The Application of Information and Communications Technologies (ICT) in Small Medium Enterprises (SMEs): Egyptian Case Study

Marwa Abd Elghany
Business Information Systems Department
College of Management & Technology
Arab Academy for Science & Technology
Alexandria, Egypt
Email: marwam [AT] aast.edu

Abstract—**The inherent advantages of SMEs in terms of flexibility and proximity to their markets have been widely acknowledged. In developing countries, SMEs play a significant role in flourishing the economy. The prevailing considerable interest in SMEs in developing countries is thus evident. While in the past many SMEs were acting on local markets, today web-based technologies and community networks are changing the pattern and scope of competition. This paper focuses on the implementation of ICT applications within SMEs boundaries. Case studies were conducted in different industrial sectors to obtain in-depth information about actual usage (and readiness toward further adoption) of ICT applications, Information Technology maturity level, user acceptance, and existing technological infrastructure within organizational boundaries. The paper concludes a number of deficiencies facing SMEs in adopting ICT in the context of developing countries.**

Keywords- *SMEs; Developing Countries; ICT; Deficiencies*

I. INTRODUCTION (HEADING 1)

SMEs have been acknowledged as a key condition in promoting equitable and sustainable social development. They are very important for the economic growth of a country ([1]; [2]; [3]). They have consistently demonstrated the ability to innovate and bring to the market new technologies [4]. Performance measures taken by SMEs are most often financial and, therefore, they do not supply SME management with appropriate means for proactively dealing with and readily responding to, the current volatile environment they face. Reference [5], addressing the issue of performance indicators gathered by UK-based SMEs, assert that *"…although all the companies had a plethora of financial measures, which made up the majority of the formal measures used, these were not seen as being directly relevant to the day-to-day running of the business"*. Based on crucial role, which SMEs play in developing countries, this paper aims to investigate ways of enhancing business processes within SMEs boundaries using automation tools. The study explores the potential of ICT applications as way of business optimization, the trend towards ICT including e-commerce adoption, and the underlying challenges facing SMEs in developing countries.

II. SMES DEFINITION & CHARACTERISTICS

Reference [6] claim that a unique definition of SMEs is not possible because the concept differs from country to country and from sector to sector. The definition of SMEs varies from country to country. All over the world, numbers of employees or capital investment or both have been used as basis for defining SMEs [7]. The SMEs definition, adopted within the European Union is illustrated in table 1. It should be noted, however, that SME definition may vary within the same country. For example, in Egypt various definitions have been adopted by various governmental authorities.

TABLE I. SMES DEFINITION ADOPTED WITHIN THE EUROPEAN UNION [7]

Criteria	Micro-Enterprise	Small	Medium
Number of employees	<10	<50	<250
Annual turnover (€ millions)	-	<7	<40
Total balance-sheet	-	<5	<27
Independence	-	No more than 25 per cent of the Capital or voting rights held by one or more enterprises which are not themselves SMEs	

Moreover, SMEs cover a wide spectrum of industries and play an important role in both developed and developing economies. They have been considered the supplier base for domestic manufacturing in all industrialized nations [8] and their importance in the developed world is unquestionable. A total of 99 percent of all businesses in North America and Europe are SMEs [9]. Even with the increasing number of nations joining the European group over four years, in 2003 SMEs accounted for 99 percent of activity in the European Union [10]. Reference [11] reports that 99 percent of all UK businesses employ less than 500 employees accounting for

62 percent of the nation's employment. Reference [12] claims that small manufacturing establishments make up over 98 percent of all manufacturers in the US. Taking India, as a developing country example, SMEs occupy a prominent position in planned development of Indian economy. The SME sector accounts for 40 percent of the industrial production, 35 percent of the total export, and provides about 80 percent of employment in the industrial sector in the country [13]. The portion of 'modern' SMEs differs considerably, however, between countries; most are found in the newly industrializing countries with strong entrepreneurial bases, vibrant export sectors and a large base of educated and technical manpower.

SMEs make indispensable contributions to the economy. They act as major job providers, produce a significant part of the total value added, feed the larger industries with their needed inputs, as well as acting as distributors/buyers of their products. Small firms provide a large segment of the lower and middle-income population with low priced consumption goods and services. Small firms also represent a channel through which small savings are being translated into investments. Small enterprises could become major sources of constant innovation and experimentation and could thereby in some cases change the market structure. SMEs have been viewed as a source of technological progress, especially in new industries. Finally, the continuous influx of small firms in all sectors of the economy by all segments of the society is considered a healthy phenomenon and a crucial barometer for social and economic well-being [14].

The fundamentally significant contribution of SMEs to the economy equally of developed and developing countries has been well appreciated [15]. Hong Kong is a reflection of the UK industrial development and Korea is indeed increasing their economic development in this field based upon the types of the firms. They could enhance their exports and realize accumulation in the investment because they have intensive skillful labor.

Large and small firms have been identified as being fundamentally different [16]. Reference [17], after examining the work of several researchers regarding the implications of organizational size, concluded the existence of significant differences between SMEs and large organization. Reference [18] reports, among the advantages small organizations enjoy in introducing new approaches to their operation are greater in flexibility, more effective in communication, ease in dealing with organizational culture change, visibility of management participation, and ease of demonstrating management commitment. According to [19], SMEs can be characterized as easy to survey and understand, having short lines of communication and flexibility in relation with the implementation of new management philosophies and approaches. On the limitations side, [6] claim that most SMEs operate with poor forecasting and planning systems and long cycle times, many of which have problems with unreliable inventory control systems, with no stock tracing and poor cost control.

III. Predecessor Studies on the Application of ICT in SMEs

There is a common agreement that ICT applications and tools have great impact on organizational performance and internal processes. ICT enrich knowledge, and optimize cost, speed and connectivity with business partners across the supply chain. In addition, ICT provides highly speed communication channels with end customers. Even though large originations as well as SMEs attempt to adopt ICT solutions that would provide competitive advantage to their organizations, Internet applications and E- commerce transactions are still not sufficiently matured [20]. Adopted solutions must be well justified optimizing the invested expenses in relation with the expected potential benefits [20].Many researchers investigated ICT potential and their usage in different sectors but few of those studies said attention to SMEs in a developing countries' context. This section introduces remarkable contribution of predecessor studies that investigated ICT importance in different contexts especially SMEs. Reference [21] discussed the role of IT tools and how their deployed capabilities enhance business processes. Most ICT solutions provide organizations with highly integrated channels for inter/intra-organizational transactions and offer a way of managing organizational competence efficiently. Sharing different types of information using networked and automated infrastructure improves speed and efficiency of business processes. Adoption of Enterprise Resource Planning would automate the back-end business processes and streamline material movement and tracking within different stages of procurement, production, and distribution. Many organizations attempt to benefit from Internet connectivity to exploit its capabilities in their value chains. Web-based applications that enable B2B transactions provide business customers and vendors with the opportunity of exchanging products and services with competitive prices. The free technological infrastructure provides bidding options and real- time communication for participants.

A broader study of existing ICT applications and their classification were conducted. A study conducted by [22] has discussed different types of IT usage and drivers for further collaboration with business partners. As stated by the study, three IT usages were represented in business processes and collaborative applications with business partners: transactional processing, supply chain planning and collaboration, and order tracking and delivery coordination. The authors related each type with a number of drivers that lead to its adoption. These drivers may focus on operational levels such as: operational cost reduction and speeding up transfer of information, or it may address strategic and holistic levels such as: managing unpredictable demands and merging In-transit delivery. The outcome of the study is demonstrated in figure 1. The relevance of IT usage and its

driving factors would be beneficial in analyzing the performance of Egyptian firms and their objectives behind IT adoption.

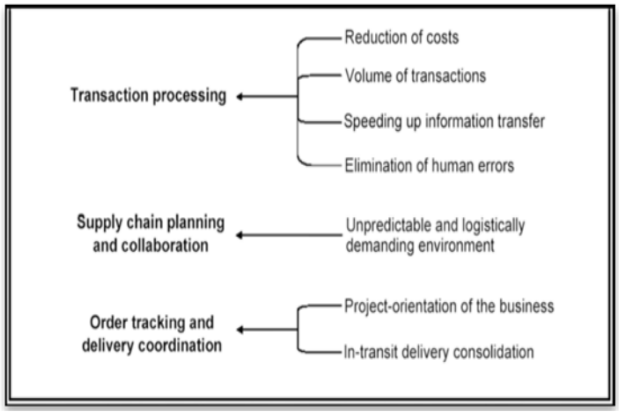

Figure 1. Relationship between IT usage and its drivers [22]

Another category of IT adoption is defined by [23]. He classifies firms according to IS adoption into organizations, whether having the intention to adopt or having already adopted IS in business processes and collaboration. In both situations, expected benefits of IT adoption, attributes of the innovation, organizational characteristics, and environmental characteristics affect such decisions of IT adoption or enhancement. These factors are being considered in this study to indicate the readiness of IT adoption for SMEs.

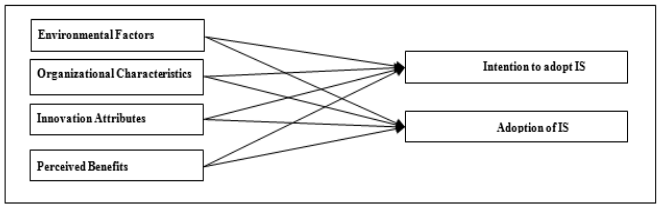

Figure 2. Firms classification based on IT adoption [23]

Reference [24] investigated the relationship between the size of organization and the application of information and communication technologies. They confirmed that the size of an organization is an important determinant of ICT implementation. Several studies such as, [25] considered SMEs as more flexible entities to adopt innovations and go in deals that would exceed their budgets. Using open source alternatives enables cost saving in ICT implementation; other SMEs in developing countries find out their way in using illegal copies of licensed software to avoid cost burden.

Setting a relative relationship between organizational size and its impact on ICT implementation is the main objective of [24] study. Other organizational settings such as, decentralization and organizational units and availability of smooth channel of communication will affect ICT implementation. The authors use Serbian classification of organizational size according to the average number of employees, total income, and assets values stated in financial reports. The study outcome proves an interrelation between organizational size and ICT. The study results confirm that the impact of the informational technology is directly coupled with creating networked model of organization and dividing large vertically integrated companies into small and flexible entities. The study showed a good potential of medium enterprises for adopting ICT intensively more than small organizations. For micro organizations, there are extreme examples of high and low ICT usage, where more organizational factors contribute in ICT adoption. For the debate whether ICT implementation would improve firm performance, ICT adoption requires human resources and financial investments as well as change management. Therefore, it is not easy for SMEs to implement Web-Based solutions.

SMEs face more difficulties than large firms in providing adequate technological infrastructure from computerized systems, Internet connectivity, and enterprise portals. Managerial levels in these organizations believe that perceived benefits of ICT might not provide sufficient motives for embracing and implementing ICT. Capabilities and functionalities of proposed solutions, systems' interoperability with a small-scale organization, technological infrastructure, and Internet connectivity impose challenges for ICT adoption. Regulatory differences and policies and trust are considerable issues in cross-boundary transactions with business partners. The authors recommended issuing solid policies that promote e- business awareness to encourage ICT usage and build the required technical skills [20].

A study that investigated the clothing industry in the UK indicated several SMEs deficiencies. Even though managers realize the importance of IS implementation and their effect on organizational performance, the lack of collaboration and trust between partners represent an obstacle that hinders this approach [26]. Reference [26] proved also that low level of Information Systems adoption and information sharing imposes a barrier for SMEs in the UK clothing manufacturing sector. The high cost of electronic technology prohibits the investment in further techniques that would enable information visibility. Reference [26] concludes that IT is not just a tool for large organizations; on the contrary, it can lead to a substantial outcome in SMEs as well. The perceived benefits behind it should be understood by SMEs to capture the interest of the managerial level.

Another study of IT barriers in developing countries was undertaken by [27]. He investigated IT-based management in developing countries, with special reference to Bangladesh. Regarding the differences between industrial and information ages, which are demonstrated in table 2, developing countries are supposed to be in the information age rather than the industrial one. They must therefore overcome certain barriers. These countries need to establish basic platforms for

e-commerce launching. A number of issues are related to the traditional industrial age that still exists, such as: a lack of basic business automation, poor management skills and lack of e-commerce integration. The study of [27] has provided state-of-the-art IT perspectives in developing countries. The author identified micro and macro recommendations for the impact of the level of automation and IT applicability in these countries. The results of this study would be utilized to investigate the IT platform in the case studies that would be investigated, and define the level of IT implementation.

TABLE II. DIFFERENCES BETWEEN INDUSTRIAL AND INFORMATION AGES [27]

Industrial Age	Information Age
Mass Production	Mass Customization
Labor serves tool	Tools serve labor
Labor performs repetitive tasks	Labor applies knowledge
Command and control structure	Common control structure
Capital intensive	Knowledge intensive
Capitalists own production means	Labor owns productions means
Capital is primary driver	Knowledge is primary driver

On a micro level, [28] summarized the situation of Egyptian e-readiness based on previous quantitative and qualitative macro studies, and concludes that Egypt represents a modest degree of e- readiness. Additionally, [28] assessed e-readiness of SMEs and large organizations in the textile sector for comparative purposes. The study outcome demonstrated in table 3 indicates that the degree of readiness showed an increased level in the case of larger organizations.
Concerning the contribution of governments in promoting ICT adoption within SMEs, [29] investigated the role of Malaysian government in this regard. The followed policy highlighted ICT usage, which might maintain value added advantage and stability for SMEs. In addition, study of [29] drilled down to define motives behind adoption ICT by SMEs in Malaysia. The study assumed that ICT provides SMEs with equal advantages as large organizations. Their study uses model of Perceived Characteristics of Innovating (PCI) of [30], which states that determinants lead to ICT adoption of SMEs. Authors use the PCI model to discuss ICT adoption by industrial organizations in Malaysia. The PCI model identified eight factors that affect dispersal of an innovation, those factors include: relative advantage, compatibility, ease of use, result demonstrability, image, visibility, trialability, and voluntariness. Reference [29] examined most PCI factors in a number of Malaysian organizations. Furthermore, the study addressed issues that face ICT implementation in SMEs, and classified such issues into internal and external issues. The study provides solid findings for the government that support the promotion of ICT awareness and implementation. The study findings indicated the absence of direct co-relation between the perception of the relative advantage of ICT and the intention of its adoption. These results do not match the findings of predecessor studies. Since most SMEs did not automate their business activities yet, the perception of ICT adopters differs from non-adopters. Decision makers who considered their organizations as ready for ICT implementation are willing to adopt it to reap its benefits. The authors elaborate more about phases of ICT adoption and implementation and factors affecting them. They referred to the essential phases of ICT implementation: first adopting ICT and then promoting the automated solutions in order to obtain user acceptance. The authors pointed major issues behind ICT abandon such as: system usability and its effect on user acceptance, lack of IT expertise, traditional and systematic way of doing business, flexibility of customization, inadequate training, and confidentiality of information. The study urged governmental authorities to get closer to SMEs, which would support the government while issuing standardized policies and regulation that could contribute positively in ICT adoption and implementation.

In contrast, a study that was conducted by [31] about how the Egyptian society responds to rapid technological change and development globally indicated a positive reaction of Egyptian firms towards ICT adoption and implementation. This study used one company, which could hardly be generalized. Realizing the success of one case in one sector does not ensure a similar outcome in the case of other firms, or ensure replication of such success in other sectors. This triggers the need for cross- industry investigations to indicate the readiness of ICT in industrial sectors.

TABLE III. PRIMARILY E-READINESS ASSESSMENT [28]

Criteria		Micro- Enterprise	Small	Medium
Connectivity/E-infrastructure	Level	L	L	L
	Type	L	L	H-M
	Software Ownership	L	M-H	H
ICT use in Transitions	Awareness	L	L	L
	Use	L	L-M	M
ICT use in Marketing	Awareness	L	L	L
	Use	L-M	L	M
ICT use in Production	Awareness	M	H	H
	Use	L	M	M-H
ICT use in Management	Awareness	M	H	H
	Use	L	M	H
Barriers to ICT use in Marketing		Awareness/Personal	Personal/ Awareness	Awareness
Barriers to ICT use in Production		Personal/ Awareness	Personal	Budget
Barriers to ICT use in Management		Personal/ Awareness	Personal	Budget/Technical Difficulties
E-readiness **	Connectivity/ Einfrastructure	L	L-M	M
	ICT Awareness	L-M	M	M
	ICT Use	L	L-M	M
	Overall **	L	M	M

A number of research studies have discussed different methods to enhance information sharing within organizational boundaries. Several attempts were undertaken

to address issues behind the lack of ICT adoption through exploring current IS capabilities and their promising benefits and performance in organizational processes, while others attempt to analyze the negative impact of the absence of ICT or drawbacks of existing IS applications within and/or among organizations.

A survey conducted to rank the barriers that face IT implementation in both contexts revealed that regardless of the barriers related to cost issue and dispersion between partners' capabilities, more influencing barriers were related to cultural effects such as, low level of integration, lack of trust between partners, and resistance to change. Reference [32] used Interpretive Structural Modelling (ISM) to define the relationship among IS implementation barriers with business partners. They show the interrelationships between barriers, driving powers and their dependency. The study outcomes highlight a number of issues such as lack of fund, poor technological infrastructure, and low priority of IT investments.

The availability of modern ICT enables organizations to capture and share information in a collaborative pattern [33]. Reference [34] indicated in their report more barriers for B2B interaction in developing countries. As represented in table 4, the authors assessed each barrier and its relevance. While transport and technology resistance were awarded high ranking and are considered as critical barriers, they concluded that ICT infrastructure was non-influential in the case of B2B transactions.

TABLE IV. DIFFERENCES BETWEEN INDUSTRIAL AND INFORMATION AGES [27]

Obstacle	Assessment
Poor ICT Infrastructure	Not as relevant as often assumed
Poor transport infrastructure	Very Important
Weak or absent legal and institutional infrastructure	Not as important as often assumed
Weak trust infrastructure for certification and effective Redress	Open e-marketplaces are not assuming the risks and expenses need to generate trust. The off-line trust infrastructure is a higher priority
Lack of preparedness. Awareness and need for training and capacity building	Training and capacity building should not be driven by broad-brush ICT and B2B e-commerce strategies
Enthusiasm, resistance and cynicism	Getting the balance between 'old' business parties and appropriate 'new' B2B e-commerce solutions is a high priority for both younger and older managers of producers firms

IV. RESEARCH METHODOLOGY

The study used a case study method to investigate sample companies of SMEs in Egypt. Case study research is usually known as an exploratory work that tests a developed conceptual framework [35]. Reference [36] emphasizes that *"the researcher use case study to investigate a phenomenon in depth, getting close to the phenomenon, enabling a rich description and revealing its deep structure"*. Unstructured interviews were conducted with decision makers to explore hidden issues. Notes were taken during the interview, and interviews were then written up more fully afterwards. Observation was undertaken of managerial and clerical staff responsible for strategic decisions and ICT implementations. Triangulation of methods combined the analysis of organizational documentation and observation with the set of unstructured interviews.

A. *Case Study Design*

In order to design the interview procedure, the researchers referred to other studies conducted in the same region and concluded several points to be investigated. The main theme of the data gathered focuses on the following:

- ICT expertize;
- Awareness, and intention to adopt ICT applications within organizational boundaries;
- Readiness towards e-commerce adoption and its perceived benefits;
- Actual use of ICT in automating organizational activities, role of Web 2.0 in business activities,
- And difficulties faced by SMEs while implementing ICT applications and moving toward e-commerce implementation such as: organizational culture, technical issues related to system implementation and maintenance, etc.

Six companies were investigated in two main industrial sectors: food industry (processed, dried and fresh food) and textile (see table V).

TABLE V. CASE STUDY CONTEXT

Companies	Sector	Public/Private Sector	Production Size	No of Plant /Mill
Company 1	Spinning, Weaving & Textile	Public	100,000 Egyptian Pound	1spinning Mills 1weaving Mills 1Processing Plant 1Confection Unit
Company 2	Textile	Private	500 Ton/Yr	1 dyeing unit 2mercerizing unit 2Confection unit
Company 3	Fresh & Frozen Food	Private	2000 Ton Frozen 4000 Ton fresh	3 Frames 2Packing house 1MT/hr Individual quick freezing (IQF)
Company 4	Processed & frozen Food	Private	Vegetables Factory: capacity 10MT/Hour	1Vegetables processing factory
Company 5	Herbs, spices and dehydrated vegetable	Private	Drying area: 400 sqr m Processing area:	1processing units: 2units for conventional

			150 sqr m	Production and 1 for organic
Company 6	Processed Food	Private	6000 Unit/Month	1 Paste Factory 1 Juice Factory

V. CASE STUDY DISCUSSION

The use of ICT in SMEs is not fully practiced or matured yet. The study findings could easily be classified into ICT adopters and non-adopters. Command-based systems are being used in few cases to handle core business process related to financial transactions, payroll systems, sales tracking and inventory control. Most deployed systems are stand-alone applications that serve department activities. The majority of these applications store day-to-day transactions and incorporate simple features of reporting techniques. Individual reports can be generated to document accumulative transactions in form of graphical charts and tabular features. Generated reports from different applications are manually merged due to compatibility issues. Office automation tools are commonly used in most cases to handle administrative work and daily operations. Microsoft Access as affordable database management system is frequently used for information storage in most of SMEs. Microsoft Excel is used to handle the arithmetic calculation of production scheduling and requirement planning. Consequently, the deployed legacy systems and office automation tools cannot guarantee an enhanced business performance of investigated cases. The current situation of ICT implementation refers to low level IT maturity. The situation necessitates further investment in advanced ICT tools that support decision making and strategic management. It will not be applicable to host advanced tools and applications without management commitment and clear pre-defined strategy toward ICT usage. From decision maker perspectives, manual records are considered as a trusted source of information. There is no need for additional cost burden. The potential of ICT and its promising applications did not fully capture the attention of decision makers to invest in the recent technologies. 'As long we can handle the routine tasks with the use of office applications or manually, so we have no problem' said CEO of medium size textile organizations. Therefore, When comes to assessing organizational readiness toward ERP implementation, most probably, SMEs might be enforced to invest in ERP systems if needed to cope with large vendors. Since ERP requires huge investments to develop a well-integrated IT infrastructure, SMEs experience problems to fund such investments. These organizations suffer from the fragmented infrastructure, limited fund as well as limited level of IT maturity.

Most investigated SMEs show a good awareness of E-commerce trend and the use of Web-Based solutions. Most of those organizations are reluctant to invest and develop their owned solutions. Enterprises decided to take the initiative and joined internet world preferred to host a simple static web- based solution. Most of those portals are informational portal that provides customer with information about company profile and contact information. The offered solution does not provide any personalization features so it cannot address customer's preference individually. Most of those sites did not require customer to create profile/login or store his own information. Therefore, customer-centric approach is absent in most of site. A contact us form is used to gather customer feedback. Other static information about offered product/service, company location, limited catalogue capabilities are provided as well. Most of SMEs recommends the use of store builder service that can provide smoothest way of site development at least cost. Using a standard template with limited site features that may not reflect company's unique identity is not a big deal when compared to low cost of investment. The use of social networking groups imposes free-of-cost option to small organizations. Usually, those groups are used as direct way of communication between end customers and product provider. Advertisement and quick memo are being shared through facebook groups. Social networking pages and groups are mainly used as an interactive channel with individuals so customers' feedback is extremely expressed there. Usage of social networking group/pages is spreading over as a good enough alternative of enterprise portals.

A. Trend and Obstaces of ICT and E-Commerce Adoption in SMEs

It can be concluded that the majority of the companies investigated use ICT for transactional purpose in accordance to [22] classification. Reference [22] categorized IT usage into: collaborative applications with business partners: Transactional processing, supply chain planning & collaboration and order tracking & delivery coordination. This is the case of most organizations studied in developing countries. Speeding up administrative work and improving productivity are key motive behind basic applications adoption. Potential of ICT implementation is not matured enough for decision maker in SMEs to expand their ICT investments. Reference [23] categorized firms according to IT adoption to ICT adopter or willing to adopt ICT and demonstrated a number of factors that would affect IT adoption such as: expected benefits of IT adoption, attributes of the innovation, organizational characteristics, and environmental characteristics. Our study indicates that intention of ICT adoption or existing use of ICT basic applications is highly defected with organizational setting and limited capabilities, environmental issues impose more barriers for further ICT implementation. Trend toward adopting an innovative technology is not fully perceived by decision makers of SMEs.

Numerous issues are facing SMEs in developing countries. Cost burden is a major limitation for most of SMEs to implement IT applications. The cost related to hardware equipment, solution maintenance and IT expertise contribute negatively to new solution adoption. Other issues aggravated ICT implementation in developing countries.

Most of SMEs in developing countries suffered from deficiencies in technological infrastructure and ICT implementation. Those challenges are commonly related to willing to share information even within organizational boundaries, weak IT infrastructure, internet connectivity, and lack of resources. Resistance of change and user perception toward automated system magnified ICT abandon. Lack of IT expertise and technical skills contributed as well to user resistance. Organizational culture aggravated the situation in SMEs. Furthermore, technical issues such as system maintenance, interoperability of software applications form challenges for ICT adoption. System usability and user-friendly design as well as limited customization feature are considered as a barrier for ICT expansion.

The conducted study showed also that managers in these organizations are reluctant to invest in ICT applications. From their perspective, it is unrealistic to shift the focus from existing business activities' optimization to plan a future IS investment inside their organizations. The use of ready-made office application can automate the administrative duties and handle transactions storage and those applications provide a significant level of automation there. Lack of Internet connectivity, limited resources, and labor skills, are considered as barriers for future IT investments. Poor technological infrastructure led to fragmented platform within organizational boundaries, which interferes for further ICT investments. This study outcome is compatible with study of [29] in highlighting the poor IT infrastructure as one of the main ICT barriers to ICT adoption by SMEs, but counterparts the obstacles identified by [34].

VI. CONCLUSION & FUTURE WORK

Companies need to emphasize more on the role of information technology to enhance business activities. Enterprises have to pay more consideration to the interfering issues of fully utilized IT system. This best utilization of ICT will lead to a significant impact on business process. Therefore, addressing issues that impose challenges for automated infrastructure would support decision makers especially in SMEs. Many researchers point out the necessity for a comprehensive IT survey in business applications that could identify its importance as a critical success factor for performance optimization.

Further investigation is needed to discuss how information technology can optimize and streamline business process especially in SMEs context. From a technical perspective, there is a need to architect a framework to formulate data interchange systems in collaborative pattern as demonstrated in [37]. Government needs to promote the use of ICT with organizational boundaries due to its potential. Facilities and flexible regulation can be permitted to decision makers in SMEs to enable ICT adoption and implementation.

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