

THE ROLE OF INFORMATION SYSTEMS AND TECHNOLOGY IN INNOVATION MANAGEMENT OF SMES IN SOUTHERN TURKEY

Oya Hacire YÜREGİR¹
Danyal PEKER²

ABSTRACT

There has been very important changes in the world after globalization and advances in technology. Increasing rivalry has forced companies to be managed better using new management approaches and methods in order to survive. SMEs are more vulnerable in this competition due to limited budget and restricted management styles. Innovation has become one of the most important solution to this challenge in recent years. The objective of this study is to find out the effects of information systems and technology on SMEs innovation management approaches in Turkey.

While the material of the study was collected through questionnaires, nonparametric statistical analysis was applied for hypothesis testing. We sent 2000 surveys to the SMEs located in Southern Turkey and 103 surveys were collected. : H₁ Participants think that "Their company is innovative", H₁: Participants think that "Innovation is important for their industry", H₁: Participants think that "IT leverages innovation".

According to the findings: i. 70.9 % of respondents claim that strategy is important for competitiveness. ii.59.2 % of them claim that their company has a strategic plan. iii.68.9 % think that strong rivalry exists in their industry. iv.69.9 % say that IT is an important enabler in innovation. v.70.9 % mention that innovation is one of the main part of their strategy.

As a result, most of the SMEs in Turkey are aware of the importance of innovation and also the role of IT as an enabler of innovation. However, it is found that SMEs' infrastructure of IT is not adequate enough to compete and survive in the world.

KEYWORDS: *innovation, IT, SME, strategy, Turkey*

JEL CLASSIFICATION: *O32*

1. INTRODUCTION

All over the world, SMEs play an important role in the national economic development of any country. Due to their flexibility and adaptability, SMEs may contribute to the development of countries by providing employment, creating a skilled industrial base, producing innovation and increasing revenues through export.

Due to their quick decision-making abilities and risk-taking qualities, SMEs may be the excellent for innovation and sustainable initiatives to react to the challenges in changing environments.

KOSGEB (Small and Medium Business Development and Support Administration) defines small and medium size enterprises (SMEs) as companies with fewer than 250 employees. The SME sector in Turkey, including services, grew by 99.8% involving 76.7 % of total employment, 38 % of the capital investment and 26.5% of value of the created contribution (OECD, 2004). Politics and medium and long term economic strategies related to SMEs began in 1960s in Turkey and it has been strengthened in the 1980s. KOSGEB was established in 1990 with the mission of increasing

¹ Çukurova University, Turkey, oyuregir@yahoo.com

² Small and Medium Business Development and Support Administration, Turkey, danyal.peker@kosgeb.gov.tr

the power of SMEs in economic and social development by providing support and services that will improve their competitiveness. One of the three strategic purpose of KOSGEB for the years from 2016 to 2020 is to increase the capacity of providing qualified service by strengthening the institutional structure and perception (KOSGEB, 2015).

SMEs must be able to react quickly to international market indications to take advantage of innovation and trading opportunities. This means that they need right information at the right time to enhance their competitiveness and productivity. Using information systems and technology, they can be aware of both the threats and opportunities of the external environment and also the strengths and weaknesses of internal environment.

The objective of this study is to find out the role of information systems and technology on SMEs innovation management approaches in Turkey. Furthermore, the readiness of SMEs' IT Information Technology) infrastructure was analyzed in order to find out the gaps for emphasizing the points to be improved.

2. LITERATURE REVIEW

Oslo Manual (2005) defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations." The Manual classifies four types of innovations: product innovations, process innovations, organizational innovations and marketing innovations. A product innovation involves a new good or service that comprises important improvements in technical specifications, components and materials, and incorporated software. A process innovation is the employment of a new or notably improved production or delivery method. A marketing innovation is the application of a new marketing method consisting of significant changes in 4P (product design or packaging, product placement, product promotion or pricing). An organizational innovation is to put a new organizational method such as new business practices or external relations into action at the firm. Organizational innovations are carried to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction, gaining access to external knowledge or reducing costs of supplies. Supply chain management systems, business reengineering, lean production, and quality-management systems are examples of the implementation of organizational innovations.

There are many studies that show a positive relationship between IT investment and company productivity levels (Brynjolfsson & Hitt, 1995; Lichtenberg, 1995). Miyazaki et al. (2012) claims that IT has impact on productivity of the companies, but those improvements depend on how the IT used. Information technologies and systems can help companies reduce costs, enable more effective processes and bring products to market faster than in the past. IT can take significant role in product innovation with software such as CAD/CAM, CATIA, etc. B2B electronic commerce, EFT and CNC applications can be a good example for companies to implement process innovation. Marketing innovation can be put into operation by IT such as pricing decision support systems, electronic commerce, social media, CRM, etc. Organizational innovations can be supported by IT implementing ERP software, B2E electronic commerce, CASE tools for business process engineering implementation, etc. According to Dodgson et al., 2006, ICT enables the exchange of ideas and information moving from one place to another as a digital infrastructure for the inexpensive, rapid and secure storage. Its infrastructure supports also many value-adding services, such as enterprise resource planning, web services and customer relations management.

There are many factors affecting the innovation efforts of SMEs. According to the literature those can be listed as: collaborations with suppliers and customers, links with knowledge centers, education level of the company, financial resources and aids, strategy, technology policy, structure, and investments in R&D (Keizer et al., 2002). According to the authors automation and production technology implementation are related with the strategy factor.

3. RESEARCH DESIGN AND METHODOLOGY

3.1. Research Context and Research Questions

The purpose of this research is to find out the relations of IS and IT on SMEs innovation management process. Their thoughts on IS and IT, their IT infrastructure and strategy were examined in order to show the relations among these parameters.

Our research involved these questions: Is innovation important for your industry? How fierce the rivalry in your industry? Do you think that your company is innovative? Do you think that IT leverages innovation? Do you have a strategic plan? Does your strategic plan includes innovation activities? Does innovation play an increasing role in export and market share?

3.2. Hypotheses

While the main hypotheses are listed below, sub hypotheses are set to find out the effect of SME size for each hypothesis.

H₁- Participants think that "Their company is innovative".

H₁- Participants think that "Innovation is important for their industry".

H₁- Participants think that "IT leverages innovation".

3.3. Methodology (Data and Methods)

The sample used for this research was randomly selected from SMEs in southern Turkey mainly from three cities: Adana, Mersin and Osmaniye. The total of 2000 surveys was posted online on questionpro.com and 103 of them were proper for statistical analysis.

While the packaged software SPSS 19 for Windows was used for the statistical analysis, chi square test and sign test were carried out and the p-value <0.05 was evaluated as significant.

Sign Test

Main hypotheses were tested using sign test. While T value is calculated by summing the "yes" answers to the questions, n value is the total number of "yes" and "no" answers.

$$t=1/2(n+ w_{\alpha/2} \sqrt{n}) \quad (1)$$

$$\alpha=0,05 \text{ ise } w_{\alpha/2} = -1.96 \quad (2)$$

$$t=1/2(103+(-1.96\sqrt{103})) \quad (3)$$

$$t= 41.55 \quad (4)$$

After putting the values in formula, t is compared with T value. If T value is greater than t value, the hypothesis is accepted. Otherwise, it is rejected.

Chi-Square

Sub hypotheses were tested by using chi-square test. It is a statistical method assessing the goodness of fit between a set of observed values and those expected theoretically. The upper tail of the chi-square distribution is used as a critical region to test the null hypothesis. If the observed distribution is sufficiently different than the expected distribution, the null hypothesis is rejected and that means the variables are related.

3.4. Descriptive Statistics

As seen in Table 1, among the respondents 21 (20.4 %) were women and 82 (79.6 %) were males. The groups according to the position were listed as: 54.5 % were owner of the company, 25.2 % were top and middle managers, and the rest was engineers and specialists. While there were 32 micro companies in our study, the quantity of small and medium companies were 49 and 22

respectively. Table 1 also shows the revenues, IT investment amounts, patent ownerships and accreditations of the companies. While only 25 out of 103 companies have had patents, 67 of them had ISO9001 standards.

Table 1. Descriptive statistics of participants

Factors	n	%
Gender		
Men	82	79.6
Women	21	20.4
Total	103	100.0
Position		
Owner	56	54.5
Top manager	19	18.4
Middle manager	7	6.8
Engineers and specialists	21	20.4
Total	103	100.0
City		
Adana	26	25.2
Mersin	27	26.2
Osmaniye	31	30.1
Other	19	18.4
Total	103	100.0
Size of the company		
Micro (1-9 employees)	32	31.1
Small (10-49 employees)	49	47.6
Medium (50-249 employees)	22	21.4
Total	103	100.0
Revenue		
<250,000 Euro	37	35.9
>250,000 < 2,000,000 Euro	37	35.9
>2,000,000 x< 10,000,000 Euro	29	28.2
Total	103	100.0
IT investment		
<2,500 Euro	32	31.1
>2,500 < 25,000 Euro	38	36.9
>25,000 < 125,000 Euro	23	22.3
>125,000 < 250,000 Euro	9	8.7
>250,000 x< 750,000 Euro	1	1.0
Total	103	100
Patent ownership		
Micro (1-9 employees)	9	8.7
Small (10-49 employees)	9	8.7
Medium (50-249 employees)	7	6.7
Total	25	24.1
Accreditations		
ISO 9001	67	65.0
ISO14001	24	23.3
CE	23	22.3
ISO22000	18	17.5
OHSAS 18001	15	14.6

Source: authors

4. RESEARCH RESULTS

Table 2 discerns the distribution of „yes” and „no” answers related to the hypothesis statements.

Main hypotheses test results are listed below.

H₁- Participants think that “Their company is innovative”.

For (T=74, n=103), T>t, 74>41.55: H₁ hypothesis is accepted. Thus, most of the companies think that their company is innovative.

H₁- Participants think that “Innovation is important for their industry”.

For (T=72, n=103), T>t, 72>41.55: H₁ hypothesis is accepted. Thus, most of the companies think that innovation is important for surviving in their industry.

H₁- Participants think that “IT leverages innovation”.

For (T=69, n=103), T>t, 69>41.55: H₁ hypothesis is accepted. Thus, respondents think that IT is an important factor for implementing innovation in the company.

Table 2. Distribution of the hypotheses answers according to the size of the company

Size of the company	The company is innovative			Innovation is important for the industry			IT leverages innovation		
	No	Yes	Total	No	Yes	Total	No	Yes	Total
micro (1-9 employees)	9	23	32	12	20	32	11	21	32
small (10-49 employees)	14	35	49	14	35	49	18	31	49
medium (50-249 employees)	6	16	22	5	17	22	5	17	22
Total	29	74	103	31	72	103	34	69	103

Source: authors

After finding out the results of main hypothesis testing, whether the size of the SMEs had any effect on the findings were investigated. As seen from Table 3, it was found that company size had no relationship with the hypothesis.

Table 3. Results of sub hypothesis testing

Sub Hypotheses	χ^2	df	Asym.sig (2 sided)	Accept / Reject
H ₀ : The size of the company has no effect on the participants' thoughts of “company is innovative”	0.013	2	0.994	Accept 0.013<10.59
H ₀ : The size of the company has no effect on the participants' thoughts of “innovation is important for the industry”	1.456	2	0.483	Accept 1.456<10.59
H ₀ : The size of the company has no effect on the participants' thoughts of “IT leverages innovation”	1.386	2	0.500	Accept 1.386<10.59

Source: authors

After analyzing innovation related findings, next the results related to information systems and technology were observed. Table 4 and Table 5 give ideas about IT infrastructure and IT strategy of SMEs. While only 24.27 % of the respondents use IT for strategy management and also prototype development, 28.15 % of them benefit from IT for R&D and process development.

Table 4. Distribution of the IT related answers according to the size of the company

Size of the company	Information systems are used for strategy management			Information systems are used for R&D and process development			Information systems are used for prototype development		
	No	Yes	Total	No	Yes	Total	No	Yes	Total
micro (1-9 employees)	23	9	32	21	11	32	20	12	32
small (10-49 employees)	41	8	49	41	8	49	41	8	49
medium (50-249 employees)	14	8	32	12	10	22	17	5	22
Total	78	25	103	74	29	103	78	25	103

Source: authors

Table 5 shows the list of information systems starting from the least used by SME according to our study. While information systems help decision making process such as ES (2), DSS (6), and ERP (24) were used less, systems which are structured and traditional such as accounting (80) and payroll (63) had the higher frequency.

Table 5. Distribution of information systems used by SMEs in ascending order

Type of information systems (IS)	Number of companies using IS	Percentage among total
RFID	1	1.0
CIM	1	1.0
Expert systems (ES)	2	1.9
Decision support systems (DSS)	6	5.8
Export	8	7.8
CAD/CATIA	8	7.8
EFT	10	9.7
Marketing	11	10.7
GIS	11	10.7
POS integration	16	15.5
MRP	18	17.5
E-commerce	18	17.5
CAD/CAM	22	21.4
Barcoding	23	22.3
ERP	24	23.3
Logistics and Distribution	26	25.2
Sales	35	34.0
Quality control	35	34.0
Production planning and control	49	47.6
Office automation	50	48.5
Inventory control	54	52.4
Payroll and personnel management	63	61.2
Accounting	80	77.7

Source: authors

CIM, GIS and electronic commerce are cutting edge approaches in nowadays competitive business and they can create breakthroughs for the companies by streamlining business processes and decreasing cost in long term.

Gibson and Nolan (1974) stated four phases in the development of corporate data processing applications: the initiation, expansion stage, formalization and maturity phases. While the initiation

phase is the usage of accounting software, the expansion phase involves the use of partially-optimized software applications. In the formalization phase IT investment is managed from a company-wide perspective. The maturity phase is described as supporting corporate decision making by investing in information systems. According to the results of this survey, Turkish companies in southern Antalya take place in the second phase. Despite companies are aware of the power of IT as a leverage to innovation, they cannot benefit it effectively due to the lack of understanding and accessing to the maturity phase of IS applications.

5. CONCLUSION

Turkish SMEs believe that IT and IS are powerful tools for innovation. However, they do not invest on IT and they do not have companywide IT strategic plan that will help them for better decision making. Because of SMEs limited budget, governments should support IT usage of SMEs by offering different solutions such as tax-free computers, low price broadband, support for IT staff wages, etc. Furthermore, SMEs should get professional help in order manage their IT investment for being aggressive in innovation.

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