



CATEGORIZATION OF ICT ROLE FOR SERVICE-BASED SMALL AND MEDIUM ENTERPRISES

¹NADHMI GAZEM, ²AZIZAH ABDUL RAHMAN

^{1,2} Faculty of Computing, Universiti Teknologi Malaysia, 81310, Skudai, Johor, Malaysia

E-mail: ¹nadhmigazem@gmail.com, ²azizahar@utm.my

ABSTRACT

Information and communications technology (ICT) has a high impact on small and medium-sized enterprises (SMEs) business. It enhances SMEs capacity for innovation and adds greater value to their service in order to attract more customers and produce greater returns to the company. The purpose of this paper is to categorize ICT available in the market for SMEs according to its roles. The study used different examples from the literature review and from the authors' observation of ICT solutions in the market. The output of this study developed new ICT categories such as automating devices, knowledge dissemination, business productivity systems, contacting, entertaining, marketing, storage, tracking, and transactions technology. Moreover, in order to demonstrate the usability of these categories, the authors have conducted preliminary integration of ICT categories with different service types. The findings of this integration offer managers different ways to think about the existing services and choose the most suitable ICT categories that can help to improve services operations or create new services.

Keywords: *Small and Medium-sized Enterprise (SME), Information and Communications Technology (ICT), Service Sector, Customers Service, Services Redesign.*

1. INTRODUCTION

Small and medium-sized enterprises (SMEs) are very important in many countries due to the development role they play in the local economy [1]. In general, official definition of SMEs varies from country to another [2]. SMEs contribute to three main sectors which are agriculture, manufacturing and service sectors. The highest majority of SEMs in many of developed and developing countries are that core businesses in the service sector [3, 4]. However, Increasing market competitiveness in the SMEs sector makes it imperative for these organizations to think of ways that support innovation when resolving their production or service problems [5].

There are many studies discussed the information and communications technology (ICT) benefits and advantages for enhancing SMEs business. Generally, the fast way to enhance SMEs business productivity and profitability can be related to adopt a suitable ICT to their business [6]. Appropriate ICT can help SMEs to cut costs by improving their internal processes, improving their product through faster communication with their customers, and better promoting and distributing their products

through online presence [7]. [8] pointed out the importance of web sites and the Internet for SME innovation support. The main forces for ICT investment in SMEs to provide better and faster customers service, stay ahead of competition, provide high quality services to their customers, establish long term relationships with customers, and following top management strategy [2]. In addition, applying existing technology would help the SMEs to create new channels of distribution, new advertising methods for their existing or new services and expand their customers' base in current market [5]. The study conducted by [9] pointed out in ICT role in measuring service quality and customer satisfaction.

Although these benefits are associated with the adoption of ICT, SMEs still have different obstacles and barriers for investing ICT into their business [7, 9-11].

Due to ICTs has wide range of computerized information and communication technologies, [12], answering question of what kind of ICT has been used by variant SMEs will be pivotal especially to some developing economics. [2] conducted a study

on ICT infrastructure that are used by SMEs and listed several ICT such as desktop computers, laptops, handheld devices, wired or wireless intranet, business productivity software like editor and spreadsheet, enterprise software, data storage and network security among others. Another study conducted by [7] identified some types of basic and advanced ICT products that used by SMEs. However, there are no clear studies state the current ICT categories that can be adopted by such firms. In fact, ICTs classifications which are currently in market have received little attention in relation with SMEs in literature. For this reason, the authors explored the ICT types and attempted to categorize them according to their general roles. This can help for further exploring of ICT in different regions or countries and assisting SMEs to get knowledge of ICT types. In addition, associating different service types in SMEs with the ICT categories will lead to more investing in ICTs and open the door for other researchers to conduct further exploration.

The rest of this paper includes six sections. Section 2 highlights the importance of ICT for SMEs. In addition, it shows some previous works on the ICT types for SMEs in different sectors. Section 3 illustrates the methodology that has been used to conduct this study, and how the authors categorized the ICT types. Section 4 explains each ICT category in details. Section 5 demonstrates, in theoretical manner, the usability of ICT categories with service types. Section 6 discusses future research directions. Finally, section 7 concludes the paper and highlights the further work.

2. ICT TYPE IN SME

In general, the type of SMEs characteristics such as business type, size, financial resources, and managerial and other factors determine the type and the usage of ICTs. [9] indicated that ICT adoption is positively related to the ability of the SME to handle the cost. In fact, a company size and its capability of expand more in ICT drives for adopting more complex ICT [10, 13, 14]. In addition, [15] mentioned that high costs, security, and limited knowledge prevent SMEs from taking decision of adopting ICT. However, whether the company is small or large, implementing computer and technological devices have facilitated collecting, storage, analyzing, and sharing data and information [15, 16].

As ICT evolves, it has pivotal role almost in all aspects of business activates, and different organizations use different types of ICT for diverse purposes. Frankly speaking, while many researches are focusing on benefits, barriers, and adoption intention of ICT in SMEs [10, 12, 14, 17, 18], few efforts have been devoted for exploratory of ICT types that are implemented by SMEs in different regions [2, 7, 13, 19]. Table 1 lists some ICT types which have been used by firms from different countries.

Table 1: Studies on ICT Types Utilization in Different SMEs Sectors.

Paper	Industry	ICT type	ICT Role
[20]	Education sector	Computers, the Internet, Knowledge dissemination technologies, & telephony.	To communicate, create, disseminate, store, and manage information
[21]	Restaurants sector	Marketing systems, HRM systems, Finance & Accounting systems, Electronic Point-of-sale (EPOS), Table management systems, Production support systems, & Inventory/procurement systems	To improve restaurants productivity



[22]	Different manufacturing and service firms (Industrial products, Construction, Trading/service, Finance, Hotel, Trusts, etc.)	Internet website & e-commerce technology	To search for general information, product advertisements, and very few for online purchases to their end customers.
[23]	Health sector	Telemedicine, mobile phones, multi-media.	To enable consultations, provide help in emergency situations, fast health care delivery, educate and inform people.
[15]	Different manufacturing and service firms	Internet-based ICT	To access to the market information and knowledge.
[24]	Logistics and freight transportation companies	ICT systems for logistics and freight transportation (Field force automation (FFA), transportation management (TM) applications, supply chain execution (SCE) applications, etc.	To improve transportation companies productivity
[16]	Hotels	Computers, network, reservation systems, Electronic Point-of-sale, & security means.	To facilitate sharing information and resources within and across the hotels to speed service for check-in of guests and guests' transactions, and easy billing of guests account during check out.

The fundamental ICT usage in various sectors of SMEs, as shown in Table 1, reveals that SMEs may use same or different ICT tools. In addition, the purposes of adopting ICT are different according to the SME needs. [22] indicated that many SMEs use internet-based ICT for searching general information or product advertisements, while few of them use it for online purchases to end customers. SMEs in manufacturing may adopt more complex ICT applications such as Enterprise Resource Planning (ERP) software [7]. However, investment of such complex ICT by some SMEs in service sector in developing countries is quite low [14]. The literature about the types of ICT in various SME sectors is not rich, therefore, further investigation of different types of ICT solutions and their impact on SMEs business are still needed [15].

Some studies discussed the ICT infrastructure and illustrated ICT types that adopted by SMEs. [7] illustrated the stages of upgrading the utilization of the ICT in SMEs. He indicated four stages of

progression of ICT that SME has been gone through for adoption of that technology. First stage, the ICT type that includes the basic communication tools such as a fixed line, mobile phone or fax. These tools allow the SME to establish a good communication relationship between suppliers and customers. Second stage, the ICT type that involves basic information technology like PC with basic software and hardware. Third stage, the ICT type that has advanced communications such as Email, Internet browsing, files sharing, e-commerce, voice over internet protocol, etc. Finally, advanced information technology includes PC with advanced software such as databases, ERP, inventory management, customer relationship management, etc. Moreover, the investigation of ICT infrastructure, productivity and business application software are used by SME in different developing countries, and showed few differences of adopting various types of ICT [2, 14]. However, these two studies showed similar usage of ICT infrastructure such as wired and wireless networking, data storage

solution, network security solution, finance/accounting, inventory management, etc.

Using ICT in SMEs is various and there is no specific approaches reveals what and how firms should adopt a particular ICT to improve specific service type. Literature review show that the massive capabilities of ICT leave all option open for SMEs to select suitable and effective technologies in order to improve their productivity and profitability. Although these studies presented dispirited in the use and adoption of ICT, but it is not sufficient for deep exploration of many types of the ICTs, and they probably neglected some of ICTs that have been adopted by SMEs. Therefore, the aim of this paper is to find platform for helping researchers to understand the existing ICT patterns in current market. Furthermore, we group the ICT types into different categories to aid SMEs to define the best technology that may improve their services performance for better customer services.

3. ICT GROUPING PROCESS

Since the internet and network concept have been integrated into the most of current technologies, the ICT definition in this study context refers to technical means that help to handle the information and involves communication means such as telephony, broadcast media, all types of transmission, audio and video processing and network based functions. In other words, ICT here include wide range of computerized information and communication technologies. Those technologies consist of physical products (hardware) and/or services (applications or necessary software).

The process of collecting data in this study was done through collecting ICT examples that have been used by SMEs from different papers in various service sector, websites, and books. In addition, the authors have also collected data through the

observation of ICT solutions in the market for almost one year. Next step was to identify the patterns in the collected ICT. With each example of ICT, we asked ourselves, "What it is used for? What are the main function(s) of this technology? Is there particular characteristics for this technology?"

As the authors progressed through this process, underlying patterns began to emerge that suggested categories of ICT. For instance, the purpose of email is to contact with customers, and get feedback. The most common function of email is that a customer can send inquiry or order to service provider, or receive notification and offers from company. The email characteristics is one of the advanced communication technology used by SME [7].

The second stage was to look in the similarity of ICT purposes, and the characteristics in each ICT tool. Then the authors interpreted and grouped these ICTs together. For example, informative website, forums, and social websites (e.g., Facebook) were used to provide information to customers in term of educating or advertising about company service. Therefore, the researchers of this study decided to group these ICT under specific term named "knowledge dissemination technology". E-learning also can be associated with knowledge dissemination technology since it is used to disseminate knowledge through online learning.

4. ICT CATEGORIES

After the process of ICT grouping, the authors developed nine ICT categories that can correspond to service-based SMEs. The ICT categories include: "automating devices, knowledge dissemination, business productivity systems, contacting, entertaining, marketing, storage, tracking, and transactions technology". Table 2 shows each category with some illustration.

Table 2: ICT Categories for Service-Based SMEs

Technology	Definition	Main Benefits	Examples
Automating Devices	This category includes any technology facilitates self-service process.	<ul style="list-style-type: none"> Improves customer self-service operation. Improves customer participation in the service delivery. 	Auto phone answer, automated ticket machines, automated Sale Devices, automated teller machines, etc.
Knowledge dissemination	This category includes any technology that can	<ul style="list-style-type: none"> Improves Educating customers. 	Radio, Television, CCTV, E-Learning,



	be used for educating or share information with customers.	<ul style="list-style-type: none"> • Improve service mobility to customer location. • Improves persuade customers in the service. 	forums, blogs, Informative websites,
Business productivity systems	This category includes any software that can be used to improve a company internal or external productivity for better serving of customers.	<ul style="list-style-type: none"> • Improves automate service operation. • Improves control of service delivery. • Improves efficiency. • Increases productivity 	Supply Chain Management, HR Management, Finance/Accounting, Inventory Management, etc.
Contacting	This category includes any technology that can be used to facilitate communication with customers or improve relationship between customers and service provider.	<ul style="list-style-type: none"> • Improves feedback • Improves customer relationship. 	Email, cellular phones, fixed line phone, fax, VOIP, Mobile technology, Social network, Wireless networking, etc.
Entertaining	This category includes any technology that can be used for entertaining, convenience, or satisfying customers or employees in service facility.	<ul style="list-style-type: none"> • Improves customer experience with service. • Improves servicescape. • 	Lighting, Sound, Video, etc.
Marketing	This category includes any technology that can be used for online marketing, shopping, or trading.	<ul style="list-style-type: none"> • Improves access to the service. • Improves service convenience. • Improves ability to customize service. • Improves service variety or options. 	E-commerce, Social network, Website, etc.
Storage	This category includes any technology that can be used for storing, retrieving, data processing, or analyzing the information.	<ul style="list-style-type: none"> • Improves store large amounts of data. • Improves information resources. 	Servers, storage devices, recorded audio and video, members card, cloud computing, files, storage area network etc.
Tracking	This category includes any technology that can be used for tracking customers' behavior, needs, or monitoring service delivery. It also includes any technology for security purpose.	<ul style="list-style-type: none"> • Improves feedback. • Improves security • Improves monitoring service. • • 	CCTV cameras, barcode scanner, global positioning system (GPS), fingerprint, wireless networking, security technology, tracking systems, etc.
Transactions	This category includes any technology that can be used for facilitating money transaction.	<ul style="list-style-type: none"> • Improves customer privacy. • Improves speed of 	Electronic Funds Transfer point of sale (EFTPOS), Electronic Point Of Sale (ESOP),



		service receiving. • Improves simplicity of receiving the service.	debit cards, Smart Card, e- banking, etc.
--	--	---	---

Table 2 briefly defines each ICT category and illustrates the general meaning and aids to understand each category. The third column pointed to the common purpose of this category and briefly revealed some benefits for customers or firm prospective. Last column lists some examples, to name a few, associated with a particular category. In order to have a comprehensive understanding of ICT categories, next section discusses each category with more details.

4.1. Automating Devices

Automating devices for customers usually refer to any technology that allows customer to perform self-service. The main focus here is on tangible means which often has characteristics of hardware devices. A customer interacts directly with these devices to serve themselves. The term of self-service assumes that direct interaction between the service provider and customer does not exist, and customers can serve themselves by using this type of technology. For example, Automated Teller Machines (ATM) allows customers to perform the banking transactions such as cash withdrawal and funds transfer by themselves. Another example is automated payment machines for car parking. The Customer can pay for his/her car parking with no need for direct interaction with any employee at the exit gate. Implementing ICT from this category allows a company to reduce the cost of service operation by shifting task of performing the service to the customer. Moreover, this technology improves the service speed since the customer will be able to participate in delivery service. For instance, some grocery stores provide hand-held scanners to customers for scanning their own groceries [25].

4.2. Knowledge Dissemination Technology

This category refers to technology that can be used as informative concept. The main focus here is in visual and audiology means. The characteristic of this category is set to deliver service to customers' location. Companies use ICT of this category to assume that some of the tasks are normally performed by customers. For instance, in distance learning such as e-learning and teleconferencing, customers do not have to worry about burdens of time, or distance to receive

knowledge [20]. Moreover, knowledge dissemination technology improves customers' satisfaction with the service. Firms can use ICT to advertise its service and share information with customers to convince them with the service.

4.3. Business Productivity Systems

It involves sophisticated information technologies in order to improve the efficiency and proactivity for firms. The main focus here is on the available ICT systems that can be worked through internet or intranet to improve the efficiency of the company such as supply chain management, HR management, finance/accounting, inventory management, etc. Business productivity system can improve firm performance by automating service operation for better serving of customers. ICT systems helps firms in many aspect such as executing activities faster, supporting automated decision-making processes, leading to adoption of better business practices to meet the customer service levels, increasing the organizational capability to respond to an environment and reducing the cost of operation [13]. Moreover, ICT systems allow the firm to control the service in order to satisfy the customers' needs. For instance, computerized information system (e.g., bar coding or checkout scanner technology) help the company to understand the customers needs by collecting and analyzing their buying behaviors [26]

4.4. Contacting Technology

This group refers to any means that can be used to strengthen the communication with the customer. This type of technology includes mobile, email, social network, etc. Customer can use this technology to contact the firm to get assistance or get/give feedback for some issues. The firm can also get benefit from this technology to improve the relationship with its customers. The contacting technology has basic technology such as line phone or fax, and advance communication technology such as email, Voice over Internet Protocol (VOIP), etc. Although e-commerce, internet, video conferencing, intranet, file sharing, and creating websites are listed under advance communication technology by [7], the authors here emphasize on means that assist the peer-to-peer communicating between the customer and service provider.



4.5. Entertaining Technology

ICT in this technology refers to the change in the service environment and making it more pleasant and satisfying. The main focus here is on any technology for entertaining, convenience, or satisfying customers in service facility. Some internet cafes provide network games section which gives customers extra value to play games or browse the internet. Sometimes this technology is associated with physical service which take form of tangible value added into the service [25]. Implementing entertaining technology to the service enhances the customer value by improving the service servicescape and brings a good experience to customers. In addition, it helps firms in improving customers persuasion with service quality. For instance, some restaurants provide few screens in different places in restaurant area so that customers can watch movies, news, or matches while they enjoy eating food. Examples of this category, to name a few, include lighting, sound, video, internet, Wi-Fi, etc.

4.6. Marketing Technology

This category refers to using technology that supports firm competitive strategy by conducting online business. Marketing technology mainly focus on any technology that gives firm opportunity of trading online, and facilitates customer online shopping, booking, reservation, or any task to streamline activation of the service. By ICT under this category, firm will be able to improve service speed, makes the service accessible anytime and anywhere. Marketing technology allows the service provider to shift the task to the customer in order to customizing the service. It also improves service variety or function, and save time and cost for customer [22]. One of good examples of this category is e-commerce, which helps SMEs to achieve competitive advantage across the business community [4]. Although the social network such as "facebook.com" can be found under knowledge dissemination category, it still can be somehow used to conduct online marketing.

4.7. Storage Technology

This category refers to any technology that promotes the concept of storing and conserving data. The main focusing here is on facilitating the storing, retrieving, processing and analyzing data. Customer can get benefit from this technology infrastructure to speed the access to data, improve the receiving service, or enhance the sharing

information. For instance, visa card stores personal account information, and the customer does not need to spend long time to fill information for making money transaction. Amazon website stores information of credit card of its customers and when the customer login to the website, they do not have to provide card number with other details. They just select the items to buy and click on pay option to finalize the process. In addition, cloud computing provides virtual storage service to allow customers to backup and make recovery of their data [27]. Some ICT examples of this category include member cards, files, dropbox.com, google drive, etc.

4.8. Tracking Technology

The basic focusing here is on getting feedback, controlling service and managing security issues. Tracking technology covers a wide range of ICT types. It can be used for security context, or business context. For example, CCTV can be used by many shops for monitoring the work area. On the other hand, CCTV can be used to get indirect feedback from customers. Firms can use tracking technology to monitor customers buying behavior. Another ICT can be used for tracking is barcode systems, which can be used to understand what kind of goods that customer mostly prefer, and where most items need to be available. Also in security manner, some of shops use anti-theft sensor gates to prevent any attempt of stealing items. Tracking does not only support company activities, it has benefits for customers as well. Buyers from Amazon.com are able to trace their package anytime by using Amazon's tracking system.

4.9. Transactions Technology

This ICT category involves any technology to streamline the financial issues. The transactions technology mainly emphasizes on hardware or software that assist in transaction process. Implementing transactions technology by firms increases speed of delivering services. For instance, Electronic Funds Transfer point of sale (EFTPOS) improves the simplicity of paying for the service. In addition, the online capabilities of financial technology limits direct interaction between service providers and the customers for a routine payment transaction[25]. This would be more convenience for some customers who are concerned about their privacy information, and they do not want to interact personally with service provider in the matter of payment. Therefore, they can use online

payment by master or visa card. Some ICT examples in this category are debit cards, Smart Card and e- banking.

5. PRELIMINARY INTEGRATION OF ICT CATEGORIES WITH DIFFERENT SERVICE TYPES

Virtually, a particular technology that is found in different ICT categories – due to technology utilization – cannot be limited for one purpose. For instance, hand-held scanners systems can be associated with automating device technology and tracking technology category. In addition, some technologies such as e-commerce can be used for online trading, which is listed under marketing technology category. In the same time, e-commerce can be used as informative website [22], which is related to the purpose of knowledge dissemination

technology. The important issue here is that different ICT categories typically can be used and combined together rather than as individual. This can enhance the company's capacity for innovation and adding greater value to customers and producing greater returns to the company.

According to [2], SMEs would be able to improve their ICT adoption if they have adequate knowledge about suitable and effective technologies. Therefore, in order to show the visibility of ICT categories to SMEs knowledge, the authors conducted theoretical test for these categories with different services. Table 3 demonstrates preliminary results of implying ICT categories with different types of services proposed by [25]

Table 3: Grouping ICT Categories with Service Redesign Approaches

Service Redesign Approaches	Service Redesign Concept	ICT Categories
Self-service	Service is performed by Customer	– Automating devices
Direct service	Moves the service to customer's location	– Contacting technology – Knowledge dissemination technology.
Pre-service	Arranges necessary tasks before consuming the service	– Business productivity systems, – Tracking technology, – Storage technology,
Bundle service	Combines multiple services together.	– Marketing Technology – Transaction technology
Physical service	add tangible elements to the service experience	– Entertaining

According to [25] findings, the self-service is a type of service that allow the customers to play role of delivering service to themselves. This type of service can be supported by automating devices technology which allow customer to perform the services. For instance, customers can scan items price using barcode scanner. Another example is automatic teller machines (ATM) that allows customer to manage cash withdrawal and funds by themselves [26].

Moreover, the direct service approach indicates to bring the service to customer location. The difference between direct service and self-service that while self-service requires some efforts from the customers to t, direct service reduce the efforts that is required to get the service [25]. This type of service can be supported by using any type of ICT under contacting or knowledge dissemination technology. A patient can use mobile or fixed line

to contact the doctors and get medical treatment service to the patient location without need to visit the hospital physically [23]. In addition, student can get learning lessons at home through distance learning such as e-learning.

Another type of service is pre-service, which is defined by [25] as streamlining the activation of a service in order to speed service delivery. The type of service can be supported by business productivity systems technology. The ICT systems help firms for better business practices to meet the customer expectations [13]. By analyzing customers' purchases, the company can focus on the most desirable goods, tasks, or services. Furthermore, tracking technology such as CCTV can be used for the same purpose as it has been explained in section 4.8. In addition, [25] gave excellent example of ICT solution, which is Speedpass device ,that can be associated with the

purpose of storage technology to support pre-service redesign approach. The Speedpass device which encased in a key ring or attached to a car window stores customer personal and credit cards account information, and enable the customer to pump gas and drive off.

Another type of service is bundle service. It involves grouping different services or products into one offering. This type of service offers various options to customer which increases the firm competitive advantages. The ICT tools under marketing technology category such as e-commerce provides multiple services to customers like shopping, booking and paying. In addition, transaction technology can support bundle service, as well. Many supermarkets combs their point of service – also can be call point of sale – with Electronic Funds Transfer point of sale (EFTPOS) [28]. Such technology allows a retailer to directly debit a customer's bank account through using a debit card. This gives extra value to the service by improving speed and simplicity of receiving the service by customers.

The last type of services is the physical service, which is about manipulation tangibles associated with the service. The tangible element here is related to service facilities, equipment, employees, communications materials, physical service environment (e.g., color, style, use of materials, furnishings, art), background conditions (e.g., temperature, lighting, music, noise, scent), and so on. This type of service helps the company to achieve differentiation. Among of the ICT categories, entertaining technology would support this service. The main purpose of ICT tools in this category is for entertaining, convenience, or satisfying customers. For example, some coffee shop provide Wi-Fi to the customer to access the internet and give them more pleasure time while they are in the shop.

6. FUTURE RESEARCH DIRECTION

Different studies were focusing on different ICT solutions, but were insufficient to cover all ICTs that are utilized by service-based SMEs. The purposes of categorizing ICTs are to encourage academic researchers for more investigation on ICT solutions, and unveil the nature of technologies that may bring great interest in establishing ICT knowledge database for different SMEs business.

Moreover, the proposed categories surely can be improved with further research. For instance, each category may also include subcategories such as storage technology can include physical and virtual storage technology. The subcategories will make the process of identifying and classifying ICT more accurate. Thereby, it can give researches an opportunity to study a set of ICTs under specific subcategories in great details.

In addition, using the combination of ICT categories can lead to more innovation-based growth. According to this study, social network such as the Facebook has been associated with knowledge dissemination and market technology categories. However, the capability of transaction technology can be integrated with the Facebook to promote its service. Thus, the users can market and sell their products and receive payment from buyers though the Facebook. The manipulation with these categories can enhance the innovation thinking, and may need for further research efforts to create appropriate utilization methods for these categories.

Currently, the authors in this study have noticed that ICT categories have opportunity to improve the performance of different services types. In fact, the categories can be used to determine the capabilities limitations of each ICT solution which has been adopted by firms. For instance, if a particular ICT tool is listed under knowledge dissemination category, it predominately refers to its ability of supporting direct service strategy, and broadcasting information. Therefore, the authors intend to move forward for more investigation in this matter.

7. CONCLUSION

The massive capability of ICT tools brings great opportunity for SMEs to improve their business performance, as long as SMEs have the desire to invest on ICTs to survive in the market competition. This article has reported the results to gather and classify examples of ICT tools that currently adopted by variant SMEs in service sector. The authors gathered many examples from previous studies and personal observations in different service-based SMEs. They reviewed those examples and used them to develop ICT categories. The researchers have discussed the ICT categories such as automating devices, knowledge dissemination, business productivity systems, contacting, entertaining, marketing, storage, tracking, and transactions in more details. The preliminary results from association of the ICT



categories with different service types unveiled the ability of investing these categories for more future studies. These categories, singularly or in combination, offer to SMEs a chance to explore opportunities of effective utilization of ICT tools for reinvigorate some or all services. The result of this study offers managers a way to think about existing services and most related ICT categories that can help to improve their service functionality. In addition, although the different business environment and culture may affect the findings, the study shed light on the different ICT categories which may encourage other academic researchers to further explore other categories if any. The future work of this study will be through conducting more investigations of integrating ICT with service types, and developing systematic innovation approach for implementing ICT categories with these services. This can bring advantages to SMEs to revitalize existing service with suitable ICT categories for the benefit of customers and the company.

REFERENCES

- [1] Muhammad MZ, Char AK, Yasoa MRb, Hassan Z. Small and Medium Enterprises (SMEs) Competing in the Global Business Environment: A Case of Malaysia. *International Business Research*. 2010;3(1).
- [2] Ashrafi R, Murtaza M. Use and impact of ICT on SMEs in Oman. *The Electronic Information Systems Evaluations*. 2008;11(3):125-38.
- [3] Gazem NAJ, A.Rahman A. Promoting the Systematic Innovation Process in Small and Medium Enterprises. *Journal of Convergence Information Technology*. 2013;8(11):528-35.
- [4] Nezakati H, Jofreh M, Liong GLW, Asgari O. Assessing E-Commerce Adoption by Small and Medium Enterprises in Malaysia, Singapore and Thailand. *World Applied Sciences Journal* 2012;19(10).
- [5] Susman G, Warren A, Ding M. Product and Service Innovation in Small and Medium-Sized Enterprises 2006:[1-71 pp.].
- [6] Tektas A, Gunay EN, Karatas A, Kuyucu ADH. ICT Capability and Innovation Utilization in Turkish SMEs: The Case of Machinery Industry. Soliman KS, editor. *Norristown: Int Business Information Management Assoc-Ibima*; 2008. 796-803 p.
- [7] Kotelnikov V. Small and Medium Enterprises and ICT: United Nations Development Programme – Asia-Pacific Development Information Programme (UNDP-APDIP) and Asian and Pacific Training Centre for Information and Communication Technology for Development (APCICT) 2007.
- [8] Thomas B, Packham G, Miller C, Brooksbank D. The use of Web sites for SME innovation and technology support services in Wales. *Journal of Small Business and Enterprise Development*. 2004;11(3):400-7.
- [9] Alam SS, Noor MKM. ICT Adoption in Small and Medium Enterprises: an Empirical Evidence of Service Sectors in Malaysia. *International Journal of Business and Management*. 2009;4(2).
- [10] Riccardo L, Alessandro S. The Adoption of ICT among SMEs: Evidence from an Italian Survey. *Small Business Economics*. 2004;23(2):151-68.
- [11] Khong Sin T, Uchenna Cyril E. An Empirical Study of Internet-Based ICT Adoption Among Malaysian SMEs. *Communications of the IBIMA*. 2008;1(1):1-12.
- [12] Ongori H, Migiro SO. Information and communication technologies adoption in SMEs: literature review. *Journal of Chinese Entrepreneurship*. 2010;2:93-104.
- [13] Zhelyazkov GI. The impact of ICT systems on road transport SMEs in Australia 2012; May 29.
- [14] Manochehri N-N, Al-Esmail RA, Ashrafi R. Examining the Impact of Information and Communication Technologies (ICT) on Enterprise Practices: A Preliminary Perspective From Qatar. *The Electronic Journal on Information Systems in Developing Countries*. 2012;51(3):1-16.
- [15] Tan KS, Chong SC, Lin B, Eze UC. Internet-based ICT adoption among SMEs: Demographic versus benefits, barriers, and adoption intention. *Journal of Enterprise Information Management*. 2010;23(1):27-55.
- [16] Ansah AK, Blankson VS, Kontoh M. The Use of Information and Communication Technologies (ICT) in Front Office Operations of Chain Hotels in Ghana. *International Journal of Advanced Computer Science and Applications*. 2012;3(3).
- [17] Saleh AS, Burgess L. Factors impacting the adoption and use of ICT in the Malaysian SME sector. 11th International Business Research Conference; Sydney, Australia: World Business Institute; 2009. p. 1-24.
- [18] Poon S, Swatman PMC. An exploratory study of small business Internet commerce issues. *Information & Management*. 1999;35(1):9-18.
- [19] Salim IS, Shayo H, Abaho E, Sheikh MA. State of affairs in ICT usage within tourist



- hotel operations: A case of Zanzibar. *Journal of Research in International Business and Management*. 2013;3(6):180-7.
- [20] Tinio VL. ICT in Education: E-primers for information economy, society and policy; 2003. Available from: http://www.saigontre.com/FDFiles/ICT_in_Education.PDF.
- [21] Sigala M. Integrating and Exploiting Information and Communication Technologies (ICT) in Restaurant Operations. *Journal of Foodservice Business Research*. 2003;6(3):55-76.
- [22] Adham KA, Ahmad M. Adoption of web site and e-commerce technology among Malaysian public companies. *Industrial Management & Data Systems*. 2005; 105(9):1172-87.
- [23] Ojo T. Communication Networking: ICTs and health information in Africa. *Information Development*. 2006;22(2):94-101.
- [24] Perego A, Perotti S, Mangiaracina R. ICT for logistics and freight transportation: a literature review and research agenda. *Int J Phys Distr Log*. 2011;41(5-6):457-83.
- [25] L.Berry I, Lampo SK. Teaching an Old Service New Tricks. *Journal of Service Research*. 2000;2(3):265-75.
- [26] Zhang J, Chai K-H, Tan K-C. 40 Inventive Principles with Applications in Service Operations Management. *The TRIZ Journal* 2003;December.
- [27] Sahandi R, Alkhalil A, Opara-Martins J. Cloud Computing from SMEs Perspective: A survey Based Investigation. *Journal of Information Technology Management* 2013;24(1):1-12.
- [28] Kayne R. What is EFTPOS? : wiseGEEK; 2014 [cited 2014 26 February]. Available from: <http://www.wisegeek.com/what-is-eftpos.htm>.