Determinants of Firm's Innovation in the MENA Region: a descriptive Analysis

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Abstract:

The paper tries to examine the relationship between some quantitative and qualitative variables to stimulate new ideas or creativity among the enterprises' staff. The enterprises using the formal training programs for permanent employee, education level of the manager, the firm's size and the enterprises innovation activities are considered as significant variables. We extract a sample of 6566 firms from MENA region available in the BEEPS database. The results show that innovation activity is founded better in firms with high level of manager education and size. The correlation coefficients, demonstrates a small positive correlation between enterprises' use of employee training and their innovation activities.

Keywords: innovation, training, MENA region, firm size, BEEPS data

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I. Introduction:

Following the high rate of changes in the technology and the environment, in addition to the mixture factors that play key roles in the future forecast of the enterprise and the instable competitiveness due to the new competitors, it is very important for the enterprise to respond to this change and to survive to keep their rate of market. From the most important factors, that the firm could invest to survive for a long period, is investing in the human capital by providing formal training because it seems as an update of the skills of the employees. From another side, the SME's that look to survive may consider acquiring knowledge and technology from external source (d'Alfonso & Giannangeli, 2012)

Both of human capital and innovation are regarded as underlying drivers of economic development. Different studies have emphasized the significant role of human capital in this context (Ali, Egbetokun, & Memon, 2018; Atif Awad, Noreha Halid, & Ishak Yussof, 2013; Pablo-Romero & Gómez-Calero, 2013; Pelinescu, 2015), while other studies have focused on the importance of innovation in the context of economic development (Augusto López-Claros, 2011; Fagerberg, Srholec, & Verspagen, 2009; Pece, Simona, & Salisteanu, 2015).

This article examines at first how formal training program of the employees is related to innovation activities of the firms, the effect of educational level of top manager on the innovativeness of the firm in addition to the size effect of the firm on the innovation .

Based on the foregoing, this study aims to contribute new evidence on the relation of training, educational level of top manager and size of the firm and the innovativeness of the firm. In this context, the paper is organized as follows: in the first a brief literature review about innovation and hypothesis development to mention. The next section is for result and discussion. Finally, we conclude with conclusion.

1. Literature review and hypothesis development

Innovation is the lifeblood of change; it destroys and recreates markets and firms (Schumpeter, 1950), and is a source of sustainable competitive advantage (Daellenbach, McCarthy, & Schoenecker, 2002). In a world filled with rapid changes, investing in innovation is the equivalent of holding options for the future. There are different fields that innovation is founded. From the important faces of innovation are discussed below.

1.1. Faces of innovation:

There are four faces of innovation segmented to two different types as it explained in figure 1.

In the figure 1, all the different types of innovation are presented. Each type of these innovation also divided to two types according to the goals want to achieve.

1.1.1 Technological innovation:

According to the study of (Krishnaswamy, Mathirajan, & Bala Subrahmanya, 2014) These activities use technology according to its important in innovation. Because, there are the activities that it uses technology, so in this time we will find technological innovation, that is mean we use technology to innovate. Therefore, we will see touch this kind of innovation in two places, the product or service from a side and the process of producing the product or giving the service in other side. There are two types of innovation that they use technology:

1.1.1.1 Product innovation:

According to the study of (Cheng, Chang, & Li, 2013) , In the way of bringing innovation into the level of the product, the innovation in the product will be realized in following some important procedures. In the first, we find that improving in technical specification as design, this kind of improvement need technology. To compare it with the kinds of innovation, we find that this is one of the incremental innovations because it keeps the characteristics of the product. From the important ways of innovation that are used in the level of product is by improving the component and materials. Using an incorporated software from the important technological innovation used in the level of the product for the result of innovating the product.

1.1.1.2 Process innovation:

In a hand, the process innovation characterized, following the study of (Ivanov & Avasilcăi, 2014), in the different procedures used to achieve the innovation in the process of the production. From the second hand, the innovation did not focus just in the product, but for all the processes of the creation from the idea to the ways of selling the product or service. In this point, we can find three important point of the process innovation as it shown in the graph:

a) Changes in techniques:

These techniques characterized in the different changes in the process, these technics may be will reduce from the consumption of the energy, reduce the time of the process pf production or distribution.

b) Changes in equipment:

With using new equipment for the procedure of innovation and these, equipment's will be of course equipment's with high technology.

c) Changes in software:

From the newest method of implementing innovation in the enterprise is following the technological development and changes, and using new software that will facilitate any procedure that was take many times to be executed in a short time with less consumption of energy and raw material with a high quality and less level of wastes.

1.1.2 Non-technological Innovation:

The second part, are the activities does not use technology, so it is not technological innovation, and we will touch this kind of innovation in both of organizational and marketing innovation. Why? , because it does need technology in the activity as it explained in the study of (Hyard, 2013). From this point, we can suggest, there will be a clarification in the meaning of the innovation, where in the first, we think that innovation is always related with technology, second in the activities that does not use technology machines or materials; we cannot think that it will be able to be innovated.

To more clarify the different types of the innovation and what they need to be innovated, the figure bellow presents this context in two different types of innovation separated in the term of using technology, so there will be technological innovation and non-technological innovation. These two types of innovation will be divided to the number of types supposed for each type.

For the non-technological innovation, we found two other types of innovation that did not need technology to be innovated. These are:

1.1.2.1 Marketing innovation:

According to (Halpern, 2010), Marketing is an important activity for the enterprises, according to its role from the creation of the product until selling it. Following the strong competitiveness in the market, the firms are obliged to look for new thigs to compete and to survive, there for the competitiveness appears as an important factor to innovate especially marketing innovation. (Gupta, Malhotra, Czinkota, & Foroudi, 2016). In addition, by using innovated method, it will be an innovated activity or marketing innovation.

These innovated activities could be segmented through the four Ps as it shown above in addition to use other new methods such as implementing new marketing method, involving significant changes in products, involving changes in promotion, pricing … etc.

1.1.2.2 Organizational innovation:

According to the different exchanges between enterprise and organization. The organization get an important role in the performance on the enterprise (Camisón & Villar-López, 2014). According to (Laforet, 2013), the organizational innovation has a greater impact on the small and medium sized enterprises.

1.2 Levels of innovation:

Following the number of circles in the firm environment, there are three levels:

1.2.1 Level of the firm:

This level is special for the firm itself (such as level of small family). It includes all operation and procedures of the firm, without counting the outside environment. In this level, the first role will return to the manager and employees. there for, there will be many things that could happen in this level such as innovation. This innovation includes all new things such as procedures, technics …etc. that were exist in the market (local or international) but new in our enterprises. There for, the important role of this innovation back to the manager (Dutta & Weiss, 1997; İzadi, Zarrabi, & Zarrabi, 2013; Pakes & Griliches, 1980)

1.2.2 Level of the market (local market, country):

The level of market (or level of local country) is the second level of the firm. It contains its proper operation and rules. The most important factor in this level is the competitiveness where in the first level, there is just firm. In this market the firm observes new obstacle to survive and compete. There for, the firm have to find new ways to survive. According to the technological development, there will be different procedures to exploit. From the important key success to survive is to innovate : (Elena Cefis & Orietta Marsili, 2003; Tohidi & Jabbari, 2012). Innovation in this level based on the competitiveness as key to innovation, create and exploit new skills (Joel Clarke, 2015).

1.2.3 Level of the world (international market):

The world level is the largest level that it includes both previous levels. This level englobes all parts of economy (such as, organization, institution, administration, competitors …etc). These parts characterize obstacles and barriers for the firms following the different outputs of each part. To survive in this level and to keep the market place, it is necessary for the firm to have its own touch in the market (new product, new technology, …).

1.3 Formal training programs and innovation:

Following the human capital theory developed by (Becker, 1964; Schultz, 1961), training can be considered as a measurement of human capital. The training of the employees has an important

interest from the researchers and the entrepreneurs following its positive impact on the productivity. Following the studies of (Howard, 1995; Thayer, Paul W., 1996) in the paper of (Salas & Cannon-Bowers, 2001, p. 472), the modern organization must specify a special interest for training .Following (Martínez-Ros & Orfila-Sintes, 2012), the innovation requires changes in human resources to overcome the lack of skills, for that the training it is from the important policies to foster innovation in the firm. According to (Dhar, 2015, p. 422) and (Dong Kyoon Yoo & Jeong Ah Park, 2007), the training helps to increase the employee performance. Therefore, the first hypothesis is as follows:
H1: Formal training programs affect the innovation of the firms in the MENA region.

1.4 Education level of top manager and innovation:

Human capital of the firm contains both of employees and managers. Therefore, in the second side of the employees, the top manager of the firm has its positive effect of the innovativeness of the firm following the studies of (Bantel & Jackson, 1989; Crowley & Bourke, 2017; Daellenbach et al., 2002).Also, several studies assume that the educational level is correlated with cognitive ability, higher levels of education should be associated with a team's ability to generate and implement creative solutions to complex problems. Their ability to generate creative solution may explain why people who are more educated have more receptive attitudes towards innovation (Kimberly & Evanisko, 1981). In addition, the companies are increasingly are choosing to fill new management posts from outside their own ranks' and that senior managers who are less infirmed about their own industry and its confederation of parts suppliers equipment suppliers , workers are customers are likely to exhibit a non-innovative bias in their choices (Robert H. Hayes & William J. Abernathy, 1980). Therefore, second hypothesis of this paper is as follows:
H2: Education level of the manager have a positive effect on the innovation of the firm

II.Results and discussion

The study population is composed of MENA firms based on BEEPS data. This firms operate in different sectors such as service, construction, industry …etc. According to data presented in Table1, maximum of the firms operate in the manufacturing sectors with more than 3700 firms in the sector. In the second place, the services sector with more than 1800 forms where the retail takes the third place with more than 800 firms. Sample of the study is 6566 firms presented in table 2 per size.

Following the table of the firm size. The sample of the BEEPs data contain 6566 firm segmented in 4 sizes. Within the 6566 firm, the highest rate is for the small firm (number of employees is between 5 and 19 employee) with 47.5%. In the second, the medium firms take the second place with 2258 firm (that it represents 34.4% of the firm surveyed). The third place for the large firms with 17.6%. following this sample, the economic tissue contains high rate of firms with more than 5 employees (99.6%).

Starting with the descriptive of the training, Table 3 presents the repartition of all firms following the training offered.

Following the Table 3, 1133 firms (that it represents just 17.3% of the firms) are interested in the human capital, therefor they are offering training for their employees.

To show if there is a relationship between the firm size and offering training programs, the Table 4 present segmentation of number of firms that offer formal training through the firm size.

Following the Table 4, the maximum of firms did not give the training such an important. There for, 5403 firm (that it represents 82.28% of all firms) did not offer training for their employees. This latest show that they did not care about the human capital. However, 1133 firm train their employees. More precisely, the big rate of the firms that it trains their employees are from large firms (405 firm train their employees with rate of 35.06% of all large firms). In addition, these latest (405 large firms) represent 35.76% of the firms that train their employees. Following these results, we find that the size of the firm plays an important role in offering training for the employees.

To check for the innovativeness of the firms in the MENA region, Table 5 contains the number of the innovation that proceed for innovation.

According to the Table 5, 44% of the firm (that it represents2889firm from 6566) interviewed proceed for innovation.

As it explained in the theoretical background, there are three levels of innovation that are new to firm, new to the market and new to the country. Table 6 contains the repartition of the innovation firm in the three level.

Followin Table 6, there are three levels of innovation in the MENA region as it explained in the theoretical part. In the first, the innovation in the level of the firm take the first place with 963 firms that it represents 89.4 % of the innovative firms in general. This latest is due to the easiest way to innovate by using existing technology for example to the production operation or changing the packaging (Table 6 explain the characteristics of the innovation). In the second place, the innovation in the level of the country with 744 firms (69.1% of the innovative firms). Where the innovation in the international market is in the third place with 270 firms (that it represents 25.1% of the innovative firms) following the different obstacles to innovate in that level.

Starting from the theoretical part, the innovation could be seen in different faces following the sector of work. There for, the study focused also on the different types of innovation implemented in the firms. The Table 7 presents the responses of the firms for the type of innovation implemented.

Following the data gathered of the study, 58.70% of the firms (1696 firms from 2889 firms) implement product innovation due to its facility in front of the other types of innovation. In second rank, 1436 firm implement marketing innovation. However, the innovation in logistics is in the latest rank with 878 firms that it represents 30.39% of the innovation firms implement the innovation in logistics. The latest results explain that the field of logistic forms the difficult field to innovation in addition. There for, the firm avoid expending resources to innovate in this sector. In addition, the other results explain that the firm implements the innovation in the easiest way that is production and marketing. In addition, Table 7 contains the majority of the characteristics of innovation. There are six types of innovation:

Following the study of (Crowley & Bourke, 2017) the manager has an important role in innovation. The results of the research indicate that management experience, management practices and management incentives are all important in determining innovation activities in firms from emerging economies. There for, the effect of the education level of the manager plays a role also. However, Table 8 presents a cross table between the highest level of the manager and the innovation of the firm.

First of all, we find that 69.46% of the firms are firms under the management of manager with university degree or higher. In the second place, firms with manager that it completes his secondary school including vocational. From another side, 5949 firms (90.60% of all firms) are firms with

manager with secondary school at least. However, 9.40% of the firms with managers under secondary school. From these data, we understand that there is a strong relationship between the level of manager's education and managing the firms. For the innovativeness of the firms, 73.58% of all innovative firms with the managers with highest level of education are most innovative ever (2126 firms). This rate represents also 46.61% of firms with manager with university degree. Also, as we mention in the firms level , the manager has the important role for the innovativeness of the firm, these results confirms the research of (Crowley & Bourke, 2017) that the managers has an important effect on innovation, and we find that the majority of the firms with innovation have manager with high education degree.

According to the study of (Kleinknecht, 1989; Shefer & Frenkel, 2005), SMEs appear on average to be somewhat less R&D intensive than large firms. From another side, the large firms are more appropriate to spend for R&D and innovate than SME. However, following the study of (Rogers, 2004), small manufacturing firms exhibit a positive association between networking and innovation. In contrast, for non-manufacturing firms this association is present for medium and large sized firms. From another side, (Plehn-Dujowich, 2009) finds that small firms are more innovative than large firms because it obtain more product innovations per dollar of R&D than large firms. Also, following the study of (Herrera & Sánchez-González, 2013), subsidies increased private R&D effort quite significantly in small firms that prompt an expansion in the sale of products new for the firm rather than the large firms. However, large subsidized firms which only increased investment in technological development improved the sale of products new to the market. Where according to the research of (Liu, 2009), we cannot simply say that large firms are more innovative than small firms or small firms are more innovative than large firms. So, it is necessary to study the relationship between firm size and innovation performance using the sector of industry as an independent variable.

Table 9 explains the relationship between the size of the firm and the innovation of the firm. For the micro size enterprises, 9 firms that it represents 32.14% of the micro-size firms proceed for innovation where 19 firm does not proceed for innovation. However, 37.37% of the small firm (1167) proceeds for innovation in front of 62.62% that did not proceed for innovation. From another side, the large firms 57.40% of the large firms proceed for different kinds of innovation. These latest data explain that the micro and small firms did not give the innovation such interest where the large firm invest in innovation following the importance of innovation for the growth and sustainability of the firm. There for, we understand also that the size of the firm affects the innovation in the firm.

Following Table 10, there are different types of innovation in the firms where in the first is the product innovation (58.7%) of all firms proceed for product innovation due to its simplicity in front of the other types of innovation (as it explained in before), where logistic innovation is the last (30.4%) because of its difficult in addition the foggy innovation in this field. To touch the statistical correlation between training and innovation, the table below presents the correlation coefficient between these two variables.

Following the researches of (Cohen, 1988; Cohen, Cohen, West, & Aiken, 2013), the correlation coefficient present the strength levels of the correlation between the variables as follows:

In the case r is (.0), there is no correlation between the variables. However, r is between (.10) and (.29), there is small correlation between the variables. In the case of r is between (.30) and (.49), there will be medium correlation between the variables where in the case of r>.50 till 1, the correlation is

so strong between the variables. From Table 11, the coefficient of correlation between innovation of the firm and formal training programs for permanent employees is (.114). This latest signifies the existence of small correlation between formal training programs in the firm and innovation in MENA region.

III. Conclusion:

The principal objective of this article was the examination of the major determinants of a firm's innovation in MENA region using BEEPs dataset. The article produced some stylized facts regarding innovation in the sample of research. First, it established that the major determinants of innovation are the education level of the manager, firm's size and formal training. Through the exploratory study, the innovation in the firms of the MENA region touch the three level that are new to the firm, new to the market and new to the world. From another side, innovation also seen in all type (product, process, marketing and organizational). Results finds also that the economic society of the MENA region contains a large part of small and medium size firms. Where the managers are majority with high degree of studies. For the education level of the manager and innovation, the manager with high level of education is more appropriate to innovate rather than the managers with lower education level. This latest show that the manager with high education level has more education skills to innovation rather than the others. Where for the firm size and innovation, the large firms are more appropriate to innovate rather than the other following the number of employees for a side, the capital from a second side, that represent more sources to innovate in addition to the high level of R&D expenditures in large firms rather than the other firms. Where For the training effect of innovation, we find that there is a small correlation between the formal training programs and innovation of the firm. Where this training is related with size of the firms from a side, and the education level of the manage from another side.

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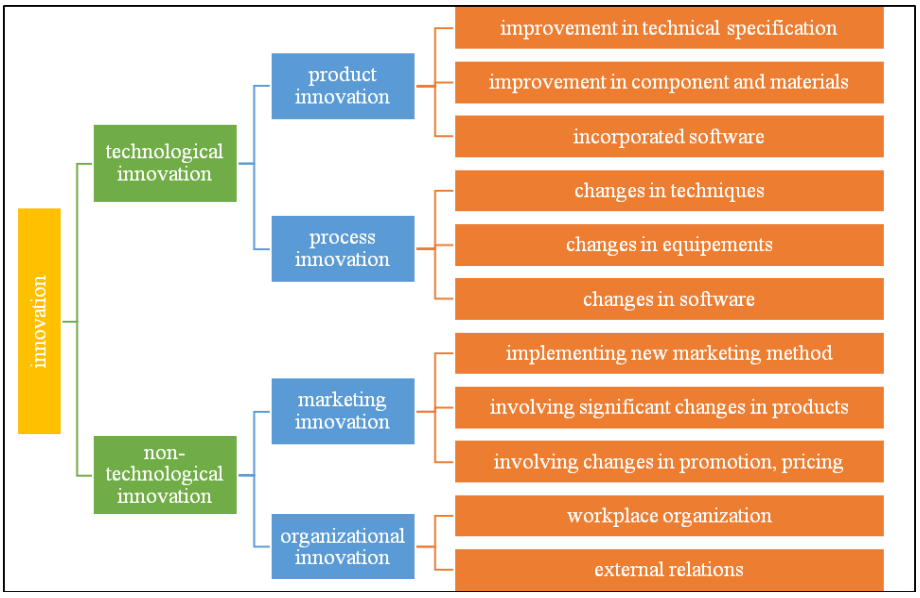
- Appendices:

Figure 1. different types of innovation



Source:(OECD, 2005)

Table 1: Sample distribution by sectors

Sector	Freq	%	Sector	Freq	%
No information	23	,4	Restaurants	132	2,0
Food	771	11,7	Hotels	144	2,2
Textiles	241	3,7	Other services	1039	15,8
Garments	463	7,1	Trans and telec	140	2,1
Leather	114	1,7	Retail and wholesale	267	4,1
Wood	88	1,3	Retail and wholesale	267	4,1
Publishing printing and recorded media	108	1,6	Other manufacturing	838	12,8
Chemicals	145	2,2	Manufacturing	303	4,6
Plastics & rubber	156	2,4	Retail	777	11,8
Nonmetallic mineral products	189	2,9	Wholesale	95	1,4
Fabricated metal products	228	3,5	Construction: section F	127	1,9
Motor vehicles	42	,6	Furniture	136	2,1
Total	**6566**	**100,0**			

Source: edited by the authors

Table 2: size of the firm

Size of the firm	Number	Percentage
Don't know	3	,0
Micro firm	28	,4
Small firm	3122	47,5
Medium firm	2258	34,4
Large firm	1155	17,6
Total	6566	100

Source: edited by the authors

Table 3: Formal Training Programs for Permanent Employees

	Frequency	Percentage
Don't know	30	,5
Yes	1133	17,3
No	5403	82,3
Total	6566	100,0

Source: edited by the authors

Table 4: Cross table of firm size and formal training of employees

	Formal Training Programs for Permanent Employees			Total
Firm Size	**Don't know**	**Yes**	**No**	
Don't know	0	1	2	3
Micro firm	0	3	25	28
Small firm	11	326	2785	3122
Medium firm	13	398	1847	2258
Large firm	6	405	744	1155
	30	1133	5403	6566

Source: edited by the authors

Table 5:innovation in the firm

	Frequency	**Percent**
Yes	2889	44,0
No	3677	56,0
Total	6566	100,0

Source: edited by the authors

Table 6: level of innovation

level of innovation[a]	**answers**		**% of obs**
	N	**%**	
The improved product was new to: this establishment's local market	963	48,7%	89,4%
The improved product was new to country	744	37,6%	69,1%
The improved product was new to: International market	270	13,7%	25,1%
Total	1977	100,0%	183,6%
a. Groupe de dichotomies mis en tableau à la valeur 1.			

Source: edited by the authors

Table 7: different types of Innovation in the firm

types of innovation in the firm[a]	**answers**		**% of obs**
	N	**%**	
New / significantly improved methods of manufacturing products/offering service	1342	17,6%	46,5%
New /sign. improved logistics delivery or distribution methods for inputs	878	11,5%	30,4%
New or significantly improved supporting activities for your processes	1150	15,1%	39,8%
New or significantly improved organizational structures or management practices	1108	14,6%	38,4%
New or significantly improved marketing methods	1436	18,9%	49,7%
Total	7610	100,0%	263,4%
a. Groupe de dichotomies mis en tableau à la valeur 1.			

Source: edited by the authors

Table 8:Studies level of the manager and innovation

Education level of the manager	**innovation**		**Total**
	Yes	**No**	
Don't know	21	17	38
University degree or higher	2126*	2435	4561
Completed Secondary school including Vocational	510	878	1388
Preparatory or Incomplete Secondary school	126	184	310
Completed Primary school	52	94	146
Incomplete Primary school or did not enter school	54	69	123
Total	**2889**	**3677**	**6566**

Source: edited by the authors

Table 9: cross table between firm size and innovation

Firm Size	new or improved something for the firm		Total
	Yes	No	
Don't know	1	2	3
Micro firm	9	19	28
Small firm	1167	1955	3122
Medium firm	1049	1209	2258
Large firm	663	492	1155
Total	2889	3677	6566

Source: edited by the authors

Table 10: cross table of formal training and innovation in the firm

Types of innovation[a]	Training		Total
	Yes	No	
New/significantly improved methods of manufacturing products/offering service	429	906	1335
New /sign. improved logistics delivery or distribution methods for inputs	312	563	875
New or significantly improved supporting activities for your processes	448	694	1142
New or significantly improved organizational structures or management practices	441	662	1103
New or significantly improved marketing methods	514	916	1430
Total	817	2060	2877

Percentages and totals are based on respondents.

a. Dichotomy group tabulated at value 1.

Source: edited by the authors

Table 11: correlation between formal training and innovation in the firm

		Formal Training	Innovation
Formal Training	Pearson Correlation	1	,114**
	Sig. (2-tailed)		,000
	N	6566	6566
Innovation	Pearson Correlation	,114**	1
	Sig. (2-tailed)	,000	
	N	6566	6566

**. Correlation is significant at the 0.01 level (2-tailed).

Source: edited by the authors

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