

TECH & KNOWLEDGE BASED ECONOMY: HOW MOBILE TECHNOLOGIES INFLUENCES THE ECONOMICS OF SMALL AND MEDIUM ACTIVITIES

Antonio Tufano
Pegaso Online University, Italy
antonio.tufano@unipegaso.it

Roberto Valente
University of Molise, Italy
roberto.valente@unimol.it

Enza Graziano
Pegaso Online University, Italy
graziano@unipegaso.it

Modestino Matarazzo
Pegaso Online University, Italy
modestino.matarazzo@unipegaso.it

Abstract:

On summer of 2018, the mobile app ecosystem represents one of the biggest industries all over the world. It encapsulates millions of app developers, literally billions of smartphone owners who use mobile apps daily and many companies that uses apps and make money with them. In 2015, global mobile app revenues amounted to 69.7 billion U.S. dollars. In 2020, mobile apps are projected to generate 188.9 billion U.S. dollars in revenues via app stores and in-app advertising. These amounts represent an important incentive in small and medium companies. Due to their nature and objective, mobile technologies and knowledge-based economy could represent the major growth vehicle in all companies. Gaining useful information from user experience, they could use them to increase their profits. The aim of this work is to analyze the impact of mobile technologies usage for small and medium companies taking into account Italian situation. Moreover, we are interested in understanding the potentialities of mixing them with knowledge-based economy.

Keywords: Information Technologies, mobile technologies, knowledge based economy, SMEs

1. INTRODUCTION

Knowledge has become one of the critical driving forces for business success. Organisations are getting more knowledge intensive, they are hiring “minds” more than “hands”, and the needs for leveraging the value of knowledge are increasing. As a result, knowledge has been treated systematically much like other tangible resources and many organisations are exploring the field of Knowledge Management (KM from now on) in order to improve and sustain their competitiveness. In order to implement KM in Small and Medium Enterprises (SMEs from now on), Kuan Yew Wong (2005) proposes a more comprehensive model based on 11 factors. They are: management leadership and support; culture; strategy and purpose; Information Technology (IT from now on); measurement; organisational infrastructure; processes and activities; motivational aids; resources; training and education; and HRM. In this research we focus attention on one of this factors: IT. We analyse how IT, in particular mobile technologies, could influence knowledge management processes and improve profits for SMEs. We take into account that there is a growing worldwide appreciation of the catalytic role played by SMEs in the development process of most economies. This position is reflected in the form of SMEs’ increasing number and rising proportion in manufacturing, exports, employment, technical innovations and the promotion of entrepreneurial skills (Pillania, 2008). So we decided to analyse the potentialities of mobile technologies in increasing knowledge and its dimensions to better apply knowledge based processes in SMEs’ activities. It is indisputable that IT is one of the key enablers for implementing KM. As we can see on techopedia.com: “*Information Technology (IT) is a business sector that deals with computing, including hardware, software, telecommunications and generally anything involved in the transmittal of information or the systems that facilitate communication*”.

IT involves many things. For instance, let’s consider an IT department operating in a company. There are many people with many jobs and different responsibilities. These responsibilities range from keeping systems and data secure to keep networks up and let them running. There are people who input data, people who manage databases and people who do programming. There are also the decision makers, such as Chief Information Officers (CIOs), who decide how an IT department will operate and what components will be purchased. IT also includes the management of data, whether it is in the form of text, voice, image, audio or some other form. It can also involve things related to the Internet. This gives IT a whole new meaning, since the Internet is its own realm. IT involves the transfer of data, so it makes sense that the Internet would be a part of IT. IT has become a part of our everyday lives and continues to proliferate into new realms. IT capability has evolved from merely being a static archive of information to being a connector of a human to information and of one human to another. IT can enable rapid search, access and retrieval of information, and it can support collaboration and communication between organisational members. So IT plays an important role in Knowledge Based Economy (from now in KBE) in its different forms. Anyway, there are important factors to be considered when developing a KM system: simplicity of technology, ease of use, suitability to users’ needs, relevancy of knowledge content, and standardization of a knowledge structure or ontology (Yew Wong, 2005). So we decided, in this paper, to consider mobile technologies supporting KM processes and so KBE for SMEs.

Starting from the concept of knowledge in enterprises’ business activity, we analyse the SMEs in Italy and what they represent in national economy, then we focus on the diffusion of mobile technologies in SMEs, and we described the knowledge based economy with particular attention to the dimensions of knowledge. We tried also to give a real example of how mobile technologies could increase knowledge and consequently business profits.

2. KNOWLEDGE BASED ECONOMY

The economics of innovation have always focused on learning and technology, and innovation has always been aimed primarily at creating and diffusing knowledge. In recent years, however, learning and knowledge have attracted increasing attention as a result of claims that knowledge-intensive industries are now at the core of growth, and that we are now entering a new type of knowledge-driven economy or even a completely new form of ‘knowledge society’ (Smith, 2002).

The term knowledge-based economy has been referred by Benoit Godin (2006) to at least two characteristics of the new economy. Firstly, knowledge would be more quantitatively and qualitatively important than before. Secondly, applications of information and communication technologies (ICT) would be the drivers of the new economy.

There is a difference between Knowledge Economy and Knowledge Based Economy reported in different works in literature. Phil Cooke et al. (Cooke & Leydesdorff, 2006) define such differences. They reported that this two concepts are common terms nowadays that are often used synonymously. “Knowledge Economy” is the older of the two concepts, with its origins in the 1950s. It focused mainly

on the composition of the labour force. The term 'knowledge-based economy', instead, has added the structural aspects of technological trajectories and regimes from a systems perspective. Livraghi (2007) defines Knowledge Economy as a new subject of the economic theory that deals with knowledge as an economic good and with connected effects on individual and collective wellness. On the other hand she defines "Knowledge Based Economy" as a new historical phase, an important change, similar to the arrival of economy of big industry. It could generate a new economic theory. The knowledge economy is the system of consumption and production that is based on intellectual capital; it is in turn at the basis of knowledge based economy. The knowledge economy typically represents a large component of all economic activity in developed countries. In a knowledge economy, a significant part of a company's value may consist of intangible assets such as the value of its workers' knowledge (intellectual capital). In the Information Age, the global economy moved towards the knowledge economy. The transition to the Information Age includes the best practices taken from service-intensive, manufacturing-intensive and labor-intensive types of economies. In addition, knowledge-based factors create an interconnected and global economy where sources of knowledge, such as human expertise and trade secrets are crucial factors in economic growth and they are considered important economic resources.

The knowledge economy addresses how education and knowledge (typically called "human capital") can serve as a productive asset or a business product since innovative and intellectual services and products can be sold and exported and can yield profits for individuals, the businesses and the economy. In the knowledge economy, products and services that are based on intellectual expertise advance technical and scientific fields encouraging innovation in the economy as a whole.

Academic institutions, companies engaging in research and development, programmers developing new software and search engines for data and health workers who use digital data to improve treatments are all examples of components of a knowledge economy. These brokers in an economy pass on their knowledge and services to workers in more traditional fields. For example, farmers may use apps and digital solutions to manage the crops on their farm (investopedia.com, 2011).

In general, we can talk about knowledge economics every time we need to face an economic segment whose economic value (utility) comes out from knowledge. Human work does not transform raw material, but it generates new knowledge that will be used to transform raw material and generate utility. The knowledge could provide useful service without transform raw material but simply giving information, advices, notices that generate utilities directly to users. Cost reduction, new product and service, production of means or wishes are some examples of utilities generated from knowledge.

To better understand the real utility of knowledge based economy we analysed the definition of knowledge and how mobile technologies can be used to improve the aspect of knowledge and consequently the profits of SMEs.

In order to achieve this objective, it's important to consider the dimensions composing the concept of knowledge. In particular, Bengt-Ake Lundvall et al (1994) defined knowledge highlighting 4 dimensions:

- *know what*: concerning the owning of information, the knowledge of the facts. It represents the information that can be transmitted with data and published using databases;
- *know why*: it concerns the principles and laws of nature, the human mind and society. It represents the theoretical knowledge at the base of scientific and technological research. It allows to innovate production processes and products deriving from them and reduce error frequency in procedures;
- *know how*: it concerns mainly work experience of individuals. They share experiences in groups with uniform practises. It constitutes the human capital of an enterprise;
- *know who*: it permits to identify people that knows how to do something and that knows the solutions to hard problems.

3. THE MOBILE TECHNOLOGIES IN SMALL TO MEDIUM-SIZED ENTERPRISES

According to European definition (2003), an enterprise can be considered as Small or Medium when it respects some specific requirements dealing with the number of employees and with the sales volume (see the Table 1).

Category	Employees		Sales volume		Assets
Big enterprise	>/ 250	or	> € 50 mln	and	> € 43 mln
Medium enterprise	<250	and	</ € 50 mln	or	</ € 43 mln
Small enterprise	<50	and	</ € 10 mln	or	</ € 10 mln

Table 1. Requirements for Big, Medium, Small and Microenterprises.

The 2017 Report about Italian Small to Medium-sized Enterprise (CERVED, 2017) says that in 2016 this kind of enterprises had a growth both about their number in national territory and about economic-financial indexes. According to a Market watch PMI edited by Banca IFIS Impresa in March 2018, in Italy there are 760 thousands PMI, that is 76% of all enterprises; 86% of enterprises are micro-sized (sales volume under 2 thousands euros).

The analysis of economic and financial indexes highlights an increase of earnings, added value and gross margins but also a more remarkable investment (+7.8%).

The CERVED report also highlights the necessity to invest more and more in innovation. Only 0,17% of the sales volume is invested in Research and Development (Banca IFIS, 2018).

What about Digital Innovation?

In 2017 DOXA institute conducted a study dealing with 900 Italian SME. Despite the increasing awareness about the importance of digitalization, web marketing and mobile systems, only for 63% of them a website is available.

For this reason, in particular we want to focus on mobile systems, such as mobile applications, because Italian SME are still far from this kind of investment. We would take a look to the benefits deriving from the use of mobile applications for SME, taking into account that an individual controls the smartphone on average 150 times a day. First of all, mobile Apps are important in the marketing of the enterprise. As they allow instant accessibility, users can immediately have information about the enterprise. They increase the brand visibility making it very powerful, as they expose the brand when user checks the phone even if he/she didn't plan it. A mobile application allows to have a direct connection with users/customers, providing them with marketing materials, notifications of deals and sales, and increasing fidelity. Finally, a properly executed, dynamic and good App can increase the perception of quality of the enterprise because it can show a serious image of the company together with its spirit of innovation closer and closer to the customer.

Moreover mobile applications can be used in order to facilitate and to optimize the management of the company, helping to improve length of time and performance. For example, there are apps aimed at managing tasks and organize the job; apps facilitating teamwork, allowing to share, to edit and to modify contents and documents; apps for easy phone conferences, apps for organizing projects or for managing sales, and so on.

4. HOW MOBILE TECHNOLOGIES CAN INCREASE KNOWLEDGE: THE REAL EXAMPLE OF A MEDIUM ENTERPRISE

With particular reference to mobile applications, how do mobile technologies affect knowledge management process of an enterprise? Does mobile application usage increase knowledge resulting in real benefits for enterprises?

To answer those questions, we consider a real enterprise operating in Molise in the sector of garbage. The enterprise has 65 employees and it can be classified as medium enterprise (see table n. 1). The enterprise mainly manage separate collection of waste in different municipalities of region Molise.

We try to analyse the factor that influences knowledge management process, and in particular how Information Technology (mobile technologies) could increase the dimensions of knowledge described before (see section 2). We refer to the daily activity of the enterprise in a single municipality to describe the work process.

Two employees start collecting different types of waste (one different type every day) using a small track and cruising every streets of the municipality to cover every house and commercial activities. Then the employees go back to recycling area, they load a bigger truck and at the end of collection, they deliver the wastes to a waste center.

We think that collecting knowledge in different dimensions can improve costs and time of work of the employees and of enterprise itself. To do that, we will analyse what kind of technologies could be implemented by the enterprise and how to use them with reference to different dimension of knowledge.

We propose a set of different technologies: a mobile application for the citizens of the municipality, a web admin tool for the municipality, a web admin tool for the enterprise and some mobile hardware tool to detect what kind of waste has been taken out.

In particular the mobile application will allow citizens to consult what kind of waste has to be taken out and how, it will allow citizens to advice the enterprise about problems concerning environment, and it will permit to request the pick up of bulky wastes. The municipality through the web admin tool could insert and manage useful information for citizens and communicate the problems and requests to the enterprises. The enterprise will have access to all the information coming out from web and mobile applications of the municipality and will use the mobile hardware to detect how many times the citizens take out a particular type of waste and to monitor track movements. In the following table we describe

how proposed technologies could match dimensions of knowledge improving so knowledge economy of the enterprise itself.

Dimension	Brief description	Proposed solution advantages
know -what	The knowledge of the fact	<p>The solutions proposed can increase information related to citizens and their routines, for example through a mobile application containing a feedback section. The retrieved information could be used by enterprise to understand users' needs and improve the services given to citizens.</p> <p>Enterprise could use a mobile hardware to collect information about type of waste, about position of citizens' houses to optimize routes done to pick up wastes.</p> <p>The web admin tool can help enterprises to understand how many citizens reside in the municipality having a clearer map locating their houses and how to reach them.</p>
know-how	Sharing work experience with humans	<p>The information gained by the usage of mobile hardware to track movements of the employees and the information gained by the mobile app and web tool about citizens routines and feelings surely would help the governance to better program and better educate employees in other municipalities in which the same enterprise operates.</p>
know-who	Identify people that knows	<p>The information based on the request and feedback of the users obtained by the usage of mobile and web tools could help to understand which employee would better solve the problems and use this knowledge to optimize the solving problem process of the enterprise.</p>

Table 2 – How to improve business processes analysing the application of technologies to some dimensions of knowledge.

The table shows a possible real application of a set of technologies to some dimensions of knowledge in business processes. This would be an example of how the information gained from technologies matches the principles of KBE.

5. CONCLUSION AND FUTURE WORKS

In the last years, knowledge has taken a more important role in economics of enterprises. We are now entering a new type of knowledge-driven economy or even a completely new form of 'knowledge society'. This work analyses knowledge based economy aspects matching them with technologies and in particular with mobile technologies, today even more popular and used in daily life. Proposing a set of possible technologies and adopting them in real processes of an enterprise operating in garbage sector, we highlighted few aspects in which technologies could help increasing knowledge.

In section 2, we pointed out that in order to increase knowledge the IT solution must have simplicity of technology, ease of use, suitability to users' needs, relevancy of knowledge content, and standardization

of a knowledge structure. The proposed solution, supported by mobile technologies, matches all these factors and helps enterprises to increase profits and to reduce costs improving daily processes. In the future, we would realize a survey and submit it to a set of SMEs to understand what kind of technologies they use in their activities. The survey will also help to understand if enterprises could adopt further technologies and how these technologies could increase knowledge taking into account its dimensions. We will propose a real IT solution to give to enterprises and we will evaluate the real impact deriving from using it.

REFERENCE LIST

1. Cooke, P., & Leydesdorff, L. (2006). Regional development in the knowledge-based economy: The construction of advantage. *The Journal of Technology Transfer*, 31(1), 5-15.
2. Five reasons why SMEs could benefit from a mobile app (2017). Retrieved from <http://www.smeweb.com/2017/04/13/five-reasons-smes-benefit-mobile-app/>
3. Godin, B. (2006). The knowledge-based economy: conceptual framework or buzzword? *The Journal of technology transfer*, 31(1), 17-30.
4. Information Technology (IT). Retrieved from <https://www.techopedia.com/definition/626/information-technology-it>
5. Livraghi, R. (2007). Economia della conoscenza. *Aggiornamenti sociali, luglio-agosto*.
6. Lundvall, B. Å., & Johnson, B. (1994). The learning economy. *Journal of industry studies*, 1(2), 23-42.
7. Panoramica sul mercato italiano (2018). Retrieved from https://www.bancaifis.it/wp-content/uploads/2018/03/MWPMI-_Marzo-2018_h15.00.pdf
8. Pillania, R. K. (2008). Strategic issues in knowledge management in small and medium enterprises. *Knowledge Management Research & Practice*, 6(4), 334-338.
9. Pmi italiane sempre più digitali (2017). Retrieved from <https://www.corrierecomunicazioni.it/over-the-top/pmi-italiane-sempre-piu-digitali-ma-il-40-resiste-all-innovazione/>
10. Racc. 6 maggio 2003, n. 2003/361/CE. G.U.U.E. 20 maggio 2003, n. L 124
11. Rapporto Cerved PMI 2016. Retrieved from <https://know.cerved.com/imprese-mercati/rapporto-cerved-pmi-2016/>
12. Smith, K. H. (2002). What is the Knowledge Economy? Knowledge intensity and distributed knowledge bases.
13. What is the "Knowledge Economy" (2011). Retrieved from <https://www.investopedia.com/terms/k/knowledge-economy.asp>
14. Yew Wong, K. (2005). Critical success factors for implementing knowledge management in small and medium enterprises. *Industrial management & Data systems*, 105(3), 261-279.