of firms as a result of deploying the BSC is not related or depending on firm size, or its market position. Opposed to Hoque (2014), Malaguen˜o et al. (2018) indicate that BSC is used by small and medium-sized firms. Sustainability Balanced Scorecard (SBSC) approach, a novel version of the BSC that includes measures of corporate sustainability, and performance related to societal and environmental strategic goals (Asiaei & Bontis, 2019; Hansen & Schaltegger, 2018).

Although this widespread use and acceptance by practitioners, there is no clear-cut evidence regarding the relationship between

BSC implementation and firm performance. O'Sullivan and Abela (2007) found that firm performance improved when BSC was used to measure marketing activties. Capelo and Dias (2009) find that BSC adoption is useless except for its financial assessment dimension. Not few studies had conflicting results regarding the relationship between BSC an firm performance calling the need for further empirical research to evaluate BSC usefulness and effectiveness. There is a gap in Literature regarding the study and analysis of the contradictory empirical results regarding the relationship between BSC adoption and firm performance and whether the BSC tool could be better employed by management in fields other than performance measurement such as assessing innovation activities undertaken by business firms.

Tawsea and Tabesh (2023) in their review of BSC literature to identify sources of the arguable relationship between BSC adoption and firm performance, identify four relevant factors that might explain such controversy. First, the effectiveness of the BSC tool is not easy to assess due to lack of consistency across business firms regarding the way BSC is used therein and in the extent to which it is adopted in such firms. Survey results reveal different adoption level since respondents are most likely to be asked about their perception of adoption level of management accounting techniques (MATs) in general and specifically the BSC technique, across 3 or 5-point Likert scale statements covering mainly the extensive usage, moderate usage, past usage,

and non-usage. In addition, Speckbacher et al. (2003a) indicated that almost half of the companies implementing BSC, exclude the learning and growth aspect due to difficulty of measurement. Thus, results of studies addressing BSC success, does not take into account how BSC is implemented differently across business firms, this makes the assessment of BSC success or effectiveness subjective and difficult to conclude.

Second, serious questions are raised in relevance with the results of prior studies addressing the relationship between BSC and firm performance, from the perspective of whether the sampled business firms in empirical part of these studies have implemented the proper BSC causal model, which as emphasized by Kaplan and Norton (1996a, 1996b), should making a link between the indicators chosen for the four aspects of BSC and objectives of firms' strategy. This link is usually skipped or ignored and not few firms adopt BSC as a performance evaluation tool that include financial and non-financial measures (Speckbacher et al., (2003); Cokins, (2020)). Again, the inconsistency in the way BSC is implemented or adopted across firms, make the validity of results concerning the impact of BSC on firm performance greatly questioned.

Finally, to examine the effectiveness of BSC or its impact on firm performance, most empirical studies use measures for both BSC and firm performance, which are usually collected by

surveys or closed interviews with top management, or chief executive officers of sampled firms. Being decision makers or in charge of taking decisions related to the adoption of BSC, participants may provide unintentional biased opinions that might indicate the success or effectiveness of BSC as a performance evaluation tool to support their earlier adoption decision of BSC.

2/2/2. Applications of BSC within the innovation context

The introduction of a well-managed, customer-oriented, and advanced innovation to the market by business firms, whether in the form of a new product or service, is considered a tool by means of which firms could attain competitive advantage and in turn business sustainable growth and prosperity. Different models are developed and used in prior studies that measure and assess different values of activity in business firms (Dudic et al., 2020). Table 2 driven from Pun and White study (2005) indicates which values for an activity in a firm are measured by each of the mostly used performance measurement models utilized in literature.

Table 2. Activity values as measured by divergent PM models by Pun and White study (2005)

	Strategic Measurement Analysis and Reporting Technique	Performance Measurement Questionnaire	Results And Determinants Matrix	Balanced Scorecard	Comparative Business Scorecard	Cambridge PM Process	Consistent PM Systems	Integrated PM Systems	Dynamic Performance Measurement Systems	Integrated PM Framework
Flexibility	+	+	+	+	+	+	+	+	+	+
Quality	+	+	+	+	+	+	+	+	+	+
Finance	+	+	+	+	+	+	+	+	+	+
Human Resources	+	-	-	+	+	+	-	+	+	-
Time	+	+	+	+	+	+	+	+	+	+
Customer Satisfaction	+	-	-	+	+	+	+	+	+	+

Supported by Dudic et al. (2020), it is understandable that the performance measurement tools used in firms operating in developed countries is different from those evaluating performance of firms in less developed or developing countries, because of many considerations among which is the different business environment, production resources, duration of production process, customers' needs, and external political and legal environment that is not the same in developed and developing countries. Because the business and operation

environment in developing countries is dominated by small and medium entitles SMEs which have to respond to changing marketing demands in a speedy and efficient manner, and because transitional economies are obliged to quickly introduce and implement developed instruments and techniques once the way of doing business change as a result of external conditions like what happened with the rise of Covid-19 issue, a model such as the BSC that reflect market changing needs within its measures for evaluating the value of a business firm activity, from the financial and non-financial perspectives, is essential for the future development of these entities. The balanced scorecard model is needed in SMEs to efficiently measure the overall value of an entity innovation activity or investment and in turn the innovation ability of the business firm, by connecting four aspects of an innovation activity: financial, which assess the financial impact of innovation activity, customer, which assess the results of the innovation activity from customers' perception, innovation and learning, which assess the capabilities of the innovation activity, and internal business processes aspect, which assess the internal operations of business which is affected by the innovation activity.

At the end measuring the value of a firm innovation activity is undertaken to avoid incorrect introduction and implementation of the innovation adopted and to provide guidance to top-level managers for the sake of business sustainable growth and

development. Within this context, several studies addressed the application of BSC tool within the innovation context. Gama et al. (2007) examined the adoption of BSC to evaluate innovative activities. Results indicated that innovation plans if linked with firms' strategic objectives, through adjusting BSC with measures that suits nature of innovation and its assessment, this can lead to better assessment of innovations' impact on businesses.

Ivanov, Avasilcăi (2014) examines the impact of using BSC as a tool to evaluate innovation activities conducted in business firms operating in different industry sectors. Different measures for innovation activities were adopted by the business firms reflecting the discrepancies of type of activities because of operating across different sectors. Results revealed that innovation measurement differs from one industry sector to another. In the same line, Blacha, Brzoska (2016) examined the impact of using BSC tool to evaluate of innovations carried out in firms operating in two different industry sectors (production and service) and carried out innovation activities which resulted in better quality, increased number of products, and improved financial outcomes in both sectors. The results indicated that BSC should be used as a tool to evaluate innovation activities of firms.

In pursuing innovation-oriented BSC, Spanò et al. (2016) propose new measures that are added to BSC to reflect innovation perspective. Malagueno et al. (2018) examined the

impact of BSC on innovation process and financial performance of SMEs. Results revealed that firms using BSC had better financial performance and higher level of innovation activities. Benková et al. (2020) study the factors that affect the use of BSC as a tool for performance measurement. Results indicated that non-financial measures are essential for evaluating the performance of firms.

Relevant to the valuation of IT investments projects, Silvius (2006) discusses how wrong IT investment decisions are led by incomplete one-side valuation which is the financial side represented by calculating return on investment as indicator of value, without considering the overall impact that IT investment could have on adopting organization. An IT investment balanced scorecard encompasses three other dimensions that reflect value beside the financial aspect. Ahmed (2014) studies the extent to which Technology Acceptance is considered in the decision-making process of IT investments in Egypt. IT investments in the study are evaluated based of IT BSC along with the behavioral dimension represented by Theory of Acceptance as another version of ITBSC. Results revealed that decision makers lack awareness of Technology Acceptance regarding IT investment decisions in Egypt.

2/4. The relation among digitalization, BSC and firm performance

The development in management accounting systems was moving in parallel with the development in digitalization tools represented by IT systems. As for the development in management accounting systems, it has evolved from traditional/conventional management accounting systems; or what has been called Diagnostic Management Accounting systems, to strategic management accounting systems; or what has also been called interactive management accounting systems, which was covered in accounting literature since the early 2000s as Management Accounting Innovations (Nowar, 2017). It is worth emphasizing that the development in management accounting systems came with the concept of contributing, rather than the concept of replacement. For example, the target costing method (TC), one of management accounting innovations, did not appear to be a substitute for the standard costing method, which is one of traditional management accounting techniques. As for the development in IT systems, it has evolved from electronic transaction processing systems to IT management systems and the emergence of new mechanisms for this development, including enterprise resource planning (ERP) and finally IT governance (ITG).

The relationship between IT systems and management accounting systems and its innovations is addressed in many accounting literature through more than one direction. On one hand, the accounting literature deals with the relationship between IT systems and management accounting systems in terms of the impact of the existence of IT systems on the efficiency of management accounting systems. On the other hand, other studies have addressed the same relationship but in terms of how management accounting systems can be the driver force for IT efficiency (Granlund and Mouritsen, 2010; Granlund, 2007; Maraghini, 2010; Pervan and Dropulić, 2019). The results of these studies weren't identical, but was rather divergent. Some of this literature indicate a positive relationship between traditional management accounting systems - planning budget systems, standard costing systems and variance analysis, performance evaluation systems - and the use of IT systems, and that is achieved through IT systems and associated mechanisms' contribution in providing more detailed, accurate and timely information to users of management accounting information systems (Granlund and Malmi, 2002; Malinić and Todorović, 2012; Ponorica et al., 2014; Pervan and Dropulić, 2019).

Complementing the relationship between management accounting systems from its innovative perspective - the activity-based costing approach, balanced scorecard, target costing, benchmarking, customer relationship management, product life

cycle - and IT systems, prior studies have shown divergent results. On one hand, some of these studies have confirmed a very limited positive impact of IT systems and mechanisms on management accounting innovations (Booth et al., 2000; Granlund and Malmi, 2002; Scapens and Jayazeri, 2003). Moreover, the results of the Pervan and Dropulić study (2019) reveal the existence of a negative relationship between IT systems in its impact on managerial accounting innovations, or what has been called within the context of that study as modern managerial accounting techniques, and the overall performance of business firm. On the other hand, other studies have revealed a positive correlation between management accounting innovations and IT systems (Malinić and Todorović, 2012; Gullkvist, 2013).

Many accounting studies indicate that expanded use of IT systems greatly improves the financial and non-financial performance of business firms (Kallunki et al., 2011; Rehman et al., 2019; Afshan et al., 2017). In contrast, the study Pervan and Dropulić (2019) indicate that despite the increasing number of studies in this field of research, the academic community in general has an incomplete understanding of the relationship between IT systems and management accounting systems and their innovations, whether in theory, or practice. Thus, some prior studies have addressed the relationship between IT and management accounting, and other studies have addressed the effects of IT on management accounting, while other studies

have focused on how management accounting provides IT solutions (Granlund, 2007; Maraghini, 2010 Granlund and Mouritsen, 2003).

The triangular relationship between management accounting systems and their innovations, IT systems and the overall performance of business firms, was addressed by a limited number of accounting literature. Vakalfotis (2011) confirm the existence of a relationship between IT systems, through the application of enterprise resource planning (ERP), and a fundamental reduction in the routinely workload of management accounting systems, which thus maximize the role of management accounting systems in serve the firm. This result was not consistent with the Kanellou & Spathis (2011) study, which does not reveal a core role for IT systems in reducing the volume of workload in management accounting systems, and therefore the impact of this relationship on the overall performance of business firm is not reflected.

In consideration to the statistical methods used by the accounting literature in testing the hypotheses, it is observed that many studies that dealt with the relationship between management accounting innovations, IT systems and the performance of business firms relied on regression analysis method, depending on Ordinary Least Squares (OLS) for Simple Regression or Multiple Regression (Pervan and Dropulić, 2019;

Etim; 2019), or depending on Partial Least Squares (PLS) using Path Analysis, or Structural Equation Modeling (SEM) - and last two methods show the direct effect and indirect effect of the exogenous variable. The direct effect through the direct relationship between the exogenous variable and the final endogenous variable in the research model, and the indirect relationship between them through the mediating variable (Vásquez and Naranjo-Gil, 2020; Gamayuni, 2019; Chapman and Kihn, 2009; Granlund and Malmi, 2002).

Research gap and added value

Prior studies dealt with the relationship between IT systems, management accounting systems, and finally the overall performance of business firms, and addressed as well the direction of this relationship, whether it was a relationship between two independent variables; IT systems and management accounting systems, and a dependent variable; overall performance of business firms, or a relationship between a single mediator variable - often represented by IT systems, and an exogenous variable; often represented in management accounting systems and their innovations, and an endogenous variable - often represented by the overall performance of business firms. Prior studies also dealt with these variables through the existence of a moderator variable; often represented by IT systems.

Therefore, the research gap and added value can be addressed as follows :

1. Prior studies did not address the reciprocal mediating relationship between digitalization being represented by IT systems and BSC in their relationships with the overall performance of business firms. In other words, this research deals with the impact of reciprocal mediation effect of exogenous/mediating variables (digitalization/BSC), on the endogenous variable represented by the overall performance of business firms.

2. Few studies addressed the relationship between digitalization and the overall performance of the business firm in light of the existence of BSC which is used to evaluate the innovation ability of firms. Thus, this research focuses on BSC as a management accounting innovation, in its relationship with both IT and the overall performance of business firms.

Thus, with respect to the research gap and study main variables represented by digitalization, BSC, and firms' overall performance, the following hypotheses can be extracted:

H_{01} There is no significant relationship between firm innovation strategy and digitalization therein

H_{02} There is no mediating effect of BSC on the relationship between digitalization and firm overall performance

H_{03} There is no mediating effect of digitalization on the relationship between BSC and firm overall performance

Figure (1) summarizes the proposed conceptual research model illustrating the reciprocal mediating impact of BSC and digitalization on their relationship with firm performance. The researcher points out that adopting institutional theory to explain how digitalization is applied in firms, and how BSC is used to assess forms' innovation ability, led to the exclusion of control variables from the research model.

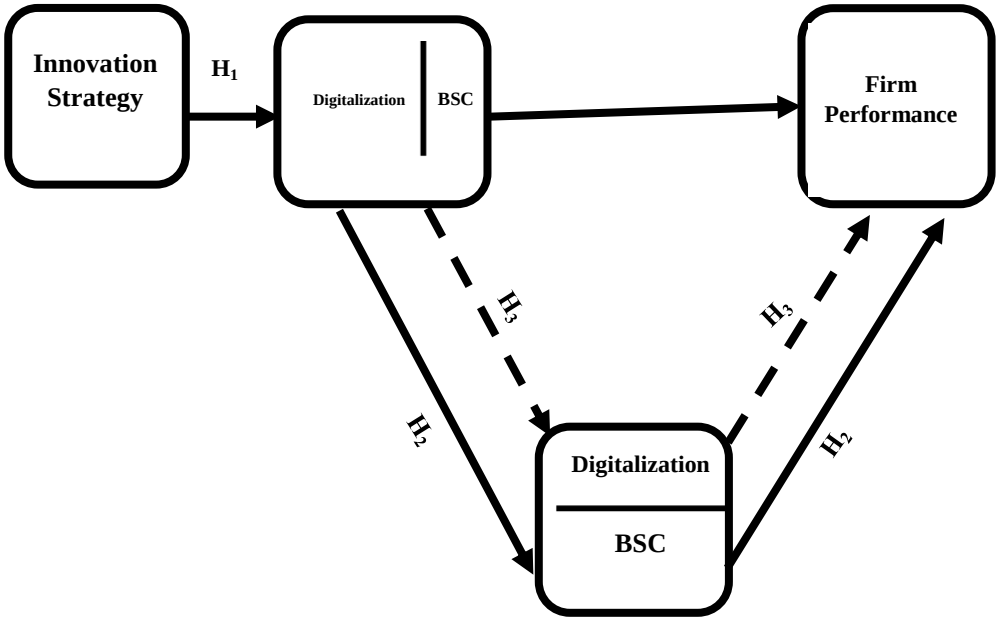


Figure 1. Research Model

3. Method

The empirical study is based on a survey through collecting data of a set of questions relevant to each variable included in the research model. After conducting pilot interviews with a group of practitioners and academics specialized in the area of management accounting, some adjustments were conducted as recommended through the pilot study, and questionnaire was distributed to intended business firms.

Collected data are linked with each other by the research model by creating relationships among variables, and statistical analysis methods that fit the nature of variables relationships are used to test such relationships. Within the framework of this research, it should be noted that the empirical study does not end at the limit of identifying the relationship among the variables of the research hypotheses, but is also concerned with discussing the results of the statistical analysis, as an essential step for deciding and recommending which relationship should exist between the variables covered by the research model. This part of the research deals with: sample selection and data collection, measuring the research variables, determining the appropriate statistical techniques to test the research model hypotheses, analyzing the data statistically, and finally discussing the results of the statistical analysis.

3.1 Sample selection and data collection

To determine the appropriate sample size in the presence of basic variables (digitalization, BSC, and firm performance), Roscoe's (1975) sample selection. rule, which indicates that the minimum size for the sample is 50, is applied. A survey form was distributed to 500 business firms, and within these 500 survey forms distributed representing the sample under study, 220 forms were received (with a response rate of 44%), and among these 220 forms of survey received, 38 questionnaires were excluded due to their invalidity as a result of not answering more than 10% of the questions in the list (Anh et al., 2018), and thus,182 survey forms (with a percentage of 36.4% usable rate) were relied upon for use as the inputs of the SPSS statistical analysis program package. The participating firms were selected randomly from among for-profit operating firms that operated in different industry sectors.

Primary data for the study was obtained through the use of self-guided questionnaire to produce data on relevant variables. The questionnaire was provided initially to a group of academics and professionals in the field, as a pilot study and the final adjusted questionnaire was translated to Arabic language (to avoid misinterpretation of statements), and distributed to participating firms to examine the reciprocal mediating effect of digitalization and BSC on their relation to firm performance. For

purpose of testing the research hypotheses, information gathered from the survey includes the firms' innovation strategy, digitalization level, innovation ability measures, and a set of indicators measuring consequential impact on firm performance. Data were collated from business firms' chairman, departments' heads, and accountants, and were analyzed statistically to establish the findings.

The questionnaire included several sections; a section including statements related to business innovation strategy, a section to measure firms' innovation ability across the BSC four dimensions, and a section including statements related to financial and non-financial indicators of firm performance. The research hypotheses were tested using a questionnaire employing a five-point Likert scale response options, structured and customized in line with the study research hypotheses, for the purpose of reflecting the direction of respondents' perceptions toward the given questionnaire statements. Several statistical methods were employed to test the research hypotheses; Analysis of Variance (ANOVA), regression analysis, and process macro technique for SPSS.

3.2 Variables Measurement

The aim of this research, as indicated earlier, is to examine the impact of reciprocal mediating effect of digitalization and

management accounting innovations represented by Balanced Scorecard BSC on their relationship with overall performance of business firms. Therefore, to test this relationship, it is essential to measure the relevant variables.

Endogenous variable, firm performance is measured by a set of 13 performance- indicting statement based on the five-point likert scale, with values ranging from 1 (not realized at all) to 5 (highly realized). The statements measured the consequential realization of some financial output, such as ratio of net income to equity (ROE), ration of net income to assets (ROA), financial leverage, and earning per share. The statements measured the realization of non-financial output as well, such as, competitive advantage, rational decision making, and risk assessment.

Innovation strategy, following Venkatraman (1989), innovation strategies are classified into 6 strategy orientations measured by 18 questions, 3 questions for each strategy orientation; aggressiveness innovation strategy measured by 3 questions, analytical strategy measured by 3 questions, defensiveness strategy measured by 3 questions, futuristic strategy measured by 3 questions, proactive strategy measured by 3 questions, and riskiness strategy measured by 3 questions.

Exogenous/mediating variables, in the research, are represented by two variables:

First, **digitalization** which is measured by the extent of dependency of IT function within the organization structure of firms, whether there is a separate IT unit, or separate IT department, or practicing IT within firm departments by employees.

Second, **BSC** which is used in this research as a strategic tool to assess the innovation ability of firms, as a way to rationalize the decision of IT or digital transformation investment. The innovation ability is measured across the four dimensions of BSC (.Misra et al., 2005). The financial dimension measured by 5 statements, the customers dimension measured by 4 statements, the internal process measured by 4 statements, and the learning and growth is measured by 3 statements.

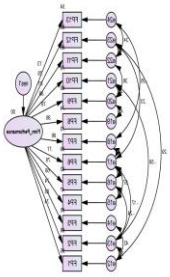
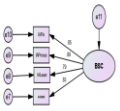
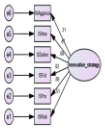
4. Data analysis and empirical results

To conduct data analysis, the author used regression analysis, and one-way analysis of variance (ANOVA) to test the first hypothesis, and Process Macro Models for SPSS to test second, and third hypotheses and determine the potential associations between the variables as reflected and suggested by the research hypotheses.

4.1 Reliability Tests

Confirmatory factor analysis (CFA) was conducted to indicate that the measures used for main variables fit the research model and data collected. Table (3) summarize the CFA indicators for the variables; firm performance, BSC, and innovation strategy, which indicates that there is strong relationship between research variables and latent indicators used to measure them.

Table (3): CFA for the main variables

CFA Indicators			
	Firm Performance	BSC	Innovation Stategy
CMIN/DF	4.679	0.048	1.971
GFI	0.852	1.000	0.967
CFI	0.931	1.000	0.973
RMSEA	0.143	0.000	0.073

4.2 Testing hypotheses

The relation between firm innovation strategy and overall firm performance represents the **first hypothesis** of the research which can be reformed in statistical regression equation as shown in equation (1).

$$Dig_i = \beta_0 + \beta_1[In.Str]_i + \varepsilon_i \quad \ldots\ldots\ldots\ldots\ldots \quad (1)$$

Where: β_0, constant of the regression equation; β_1, coefficient parameter of the independent variable $In.Str_i$, innovation strategy for the firm (i); $Dig_{i,t}$, the dependent variable (digitalization) for the firm (i); ε_i, random error of the regression equation. Table (4) shows the analysis of variance (ANOVA) and the coefficient of the parameters of the regression equation (1).

Table (4); Analysis of Variance and coefficients of innovation strategy

Panel A **ANOVA[a]**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.160	1	.160	.327	.568[b]
	Residual	88.219	180	.490		
	Total	88.379	181			

a. Dependent Variable: Digitalization

b. Predictors: (Constant), Innovation Strategy

Panel B **Coefficients[a]**

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.064	.393		5.250	.000
	Innovation Strategy	-.060	.105	-.043	-.572	.568

a. Dependent Variable: Digitalization

Table (4) shows there is no significant relationship between innovation strategy and digitalization, where the probability value is less than the significant level (0.05). To make the hypothesis more detailed, the extent of the relationship between each type of innovation strategy and digitization can be tested. The test results of this relationship are shown in Table No. (5).

Table (5); Analysis of Variance and coefficients of types of innovation strategy

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.358	6	.893	1.882	.086[b]
	Residual	83.021	175	.474		
	Total	88.379	181			

a. Dependent Variable: IT Department

b. Predictors: (Constant), Innovation Strategy Riskiness, Innovation Strategy Aggressiveness, Innovation Strategy Analytical, Innovation Strategy Defensive, Innovation Strategy Futurist, Innovation Strategy Proactive

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.538	.451		3.414	.001
	Innovation Strategy Aggressiveness	.150	.080	.144	1.872	.063
	Innovation Strategy Analytical	.162	.094	.143	1.721	.087
	Innovation Strategy Defensive	-.073	.092	-.078	-.793	.429
	Innovation Strategy Futurist	-.232	.101	-.258	-2.301	.023
	Innovation Strategy Proactive	.047	.099	.055	.472	.638
	Innovation Strategy Riskiness	.060	.092	.055	.650	.517

a. Dependent Variable: Digitalization

Although the results of table (5) do not differ significantly in terms of acceptance or rejection of the validity of the first hypothesis of the results shown in table (4). However, Table (5) showed a statistically significant relationship between the Futurist innovation strategy and digitization, with (P) value less than the significant level (0.05). On the other hand, table (5) shows there is no relationships between other types of innovation strategy and digitalization, thus statistical results of multiple regression equation shows there is no relationship between Aggressiveness, Analytical. Defensive, Proactive, and Riskiness strategy and digitalization, where the (P) values of these types of innovation strategy are greater than the significant level (0.05).

To test the **second hypothesis**, which investigates the mediating effect of BSC on the relationship between digitalization and firm performance, **model (4) of Hayes Process Macro** is used, where one mediator variable (BSC), independent variable (Digitalization), and a dependent variable (firm performance) are used. Therefore, the second hypothesis is tested through three regression equations.

Equation (2) shows the relation between the mediator variable (BSC) and exogenous (independent) variable (Digitalization).

$$BSC_i = \beta_{01} + \beta_1[Dig.]_i + \varepsilon_{1i} \quad \ldots\ldots\ldots\ldots\ldots \quad (2)$$

Where: Where: BSC_i, the mediating variable for the firm (i); β_{01}, constant of the first regression equation; β_1, coefficient

parameter of the independent variable; $Dig._i$, independent variable (digitalization) for the firm (i); ε_{1i}, random error of the first regression equation for firm (i).

Equation (3) shows the mediating effect of BSC on the relationship between the exogenous variable (Digitalization) and the endogenous variable (firm Performance).

$$FP_i = \beta_{02} + \beta_2[Dig.]_i + \beta_3[BSC]_i + \varepsilon_{2i} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (3)$$

Where: Where: FP_i , firm performance the dependent variable for the firm (i); β_{02}, constant of the second regression equation; β_2 coefficient parameter of the independent variable (digitalization); β_3 coefficient parameter of the mediating variable (BSC); ε_{2i}, random error of the second regression equation for firm (i).

Equation (4) shows the relationship between the exogenous variable (Digitalization) and the endogenous variable (firm Performance).

$$FP_i = \beta_{03} + \beta_4[Dig.]_i + \varepsilon_{3i} \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Where: Where FP_i , firm performance the dependent variable for the firm (i); β_{03}, constant of the third regression equation; β_4, coefficient parameter of the independent variable; $Dig._i$, independent variable (digitalization) for the firm (i); ε_{3i}, random error of the third regression equation for firm (i).

The three equations should match four conditions to prove the existence of the mediating impact. First, the exogenous variable (Digitalization) should statistically significantly predict the endogenous variable (firm performance) in equation (4). Second, the exogenous variable (Digitalization) should predict the mediating variable (BSC) in equation (2). Third, the mediating variable (BSC) should predict the endogenous variable (firm performance) in equation (3). Forth, the exogenous variable (Digitalization) should predict the endogenous variable (firm performance) with β_4 in equation (4) < β_2 in equation (3).

Table (6) shows the results of the regression equation (2). Which reflect the relation between the mediator variable (BSC) and exogenous (independent) variable (Digitalization).

Table (6). results of regression analysis to predict the mediating variable (BSC) through the exogenous variable (Digitalization)

Predicted	Predictor	R	R^2	F	Sig.	β_0	β_1	Beta	Stand. error	TValue	Sig.	ULLCI	ULCI
BSC	Digitalization	.165	.027	5.051*	.026	3.907	-.172	-.165	.077	2.247*	.026	-.323	-.021

*** Significant at 5%.**

Table (6) revealed that the ability of the exogenous variable (Digitalization) to predict the mediating variable (BSC); where R^2 of (0.27) means that the exogenous variables (Digitalization) can alone predict 2.7% in the variation of the mediating variable (BSC). P value (0.026) is less that significant level of (0.05). in

other words, T value of (2.247) is statistically significantly at less than (0.05). moreover, Beta coefficient (-1.65) lies within upper and lower limits (-.323: -.021).

Table (7) shows the results of the regression equation (3). Which predict the endogenous variable (Firm performance) through both the mediating variable (BSC) and the exogenous variable (Digitalization).

Table (7). Results of regression analysis to predict the endogenous variable (Firm performance) through both the mediating variable (BSC) and the exogenous variable (Digitalization)

Predicted	Predictor	R	R^2	F	Sig.	β_0	β_1	Beta	Stand. error	TValue	Sig.	ULLCI	ULCI
Firm performance	Digitalization	.568	.323	42.71**	.000	1.062	.055	.043	.080	.685	.494	-1.03	.213
	BSC						.708	0574	.077	9.204**	.0000	.556	.860

**** Significant at 1%.**

Table (7) shows the following results: (i) the ability of both the mediating variable (BSC) and the exogenous variable (Digitalization) to predict the endogenous variable (Firm performance).where R^2 of (0.323) indicates the ability of both the mediating variable (BSC) and the exogenous variable (Digitalization) to explain (32.3%) of the variation of the endogenous variable (Firm performance). (ii) Beta coefficient of (.055) is **not** statistically significantly where (P) value of (0.494) is > than (0.05). Moreover, Beta equals (.043); which reflects the

direct effect of the exogenous variable (Digitalization) on the endogenous variable (firm performance) in the presence of the mediating variable (BSC).

The ability of (BSC) in the presence of digitalization to statistically predict the firm performance, where beta coefficient of (0.708) lies within the upper and lower limits (.556: .860). Moreover, T value of (9.204) is statistically significant at (0.000), which is < (0.05). finally, beta coefficient of (.574) reflects the effect of the (BSC) on the firm performance in the presence of digitalization,

Table (8) shows the total effect of the exogenous variable (Digitalization) on the endogenous variable (Firm performance) in the absence of the mediating variable (BSC).

Table (8). Results of regression analysis to predict the endogenous variable (Firm performance) through the exogenous variable (Digitalization) in the absence of the mediating variable (BSC)

Predicted	Predictor	R	R^2	F	Sig.	β_0	β_1	Beta	Stand. error	TValue	Sig.	ULLCI	ULCI
Firm performance	Digitalization	.052	.003	.490	.485	3.829	-.067	-.052	.096	-.700	.485	-.256	.122

Table (8) shows the inability of the exogenous variable (Digitalization) to predict the endogenous variable (Firm performance). Where R^2 of (0.003) indicates that Digitalization in the absence of BSC interpret (0.03%) of Firm performance. T

value of (.700) is insignificant at (0.05). Moreover, beta coefficient (-.052) does lie with upper and lower limits (.256: .122), which indicates the statistical insignificance of the total effect of the digitalization on the firm performance.

Table (9) shows the total and direct effects of digitalization on the firm performance and their significance.

Table (9) the total and direct effects of digitalization on the firm performance

Kind of effect	Beta Coefficient	T Value	Significance
Total effect of digitalization on firm performance	-.052	.700	.485
Direct effect of digitalization on firm performance	.043	.685	.494

Table (9) shows the following results. (i) total effect of digitalization on firm performance (-.052) is insignificant where T value of (.700) is insignificant at (0.05). (ii) the direct effect of digitalization on firm performance (-.043) is insignificant where T value of (.685) is insignificant at (0.05). (iii) there is indirect effect of digitalization on firm performance in the presence of (BSC), where beta coefficient of (-.095) which is statistically significant since the upper and lower limit for interval level of confidence is (-.173: -.019), which indicates that it lies within this limit. (iv) referring to the criteria that clarify the absence or occurrence of the mediating effect, the main criteria which is

represented by the ability of the exogenous variable to predict the endogenous variable independently was not satisfied (equation (4)). Although the ability of the exogenous variable to predict- statistically and significantly- the endogenous variable in the presence of the mediating variable, the exogenous variable in presence of the mediating variable could not completely predict the endogenous variable (equation (3)). Although, equation (2) revealed the ability of the exogenous variable to predict the mediating variable, yet it is insufficient to conclude that the mediating variable has a mediating effect (Total or partial) on the endogenous variable.

Based on the above statistical analysis, the **second null hypothesis is accepted**, due to the insignificance of total- direct and indirect- effect of the exogenous variable (digitalization) on the endogenous variable (firm performance). The indirect effect of exogenous variable on the endogenous variable through the mediating variable is statistically significant, nevertheless the four criteria required to realize the mediating effect- either totally or partially- are not satisfied.

To test the **third hypothesis**, which investigates the mediating effect of digitalization on the relationship between BSC and firm performance, model (4) of Hayes Process Macro is used, where one mediator variable (digitalization), independent variable (BSC), and a dependent variable (firm performance) are used. Therefore, the third hypothesis is tested through three regression

equations, which should match the four criteria stated earlier in the second hypothesis to verify the mediation effect occurrence.

Equation (5) shows the relation between the mediator variable (digitalization) and exogenous (independent) variable (BSC).

$$DIG_i = \beta_{01} + \beta_1[BSC]_i + \varepsilon_{1i} \quad \ldots\ldots\ldots\ldots\ldots \quad (5)$$

Where: Where: Where: DIG_i, the mediating variable for the firm (i); β_{01}, constant of the first regression equation; β_1, coefficient parameter of the independent variable; BSC_i, independent variable for the firm (i); ε_{1i}, random error of the first regression equation for firm (i).

Equation (6) shows the mediating effect of digitalization on the relationship between the exogenous variable (BSC) and the endogenous variable (firm Performance).

$$FP_i = \beta_{02} + \beta_2[BSC]_i + \beta_3[DIG]_i + \varepsilon_{2i} \quad \ldots\ldots\ldots\ldots\ldots \quad (6)$$

Where: Where: FP_i, firm performance the dependent variable for the firm (i); β_{02}, constant of the second regression equation; β_2 coefficient parameter of the independent variable (BSC); β_3 coefficient parameter of the mediating variable (digitalization); ε_{2i}, random error of the second regression equation for firm (i).

Equation (7) shows the relationship between the exogenous variable (BSC) and the endogenous variable (firm Performance).

$$FP_i = \beta_{03} + \beta_4[BSC]_i + \varepsilon_{3i} \ldots\ldots\ldots\ldots\ldots (7)$$

Where: Where FP_i , firm performance the dependent variable for the firm (i); β_{03}, constant of the third regression equation; β_4, coefficient parameter of the independent variable; BSC_i, independent variable for the firm (i); ε_{3i}, random error of the third regression equation for firm (i).

Table (10) shows the results of the regression analysis (equation 5) in which the independent variable (BSC) predicts the mediator variable (digitalization).

Table (10). Results of regression analysis to predict the mediator variable through the independent variable in the study model

Predicted	Predictor	R	R2	F	Sig.	β_0	β_1	Beta	Stand. error	T Value	Sig.	ULLCI	ULCI
Digitalization	BSC	.165	.027	5.051*	.026	2.411	-.159	-.165	.071	2.247*	.026	-.298	-.019

*** Significant at 5%.**

- Table (10) shows the ability of independent variable (BSC) to predict the mediator variable (Digitalization); It had a T value of (2.247), which can be considered statistically significant at a level of (0.05), and the value of the beta coefficient (-.165) fell within the upper and lower confidence limits.
- The independent variable (BSC) was able statistically to predict the mediator variable (Digitalization); The R2 value (0.027) indicated that the independent variable (BSC) was able to

explain individually (2.7%) of the variance in the mediator variable (Digitalization) indicating the ability of independent variable solely to predict the mediator variable (Digitalization).

Table (11) also shows the results of the regression analysis (equation (6)) in which both the independent variable and the mediator variable together predict the dependent variable.

Table (11). Results of the regression analysis to predict the dependent variable through the independent variable and the intermediate variable

Predicted	Predictor	R	R2	F	Sig.	β_0	β_1	Beta	Stand. error	T Value	Sig.	ULLCI	ULCI
Firm performance	BSC	.568	.323	42.71**	.000	1.062	.708	.007	.574	9.204**	0.000	.558	.860
	Digitalization						.055	080	.043	.685	.494	.-1.03	..213

**** Significant at 1%.**

Table (11) shows the following points:

I. The independent variant (BSC) and the mediator variable (Digitalization) were able to equally predict together the dependent variable (Firm performance); The R2 value (0.323) means that both the independent variable (BSC) and the mediator variable (Digitalization) were able to explain together the 32.3% variability in the firm performance.

II. The independent variable (BSC) in the presence of the model's mediator variable (Digitalization) was able to predict the dependent variant (Firm performance) statistically significant; Beta coefficient values (0,708) fell between the lower and upper confidence interval, and T value (9.204), statistically significant at the (0,000) level, is less than the level of significance (0.05). The beta coefficient (0.574) (direct effect of the independent variable in the dependent in case of the mediator variable in the model) was also verified.

III. The mediator variable (Digitalization) could not predict the dependent variable (Firm performance); Beta coefficient values (0.055), a statistical function at (0.494), greater than the significance level (0.05); This indicates that it is not statistically significant. Beta's value was (0.043).

Table (12) shows the total effect of the exogenous variable (BSC) on the endogenous variable (Firm performance) in the absence of the mediating variable (Digitalization).

Table (12). Results of regression analysis to predict the endogenous variable (Firm performance) through the exogenous variable (BSC) in the absence of the mediating variable (Digitalization)

Predicted	Predictor	R	R^2	F	Sig.	β_0	β_1	Beta	Stand. error	TValue	Sig.	ULLCI	ULCI
Firm performance	BSC	.567	.321	85.211**	0.000	1.195	.699	.567	.076	9.231**	0.000	.550	.849

**** Significant at 1%.**

Table (12) shows the ability of the exogenous variable (BSC) to predict the endogenous variable (Firm performance). Where R^2 of (0.321) indicates that BSC in the absence of digitalization interpret (32.1%) of Firm performance. T value of (9.231) is significant at (0.05). Moreover, beta coefficient (.567) does lie with upper and lower limits (.550: .849), which indicates the statistical significance of the total effect of the BSC on the firm performance.

Table (13) shows the total and direct effects of BSC on the firm performance and their significance.

Table (13) the total and direct effects of BSC on the firm performance

Kind of effect	Beta Coefficient	T Value	Significance
Total effect of BSC on firm performance	.567	9.231**	0.000
Direct effect of BSC on firm performance	.574	9.204**	0.000

Table (13) shows the following results. (i) total effect of BSC on firm performance (.567) is significant where T value of (9.231) is significant at (0.05). (ii) the direct effect of BSC on firm performance (.574) is significant where T value of (9.204) is significant at (0.05). (iii) there is indirect effect of BSC on firm performance in the presence of (Digitalization), where beta coefficient of (-.007) which is statistically insignificant since the

upper and lower limit for interval level of confidence is (-.033: .014), which indicates that it does not lie within this limit. (iv) Referring to the criteria that clarify the absence or occurrence of the mediating effect, the main criteria which is represented by the ability of the exogenous variable to predict the endogenous variable independently is satisfied (equation (7)). The exogenous variable was able to predict- statistically and significantly- the endogenous variable in the presence of the mediating variable, (equation (6)). The exogenous variable was independently able to predict the mediating variable (equation (5)), where the indirect effect of the exogenous variable on the endogenous variable is very low and insignificant (-0.007), thus it is insufficient to conclude that the mediating variable has a mediating effect (Total or partial) on the endogenous variable.

Based on the above statistical analysis, the **third null hypothesis is accepted**, due to the insignificance of the indirect effect of the exogenous variable (BSC) on the endogenous variable (firm performance), through the mediating variable (Digitalization). Therefore, the four criteria required to realize the mediating effect- either totally or partially- are not satisfied.

5. Conclusion and future research

Due to the increasing competition in business markets, forces of globalization, and advances in technology, strategic planning became crucial to evaluate firms' innovation ability and the

impact of the digitalization of its operations on firm performance. The research aims to examine the impact of reciprocal mediating effect of digitalization and management accounting innovations represented by Balanced Scorecard BSC on their relationship with overall performance of business firms using data collected through a survey conducted in 2022 on 500 profit-oriented business firms. Also, it examines the effect of innovation strategy on firm digitalization level. Simple regression analysis, and Process Macro model for SPSS are used to test the reciprocal mediating effect of digitalization and BSC on their relationship with firm performance.

In agreement with Venkatraman (1989), results show statistically significant relationship between the Futurist innovation strategy and digitization, and the insignificant relationship between other types of innovation strategy and digitalization within firms. Results reveal as well the insignificance of total- direct and indirect- effect of the exogenous variable (digitalization) on the endogenous variable (firm performance). In agreement with prior studies which revealed that better firm performance is attained upon using BSC to evaluate innovation activities (Gama et al. ,2007; Ivanov, A.,2014; Benková et al., 2020), the indirect effect of exogenous variable (digitalization) on the endogenous variable (firm performance) through the mediating variable (BSC) is statistically significant. Results also reveal the insignificance of

the indirect effect of the exogenous variable (BSC) on the endogenous variable (firm performance), through the mediating variable (Digitalization), this insignificance was due to the highly significant direct effect of BSC on firm performance (DeBusk & Crabtree, 2006; Hoque, 2004; Blacha and Brzoska, 2016).

Businesses and operations environment in developing countries are dominated by SMEs which have to respond to changing marketing demands in a speedy and efficient manner, and because transitional economies are obliged to quickly introduce and implement developed instruments and techniques in response to multiple challenges, a model such as the BSC that reflect market changing needs within its measures for evaluating the value of a business firm activity, from the financial and non-financial perspectives, is essential for the future development of these entities. Thus, further research is needed to address the innovation-dimension of BSC and the new measures that should be added to BSC to reflect innovation perspective and better assess firms' innovation ability. Further research is needed as well to address the necessity of adopting innovation strategy by business firms prior to investing in IT or digital transformation to avoid losses from wrong IT investment decisions. Future studies' sample selected for analysis should encompass profit and non-for-profit entities for better generalization of results.

References:

1. Ahmed, M.I. (2014). Incorporating technology acceptance into composite IT BSC fir IT investment evaluation: An exploratory study in Egypt. The 9th International Conference on Informatics and Systems.

2. Ako-Nai, Anyetei, and Anesh M. Singh. (2019). Information technology governance framework for improving organisational performance. South African Journal of Information Management 21, no. 1: 1-11.

3. Afshan, S., Yu, J.B.Y., Standing, J.R., Vollum, R.L., Potts, D.M. (2017). Ultimate capacity of a segmental grey cast iron tunnel lining ring subjected to large deformations. Tunnelling and Underground Space Technology 64, 74–84.

4. Anh, L. H., Dong, L. S., Kreinovich, V., & Thach, N. N. (2018). Econometrics for Financial Applications (1st ed.). Springer Publishing Company, Incorporated.

5. Asiaei, K., & Bontis, N. (2019). Using a balanced scorecard to manage corporate social responsibility. Knowledge and Process Management, 26(4), 371-379.

6. Bassi, L. Harrison, P. Ludwig, J., & McMurrer, D. (2004). The impact of U.S firms investments in human capital on stock prices, unpublished.

7. Bassi, L., & McMurrer, D. (2007). What to do when people are your most important asset. McBassi & company.

8. Benková, E.; Gallo, P.; Balogová, B.; Nemec, J. Factors Affecting the Use of Balanced Scorecard in Measuring Company Performance. Sustainability 2020, 12, 1178.

9. Bhimani, A. (2020). Digital data and management accounting: why we need to rethink research methods. J. Manage. Control 31(1–2), 9–23.

10. Blacha, L.; Brzóska, J. The use of the Balanced Scorecard in evaluating the results of the innovations implemented in metallurgical companies. Metalurgija 2016, 55, 790–792.

11. Booth, P., Matolcsy, Z. & Wieder, B. (2000). The impacts of enterprise re- source planning systems on accounting practice – the Australian experience. Australian Accounting Review, 16(1), 4-18.

12. Bouncken, R. B., & Kraus, S. (2018). Digitalization and innovation management: A review and future research directions. International Journal of Innovation Management, 22(01), 1-30.

13. Butler, M.G. (2006). Human resource outsourcing: the impact of managerial decisions on operating and market performance. University of Arkansas

14. Cabello-Medina, C., Lopez-Cabrales, A., & Valle-Ca- brera, R. 2011. Leveraging the innovative perfor- mance of human capital through HRM and social capital in Spanish firms. International Journal of Human Resource Management, 22: 807–828.

15. Capelo, C., & Dias, J. F. (2009). A system dynamics-based simulation experiment for testing mental model and per- formance effects of

using the balanced scorecard. System Dynamics Review. The Journal of the System Dynamics So- ciety, 25(1), 1-34.

16. Chapman CS, Kihn L-A. (2009). Information system integration, enabling control and performance. Acc Organ Soc;34(2):151–69.

17. Cokins, G. (2020). The strategy map and its balanced scorecard. The EDP Audit, Control, and Security Newsletter, 61(3), 1e16.

18. Cooper, Robin, and Robert S. Kaplan. "How cost accounting distorts product costs." Strategic Finance 69, no. 10 (1988): 20.

19. Dahou, K., & Hacini, I. (2018). Successful employee empowerment: Major determinants in the Jordanian con- text. Eurasian Journal of Business and Economics, 11(21), 49–68.

20. DeBusk, G. K., & Crabtree, A. D. (2006). Does the balanced scorecard improve performance? Management Accounting Quarterly, 8(1), 44-48.

21. DeSanctis, G. and Poole, M.S. (1994). Capturing the complexity in advanced technology use: adaptive structuration theory. Organization Science, Vol. 5 No. 2, pp. 121-47.

22. Dudic, Z.; Dudic, B.; Gregus, M.; Novackova, D.; Djakovic, I. The innovativeness and usage of the Balanced Scorecard model in SMEs. *Sustainability* 2020, *12*, 3221.

23. Etim, E. O. (2019). Management Accounting System, Perceived Environmental Uncertainty and Corporate Performance in the Nigeria Breweries Sector. Archives of Business Research, 7(7), 255-268

24. Fatima, T., & Elbanna, S. (2020). Balanced scorecard in the hospitality and tourism industry: Past, present, and future. International Journal of Hospitality Management, 91, Article 102656.

25. Gama, N.; Silva, M.M.; Ataide, J. (2007). Innovation scorecard: A balanced scorecard for measuring the value added by innovation. In *Digital Enterprise Technology*; Cunha, P.F., Maropoulos, P.G., Eds.pp. 417–424.

26. Gamayuni, R. (2009). Berbagai Alternatif Model Prediksi Kebangkrutan. Jurnal Akuntansi dan Keuangan, vol. 14, no. 1, pp. 75–89.

27. Garengo, P, Biazzo,S & Bititci, U. (2005). 'Performance measurement systems in SMEs: A review for a research agenda'. International Journal of Management Reviews, vol.7, Issue 1, pp. 25-47.

28. Goldratt, E. M. 1983. Cost accounting: The number one enemy of productivity. In: APICS 26th International Conference Proceedings. October. Falls Church, VA: APICS.

29. Goncharuk, A. G., & Kremenetska, O. V. (2019). Digitalization and innovation strategy for sustainable development of enterprises. Journal of Entrepreneurship Education, 22(1), 1-12.

30. Granlund M. (2007). On the interface between management accounting and modern information technology. The 30th Annual Congress of the European Accounting Association, Lisbon.

31. Granlund M, Malmi T. (2002). Moderate impact of ERPS on management accounting: a lag or permanent outcome. Management Accounting Research;13:299–321.

32. Granlund M, Mouritsen J, Vaassen E. (2010). Call for Papers "On the relations between modern IT, decision making and management control". International Journal of Accounting Information Systems;11(1): III–IV.

33. Gullkvist, B. M. (2013). Drivers of change in management accounting practices in an ERP environment. International Journal of Economic Sciences and Applied Research 6 (2), 149-174.

34. Gumbus, A. (2005) Introducing the balanced scorecard: Creating metrics to measure performance, *Journal of Management Education, 29 (4)*, 617-630.

35. Hansen, E. G., & Schaltegger, S. (2018). Sustainability balanced scorecards and their architectures: Irrelevant or misunderstood? Journal of Business Ethics, 150(4), 937-952.

36. Harris, Sidney E., and Joseph L. Katz. (1991). Firm size and the information technology investment intensity of life insurers. Mis Quarterly: 333-352.

37. Hasan, R. U., & Chyi, T. M. (2017). Practical application of balanced scorecarddA literature review. Journal of Strategy and Performance Management, 5(3), 87-103.

38. Hinings, B., Gegenhuber, T., Greenwood, R. (2018). 'Digital innovation and transformation: an institutional perspective'. Information and Organization. Vol. 28 (1), 52–61.

39. Hopp, C., & Lukas, W. (2019). Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. Journal of Product Innovation Management, 36(2), 211-236.

40. Hopwood, A.G. (1976). Editorial.The path ahead. Accounting, Organizations and Society, 1 (1) (1976), pp. 1-4.
41. Hoque Z (2004) A contingency model of the association between strategy, environmental uncertainty and performance measurement: Impact on organisational performance. Int Bus Rev 13:485–502.
42. Hoque, Z. (2014). 20 years of studies on the balanced scorecard: Trends, accomplishments, gaps, and opportunities for future research. The British Accounting Review, 46(1), 33-59.
43. Hunter, W.C., Timme, S.G. (1986). Technicalchange,organizationalform, and the structure of bank production.Journalof Money, Credit, and Banking 18, 152 166.

44. Huselid, A.M., & Barnes, E.J. (2003). Human capital measurement systems as a source of competitive advantage. Rutgers University. 08854-8054.

45. Ivanov, C.I.; Avasilcai, S. Measuring the performance of innovation processes: A Balanced Scorecard perspective. *Procedia Soc. Behav. Sci.* **2014**, *109*, 1190–1193.

46. Johanson, U. Eklon, G. Holmgren, M., & Martensson, M. (1999). Human resource costing and accounting versus the balanced scorecard: a literature survey of experience with the concepts. School of business. Stockholm University.

47. Kagermann, H., Wahlster, W., & Helbig, J. (2013). Recommendations for implementing the strategic initiative industrie 4.0: Final report of the Industrie 4.0 working group.

48. Kallunki, Juha-Pekka & Laitinen, Erkki & Silvola, Hanna. (2011). Impact of Enterprise Resource Planning Systems on Management Control Systems and Firm Performance. International Journal of Accounting Information Systems. 12. 20-39.

49. Kanellou, A., & Spathis, C. (2011, July 11-12). Accounting Benefits and Satisfaction in an ERP Environment. Paper presented 8th International Conference on Enterprise Systems, Accounting and Logistics: 8th ICESAL 2011, Thassos Island, Greece.

50. Kaplan, R. S. (1984). The evolution of management accounting. Readings in accounting for management control, 586-621.

51. Kaplan, R. S., & de Pinho, R. (2003). Volkswagen do Brasil: Driving strategy with the balanced scorecard (HBS No. 9- 111-049). Boston, MA: Harvard Business School Publishing.

52. Kaplan, R. S., & Norton, D. P. (1992). The balanced scorecard d Measures that drive performance. Harvard Business Review, 70(1), 71-79.

53. Kaplan, R. S., & Norton, D. P. (1996a). Using the balanced scorecard as a strategic management system. Harvard Business Review, 74(1), 75-85.

54. Kaplan, R. S., & Norton, D. P. (1996b). Linking the balanced scorecard to strategy. California Management Review, 39(1), 53-79.

55. Kaplan, R.S. and Norton, D.P. (2006), Alignment: Using the Balanced Scorecard to Create Corporate Synergies, Harvard Business School Press, Boston, MA.

56. Khalil, S., & Belitski, M. (2020). Dynamic capabilities for firm performance under the information technology governance framework. *European Business Review, 32*(2), 129–157.

57. Lawson, R. (2019). Management Accounting Competencies: Fit for Purpose in a Digital Age? NJ: Institute of Management Accountants.

58. Liao, C-H., Mo, S., & Grant.J. (2006). Market implication of human capital investment. Case Western Reserve University. Cleveland, OH 44106.

59. Loveman, Gary W. (1994). An assessment of the productivity impact of information technologies. Information technology and the corporation of the 1990s: Research studies 84: 110.

60. Malagueno, R.; Lopez-Valeiras, E.; Gomez-Conde, J. (2018). Balanced scorecard in SMEs: Effects on innovation and financial performance. Small Bus. Econ. 2018, 51, 221–244.

61. Malinić, S., & Todorović, M. (2012). How Does Management Accounting Change under the Influence of ERP? Economic Research - Ekonomska Istraživanja, 25(3), 722-751.

62. Manoj, A. Sahay, B. S. & Saha, S. (2005). Balanced Scorecard in indian companies. VIKALPA, 30(02).

63. Maraghini, M. P. (2010). New Integrated Information Systems and Management Control Change in Small and Medium Enterprises. In P. Taticchi (Ed.), Business Performance Measurement and Management, 13-37.

64. Markus, M.L. and Soh, C. (1993), "Banking on information technology: converting IT spending into firm performance", in Banker, R.D., Kauffman, R.J. and Mahmood, M. (Eds), Strategic Information Technology Management, IGI Publishing, Harrisburg, PA.

65. Medina TN, Snedeker J, Trueswell JC, Gleitman LR. (2011). How words can and cannot be learned by observation. P. Natl. Acad. Sci. USA ;108:9014–9019.

66. Misra, S.C., Kumar, V., Kumar, U., Mishra, R., 2005. Goal-driven measurement framework for software innovation process. Journal of Information Technology Management 16, 30–42.

67. O'Sullivan, D., & Abela, A. V. (2007). Marketing performance measurement ability and firm performance. Journal of Marketing, 71(2), 79-93.

68. Öncü, M. A., Mesci, M., , Ö., & Fikoglu, s. (2013). Financial yeniliklerin isletme performansina etkisi: Istanbil'daki hizmet isletmelerine yonelik bir arastirma. Uluslararasi Alanya Isletme Fakultesi Dergisi, 5(3), 119-129.

69. Pandey, I. M. (2005). Balanced Scorecard: myth and reality. VIKALPA, 30(1).

70. Pervan, Ivica & Dropulić, Ivana. (2019). The impact of integrated information systems on management accounting: case of Croatia. 24. 21-38.

71. Ponorica, A. G., Al-Saedi, A. H. J., & Sadik, H. H. (2014). The impact of en- terprise resource planning systems on management accounting. Challenges of the Knowledge Society, 4(1), 682-690.

72. Pun, K.F. and White, A.S. (2005). A performance measurement paradigm for integrating strategy formulation: A review of systems and frameworks. International Journal of Management Reviews, 7: 49-71.

73. Rehman, Shafique Ur & Mohamed, Rapiah & Ayoup, Hazeline. (2019). The mediating role of organizational capabilities between organizational performance and its determinants. Journal of Global Entrepreneurship Research.

74. Rigby, D., & Bilodeau, B. (2009). Management tools and trends. London, UK: Bain & Company.

75. Rigby, D., & Bilodeau, B. (2018). Management tools and trends. London, UK: Bain & Company.

76. Roscoe, J.T. (1975) Fundamental Research Statistics for the Behavioral Science, International Series in Decision Process, 2nd Edition, Holt, Rinehart and Winston, Inc., New York.

77. Scapens RW, Jazayeri M. (2003). ERP systems and management accounting change: opportunities or impacts? A Research Note. European Accounting Review;12(1):201–33.

78. Schildt, H. (2022), "The Institutional Logic of Digitalization", Gegenhuber, T., Logue, D., Hinings, C.R.(B). and Barrett, M. (Ed.) *Digital Transformation and Institutional Theory*(*Research in the Sociology of Organizations, Vol. 83*), Emerald Publishing Limited, Bingley, pp. 235-251.

79. Silvius A.J.G. (2006) "Does ROI Matter? Insights into the true Business Value of IT" The Electronic Journal Information Systems Evaluation Volume 9 Issue 2, pp 93 – 104.

80. Simmonds K. (1981). Strategic Management Accounting, Management Accounting (UK), April, pp.26-29.

81. Sirisomboonsuk, Pinyarat, Vicky Ching Gu, Ray Qing Cao, and James R. Burns. (2018). Relationships between project governance and information technology governance and their impact on project performance. *International journal of project management* 36, no. 2: .287-300

82. Spanò, R.; Sarto, F.; Caldarelli, A.; Viganò, R. Innovation & performance measurement: An adapted balanced scorecard. *Int. J. Bus. Manag.* **2016**, *11*, 194–2014.

83. Speckbacher, G., Bischof, J., & Pfeiffer, T. (2003). A descriptive analysis on the implementation of balanced scorecards in German-speaking countries. Management Accounting Research, 14(4), 361e388.

84. Tawse, A., & Tabesh, P. (2023). Thirty years with balanced scorecard: what have we learned. Business Horizons, 66, 123-132.

85. Ugalde Vásquez, A. F., & Naranjo-Gil, D. (2020). Management Accounting Systems, Top Management Teams, and Sustainable Knowledge Acquisition: Effects on Performance. *Sustainability*, *12*(5), 2132.

86. Vakalfotis, N., Ballantine, J., & Wall, A. (2011, July 11-12). A Literature Review on the Impact of Enterprise Systems on Management Accounting. Paper presented 8th International Conference on Enterprise Systems, Accounting and Logistics: 8th ICESAL 2011, Thassos Island, Greece.

87. Venkatraman, N. (1989). Strategic orientation of business enterprises: The construct, dimensionality, and measurement. Management Science, 35 (8), 942-962.

88. Webb, C. (2020). The digital accountant: Digital skills in a transformed world. UK: ACCA.

89. Weill, P. (1992). The Relationship Between Investment in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector. *Information Systems Research*, *3*(4), 307–333.

90. Weill, Peter, and Jeanne W. Ross. (2004). IT governance: How top performers manage IT decision rights for superior results. Harvard Business Press.

91. Weill, P. and M. H. Olson (1989). "An assessment of the contingency theory of management information systems," *Journal of Management Information Systems* 6(1): 59-79.

92. Westerman, G., Bonnett, D., & McAfee, A. (2014). Leading digital: Turning technology into business transformation. Boston, MA: Harvard Business Review Press.

93. Westphalen, S-A. (1999). Reporting on Human Capital; Objectives and Trends. International Symposium. Amesterdam of Measuring and reporting intellectual capital experience. Issues and prospects: reporting on human capital, objectives and trends.

94. Wickramasinghe, D., & Alawattage, C. (2007). Management accounting change: approaches and perspectives. (Routledge., Ed.).

95. Wooldridge, Bill & Floyd, Steven. (1990). The Strategy Process, Middle Management Involvement, and Organizational Performance. Strategic Management Journal. 11. 231 - 241.

96. Wu, Shelly Ping-Ju, Detmar W. Straub, and Ting-Peng Liang. (2015) How information technology governance mechanisms and strategic alignment influence organizational performance. MIS quarterly 39, no. 2: 497-518

٩٧. نوار، رولا سامي (٢٠١٧). التأثيرالوسيط للإبتكار المستدام فى العلاقة بين نظم المحاسبة الإدارية و الأداء المستدام لمنشأت الأعمال: دراسة ميدانية. مجلة الفكر المحاسبى. العدد الثالث ص ٦٩٩--٧٣٠.