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The Reseach & Development and Innovation Capacity of Small and Medium Sized Enterprises in IMES

Gizem Akıncı[a]*, Zafer Utlu[b]

[a]*Istanbul Zaim University, Faculty of Business Administration, Istanbul 34000, Turkey*
[b]*Istanbul Aydin University, Faculty of Mechanical Engineering, Istanbul 34000, Turkey*

Abstract

Small industrial estates and industrial zones are an important contribution to economic and social development. Small industrial estates combined with various industrial policies, such as the clustering of Small and Medium Sized Enterprises (SME) are very important for the global economy. Clustering approach reduces transaction costs and increases productivity between firms by being together. The firms which are producing complementary and byproducts for each other together and within a program is an efficient way to be competitive and profitable. The studies related with the small industrial estates suggest that the relationship established between these business networks is providing a basis for Research and Development (R & D) and innovation. IMES Industrial Estate meets a significant portion of industrial machinery and spare parts of medium and large scaled industries with 150 Social Facility, 1150 workplace operating in 50 different areas and more than 12 thousand employees in Turkey. With this research, we want to analyze the SMEs' R & D and innovation capacity in IMES Industrial Estate and we will recommend some ways to improve the R & D and innovation capacity. As of April 2013, the SMEs located in IMES were included in the study. The survey was administered to 713 out of 851 firms. 580 firms has reponded to survey. As a result of this research, R & D and innovation capacity of SMEs' in IMES are found to be low. According to this current situation identified with this research, we will make some suggestions to improve R& D and innovation capacity in IMES.

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Keywords: R & D, innovation, SMEs

* Corresponding author. Tel.:+902126627723.
E-mail address: gizemsayan@hotmail.com

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1. Introduction

Small Industrial Estates and Industrial Zones are making an important contribution to economic and social development. The main parameter of success is competition in today's world. Small industrial sites combined with various industrial policies, such as the clustering of SMEs with many and various sectors are very important for the global economy and competitiveness. The clustering approach reduces transaction costs between SMEs and increases their productivity by being together. The firms which are producing complementary and byproducts for each other together and within a program is an efficient way to be competitive and profitable. As a result the industrial zones make contribution to production increase, exports growth, additional jobs in the local area economy.

2. Literature Review

The industrial competitiveness refers to the ability to produce goods and services according to international market standards. A company's internal and / or external competitiveness in the market is related with being superior in terms of product price and quality against competitors. The main factors that determine the competitiveness is technology and innovation. (Harrison, 1992) If companies want to have a competitive advantage over competitors, they must constantly renew technology and innovation to improve their performance. Increased market competition is forcing companies to renew their manufacturing technology capacity and to make faster innovations. New product development and product diversification is possible with innovative processes, technology development, innovation systems and regular R & D activities. (Henderson et al., 2001) Studies between SMEs, show that the relations established between these business networks form the basis of R & D and innovation activities. Therefore, in industrialized countries, in order to improve SMEs effectiveness and technological infrastructure, the businesses operating in similar fields are developing alliances and partnerships. The studies related with the small industrial estates suggest that the effectiveness of these networks in providing the emergence of innovative activities is related with the R & D capacity. (Harrison, 1992; Utlu et al., 2007; Utlu et al., 2008; Utlu et al., 2015)

3. Methodology

3.1. Research Goal

IMES Industrial Estate meets a significant portion of industrial machinery and spare parts of medium and large scaled industries with 150 Social Facility, 1150 workplace operating in 50 different areas and more than 12 thousand employees in Turkey. There are predominantly special machine manufacturers, automotive supply industry, metal casting industry and white goods manufacturers in IMES. The R&D and innovation capacity of SMEs in IMES is not high. In this research, we aim to analyze the SMEs' R & D and innovation capacity in IMES Industrial Estate and we will recommend some ways to improve the R & D and innovation capacity. To test the propositions, a field survey using questionnaires was conducted.

3.2. Sample and Data Collection

As of April 2013, the SMEs' located in IMES' were included in this study. Full census survey and sampling methods were applied together. The number and status of the companies participating in the survey are shown in Table 1 .The survey was administered to 713 out of 851 firms. 580 firms have reponded to survey. The rate of response is %68.15. The manufacturing sector seems to be the largest cluster with 91%. The remaining 9% has already been allocated to other parts of the industry. The mining and quarrying sector is the second in size with %2. This situation is indicating that IMES is an intensive manufacturing zone.

3.3. Analyses and Results

In this part of the study, manufacturing companies in IMES were examined according to what extent they take place in technological efficiency and technological change and the resources for R & D activities and technology. Thus, a general understanding of the technology structure and level in IMES will be explained. The first question was asking whether the companies had a unit which is responsible for regular R & D activities. 28.79% of the companies stated that they had R & D unit in the company. As 53.57's% stated that they had no R&D unit, 11.83% stated that they receive consultancy if needed. (Table 1)

Table 1. Do you have a unit which is responsible for regular R & D activities?

Size (person)	Number of companies	Yes, we have R & D unit	(%)	No, we don't have R & D unit	(%)	Receive consultancy if needed	(%)	Others	(%)
2-5	247	62	25.13	140	56.68	28	11.23	17	6.95
06-10	197	52	26.35	105	53.38	29	14,86	11	5.41
11-20	79	32	40.63	38	48.44	2	3.13	6	7.81
20-40	35	9	26.67	21	60.00	5	13.33	0	0.00
More than 41	22	10	47.37	7	31.58	5	21.05	0	0.00
Total	**580**	**167**	28.79	**311**	53.57	**69**	11.83	**34**	5.80

The types of R & D activities carried out in the companies are as follows: 29.14% answered that R & D activities were carried out in basic research areas. 25.41% of the respondents were doing applied research. Experimental development was determined as 20.36%, while the quality control as 15.07%. (Table 2) According to these results it is seen that medium and large scale firms give more importance to R&D activities.

Table 2. What are the types of R & D activities carried out in your company?

Size (person)	Number of companies	Basic research areas	(%)	Applied research	(%)	Experimental development	(%)	Feasibility	(%)	Quality control	(%)	Modelling	(%)
2-5	247	154	29.28	142	27.00	117	22.24	11	2.09	51	9.70	51	9.70
06-10	197	113	27.63	104	25.43	65	15.89	22	5.38	83	20.29	22	5.38
11-20	79	56	34.15	34	20.73	37	22.56	6	3.66	28	17.07	3	1.83
20-40	35	14	20.00	21	30.00	21	30.00	0	0.00	14	20.00	0	0.00
More than 41	22	15	38.46	6	15.38	6	15.38	6	15.38	6	15.38	0	0.00
Total	**580**	**352**	29.14	**307**	25.41	**246**	20.36	**45**	3.73	**182**	15.07	**76**	6.29

A significant portion of the companies in IMES obtained the technology with their own knowledge and experience in the early establishment phase. The rate of obtaining technology with their efforts is 57.92% and the rate of using domestic technology is 15.67%. Some companies are supported through imports (12.67%) Ratio of firms with a license agreement (8.00%) is low. Obtaining technology by foreign and partnership facilities is 3.0%. It is seen that the companies surveyed in IMES are using their own resources in selection and implementation of technology. Another question was to understand whether the innovations were made on a regular basis or not. The answers were as follows: 32.14% of the companies stated that they were making innovations regularly. 31.47% stated they weren't. (Table 3) According to these results it is seen that medium and large scale firms give more importance to innovation.

Table 3. Are you making innovations on a regular basis?

Size (person)	Number of companies	Yes, regularly	(%)	No	(%)	Receive consultancy if needed	(%)	Others	(%)
2-5	247	74	29.95	90	36.36	61	24.60	22	9.09
06-10	197	57	29.05	59	29.73	56	28.38	25	1.,84
11-20	79	37	46.88	25	31.25	14	17.19	4	4.69
20-40	35	12	33.33	8	23.33	12	33.33	4	10.00
More than 41	22	6	26.32	2	10.53	12	52.63	2	10.53
Total	**580**	**186**	32.14	**183**	31.47	**154**	26.56	**57**	9.87

In response to the question “Which of the following have you made between 2008-2012 in the form of innovation?” the answers are as follows: Development and improvement of current products has the largest share of 54.69%. Diversification of products has a rate of 28.68%. 15.63% of the companies are using total quality management. (Table 4) In response to the question “How do you monitor the innovations and changes related with production?” the answers are as follows: 34.38% of the companies are monitoring innovations in the country has the largest share of 34.38%. Those who are monitoring the fairs held in the country ranked second in 31.47%. The ratio was determined as 13.39% of those who do not follow.

Table 4. Which of the following have you made between 2008-2012 in the form of innovation?

Size (person)	Number of companies	Development and improvement of current products	(%)	Imitate new products	(%)	Product diversification	(%)	Customizing	(%)	Development of new product	(%)	Development of new production technic	(%)
2-5	247	143	57.75	4	1.60	62	25.13	12	4.81	17	6.95	9	374
06-10	197	104	52.70	5	2.70	71	35.81	5	2.70	5	2.70	7	3.38
11-20	79	41	51.56	4	4.69	20	25.00	4	4.69	6	7.81	5	6.25
20-40	35	19	53.33	2	6.67	8	23.33	0	0.00	6	16.67	0	0.00
More than 41	22	12	52.63	0	0.00	6	26.32	2	10.53	0	0.00	2	10.53
Total	**580**	**317**	54.69	**16**	2.68	**166**	28.68	**23**	4.02	**35**	6.03	**23**	4.02

The answers in order to understand the systems and standards that the companies using for innovations and technological change are as follows: Using computer-aided design and manufacturing has the largest share of 42.86%. Using Internet has a rate of 25.89%. 15.63% of the companies are using total quality management. In response to the question "Do you know that you can cover your R & D and innovation expenditures by the help of government incentives?" the answers are as follows: 54.46's% of respondents stated that they did not. The companies using incentives continuously is 11.61%. Though 12.50% of the companies applied for the incentives, they were not accepted. This situation is also showing a need for training in applications. The ratio of R & D and innovation expenditures of companies to total turnover are as follows: 37.32% of the companys' innovative expenditures are less than 1% of the total turnover. (Table 5)

Table 5. The ratio of R & D expenditures of companies' to total turnover

Size (person)	Number of companies	Less than 1%	(%)	Between 1-3%	(%)	Between 4-6%	(%)	Between 6-10%	(%)	Between 10-20%	(%)	More than 20%	(%)
2-5	187	92	37.43	40	16.04	32	12.83	36	14.44	17	6.95	30	12.30
06-10	148	75	37.84	61	31.08	21	10.81	16	8.11	13	6.76	11	5.41
11-20	64	31	39.06	10	12.50	19	23.44	10	12.50	7	9.38	2	3.13
20-40	30	13	36.67	0	0.00	13	36.67	6	16.67	4	10.00	0	0.00
More than 41	19	6	26.32	6	26.32	0	0.00	2	10.53	8	36.84	0	0.00
Total	**448**	**216**	37.32	**115**	19.87	**85**	14.73	**70**	12.05	**50**	8.71	**43**	7.37

Table 6. In which ways do you ensure licenses, know-how, royalty etc.?

Size (person)	Number of companies	Receive consulting	(%)	Provide services with joint applicants	(%)	By purchasing from companies	(%)	We don't have a need	(%)	Buy for account	(%)	Buy for account	(%)
2-5	247	22	9.09	54	21.93	30	12.30	119	48.13	7	2.67	15	5.88
06-10	197	24	12.16	19	9.46	32	16.22	65	32.99	11	5.41	25	12.84
11-20	79	25	31.25	7	9.38	10	12.50	26	32.91	2	3.00	2	3.13
20-40	35	12	33.33	2	6.67	2	6.67	14	40.00	0	0.00	2	6.67
More than 41	22	5	21.05	0	0.00	7	31.58	9	40.91	0	0.00	0	0.00
Total	**580**	**89**	15.40	**82**	14.06	**82**	14.06	**233**	40.15	**19**	3.35	**44**	7.59

23.79% of the respondents have received incentives from SMIDO (Small and Medium Industry Development Organization) while 3.45% received from STRCT (Scientific and Technological Research Council of Turkey). 71.21% of the companies stated they never received any incentive not know the R & D and innovation and research indicate that he did it. In this case, there is insufficient knowledge about promoting the company and also reveals the

necessity of education. In response to the question "In which ways do you ensure licenses, know-how, royalty etc.?" the answers are as follows: 40.15% of respondents answered that they do not have such a need. 15.40% of them stated that they receive consulting 14.06% of the respondents indicated that they provide services with joint applicants. (Table 6) It is understood that the companies have insufficient knowledge about licenses, know-how and royalty and they need training.

73.66's% of respondents declared that they did not have a university- industry cooperation. 14.06% of them stated that they were in need for that kind of cooperation. 7.14% of them stated that they had an efficient cooperation. (Table 7)

Table 7. Do you have a university-industry cooperation?

Siz (person)	Number of companies	Yes, we have	(%)	No	(%)	Yes, we are in need	(%)	Others	(%)
2-5	247	18	7.49	193	78.07	28	11.23	8	3.21
06-10	197	9	4.73	144	72.97	32	16.22	12	6.08
11-20	79	2	3.13	54	68.75	15	18.75	7	9.38
20-40	35	4	10.00	25	70.00	7	20.00	0	0.00
More than 41	22	7	31.58	13	57.89	0	0.00	2	10.53
Total	**580**	**41**	7.14	**427**	73.66	**82**	14.06	**30**	5.13

In response to the question "Have you applied for a model or trademark registration?" the answers are as follows: 24.66% of the respondents answered that they applied for national trademark registration. While 27.41% stated that they applied for royalty. 22.76's% of them have no application. (Table 8)

Table 8. Have you applied for a model or trademark registration?

Size (person)	Number of companies	Examined Patents	(%)	Utility model registration	(%)	Applied for national trademark registration	(%)	Unexamined patent	(%)	Royalty	(%)	International trademark registration	(%)	No application	(%)
2-5	247	4	1.62	48	19.43	42	17.00	0	0.00	84	34.01	9	3.64	60	24.29
06-10	197	13	6.60	21	10.66	59	29.95	5	2.54	50	25.38	0	0.00	49	24.87
11-20	79	8	10.13	13	16.46	28	35.44	0	0.00	11	13.92	4	5.06	15	18.99
20-40	35	0	0.00	2	5.71	10	28.57	8	22.86	8	22.86	2	5.71	5	14.29
More than 41	22	3	13.64	6	27.27	4	18.18	0	0.00	6	27.27	0	0.00	3	13.64
Total	**580**	**28**	4.83	**90**	15.52	**143**	24.66	**13**	2.24	**159**	27.41	**15**	2.59	132	22.76

46.90% of the companies surveyed stated that they did not monitor the techological developments in European Union (EU) and in other countries related with their industry. 39.66% of the respondents stated that they partially monitored. 10.86% stated they monitored the technology. The insufficient monitoring of competition a negative aspect for the competitiveness. (Table 9)

Table 9. Do you monitor the technological developments in European Union?

Size (person)	Number of companies	Partially	(%)	Yes	(%)	No	(%)	Others	(%)
2-5	247	87	35.22	20	8.10	134	54.25	6	2.43
06-10	197	85	43.15	15	7.61	91	46.19	6	3.05
11-20	79	35	44.30	12	15.19	29	36.71	3	3.80
20-40	35	17	48.57	5	14.29	13	37.14	0	0.00
More than 41	22	6	27.27	11	50.00	5	22.73	0	0.00
Total	580	**230**	39.66	**63**	10.86	**272**	46.90	**15**	2.59

10.86% of respondents stated that they had TSI (Turkish Standards Institute) Certificate. 21.72% of them declared they had ISO certificate. 4.83% of them stated they had CE Certificate. 59.31% of them did not have any certification. (Table 10) As the technology used is not certified in most of the companies, the competition is affected adversely. 45.00% of the respondents replied that they were lack of training departments. 20.69% of them had training departments. 29.31% of them stated that they did not need a training department. 47.41% of the respondents provided new technology and machinery training from the service companies. 25.69% of them got on the job training. 17.59% of respondents declared the employees learnt experientially. 5.86% of them made use of internet research.

Table 10. The certificates of the firms

Size (person)	Number of companies	TSI	(%)	ISO certificate	(%)	CE certificate	(%)	HACCP certificate	(%)	Others	(%)	No certificate	(%)
2-5	247	21	8.50	27	10.93	9	3.64	5	2.02	5	2.02	180	72.87
06-10	197	21	10.66	45	22.84	7	3.55	0	0.00	7	3.55	117	59.39
11-20	79	7	8.86	32	40.51	10	12.66	0	3.00	2	2.53	28	35.44
20-40	35	5	14.29	17	48.57	0	0.00	0	0.00	0	0.00	13	37.14
More than 41	22	9	40.91	5	22.73	2	9.09	0	0.00	0	0.00	6	27.27
Total	580	**63**	10.86	**126**	21.72	**28**	4.83	**5**	0.86	**14**	2.41	**344**	59.31

55.80% of the companies did not have any training during 2012-2013 and even they did not have any training plan for future. 17.86% of them had just training in 2012. 16.96% of them respondents had training in 2012 and also they had a plan for 2013. 9.38% of them stated that they just planned for 2013. This situation shows us that the companies are not placing importance on training. 42.63% of the respondents wanted training organized by IMES. 29.69% of them did not want any training. 15.40% of them stated they would like to be trained; however they did not have enough time. 9.60% declared they did not need training. The trainings requested by the companies are as follows: Those who wished to be trained in technological issues had a rate of 34.24% while 10.21% of them declared they wished training in business commerce. The percentage of the respondents who wished training about the legal act was 13.66%. Those who need occupational health and safety training were % 16.79. The ratio of those who need incentives training was 7.54%; R & D and innovation training need of the respondents were 3.21%. Those who wished to receive training in all subjects were determined as 14.32%.

10.49% of respondents stated that they continually monitor IMES website. 50.59% of them declared they monitor occasionally, while 38.62% of them did never monitor. The companies who know and use the IMES business development consultancy services are as follows: 40.69% of the respondents declared that they knew this service however they did never use before. 51.55% of the respondents did not know that IMES was giving consultancy. The companies who knew and used this service was just 3.28%. 4.48% of them stated that they knew and they used this service occasionally. The subjects that the companies wished to receive consultancy are as follows: 63.79% of the companies wished consulting in government supports. While 24.73 % of them stated they need consultancy in legislation and laws. 15.17% of them did not need any consultancy. Most of the firms were determined to be in need of a consultancy about government supports.

4. Conclusion

Few companies in IMES realize the technological change. One of the reason for this is, most of the small and medium-sized businesses are family companies in which the owners having a low level of education. Underdeveloped R & D awareness and innovation culture together with the incomplete institutionalization process are the other reasons for backwardness. Nevertheless, some of the companies in IMES monitor the innovations in manufacturing industry and they spread efforts on making innovations. 79.5 % of manufacturing companies in IMES stated that they made innovations related with production. Medium and large sized businesses in IMES give much more importance to R & D activities.

Development of IMES industry is related with improving the technology infrastructure and adapting the companies' culture to scientific research, innovation and technological development. Therefore, an action plan should be carried out in cooperation with especially SMIDO and other public and private organizations.

One of the major problems of the manufacturing companies in IMES is not monitoring technological innovations and to renew their technologies. The companies should resolve these problems either by receiving consultancy or forming partnerships and licensing agreements. However small and medium-sized businesses could not find this opportunity. Therefore, small businesses should be supported with technological information related to technology selection and renewal, quality and standardization and quality assurance systems for EU standards.

Being close to the Universities is a great opportunity for IMES. University-industry cooperation should be developed and knowledge and experience of both the industry and the University should be shared. IMES should take advantage of Universities' research opportunities and ensure cooperation in knowledge sharing and workforce training. The University-Industry Cooperation Coordination which will be established in IMES will prepare programs for training employees, managers and industry.

As stated in the analysis, IMES industry could not benefit from the advantages of government support and assistance. The number of enterprises that were unaware of the government support legislation was quite high. Therefore, there should be central institutions which would provide consultancy related to investment legislation.

IMES should establish its own training and research departments and the companies should be informed about the programs offered and staff / members should be encouraged for participation. One of the main targets of the EU is to develop the joint science and technology programs. In order to strengthen the technological capacity of the countries in the region, EU is implementing a five-year Framework Program. IMES Industrial Estate can also explore the possibilities of utilization of funds to increase competitiveness.

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