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Literature Review

The Effects of Technological Investments on Health and Safety Culture in Turkish Small and Medium Sized Entrepreneurs

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Abstract

Technological investments are one of the most important driving factors, allow firms stay in market and satisfy the client expectations. Since technology develops rapidly, it is an obligatory for a firm to support the process techniques with these advancements. In addition to following technological trends, health and safety culture is crucial for a firm in order to prevent work accidents and occupational diseases and staying in market. For this reason, utilizing technological advancements in order to improve health and safety conditions at a firm is important too. Researches conclude that the firms, which adapt/adopt technological investments on their own, may have more chance to compete in the market. This study analysed the impacts of technological investments while improving the health and safety culture of the firm. It was carried in November/December 2018 with 30 participants in two organized industrial zones in Ankara, Turkey. A questionnairrie and an interview was applied at the same time and the collected data was analysed by using statistical pocket program. By the results, we found that technological investments enhancing health and safety conditions of the firms and this enables the sustainabilty of them in the marketpalce. The results of this study is compatible with the results found in similiar studies in literature. At the end of the study, a frame was drawn about the current condition. This study is unique that it investigated

the technological investments effects on firms' conditions, especially in terms of health and safety in a broader sense.

Introduction

The main actors of innovation can be counted as economic, organisation, and project-oriented [1]. Researches showed that small sized businesses are as innovative as the larger ones. Behind the achievement of innovation in small and medium sized entrepreneurs (SMEs) lies, networking, regional support, business planning, and strategies contribute to SME innovation. Optimisation of organisational structure also contributes to effective and efficient management of innovation. The cooperation and connection between the other firms are also main driving factors to improve innovation at firms. Researches showed that the external environment, and structural factors as well as firm-specific characteristic affect innovation in SMEs. Strategic orientation, market orientation and competetive structure are all affect innovation on SMEs [2]. For the industrilized countries, the key component is technological innovation for social progress and problem-solving. It is also crucial for the global knowledge-based economy [3]. Since innovation is everyone's business, it can grow much if the active participation of all participants have been supported [4]. If an innovation or a planned technological investment to be taken into practice, this should be everyone's concern in and out of the firm. From this perspective innovation and technological investments resemble the health and safety issues in the firm, since the latter is everyone's business and it should be sustainable as well.

Innovation has also considerable impact on health and safety at a firm [4]. If a work accident occurs it will not only affect the injured employee, but also the other employees will inevitably affected from that event at least physicologically. Absentisism and economic loses are the other issues concerned the employers [5]. The responsibility both for the employee and the government are the important points, also. Because of this, health and safety issue at a firm can not be seperated from the other issues in the firm. Since the firms are living organisims, they can not even stay stagnant. They should follow technological developments, their competitors, the needs of customers and the capabilities of employees. Occupational health and safety conditions are not stagnant in the firm like the firm itself. They should follow the new technological trends and they should be compatible with the operations in the firm and the employees's needs of the firm. For example, working with toxic gases in a firm and exposure time and duration of it may pose severe disruptive health effects. An easy technological investment on the source, will prevent the dispersion of gas can also prevent the exposure to the gas and is an effective way inhibit any respiration diseases sourced from that gas. Another example can be any technological investment or an innovative design which will enhance the ergonomic conditions of employees and also prevent the muscloskeletal diseases among the employees. Researches and the experience have shown that the financial side of prevention is less than the real event. Any firm must spend much more if it will face an accident or disease sourced by the operation. Because of these reasons it is an effective way to get support from the advantages of innovation in order to improve health and safety conditions in any firm [6].

With the help of these guidence, our study will mainly focus on the technological effects on the improvement and sustainability of occupational health and safety in the SMEs. The main purpose of this study is to determine the effect of technological investments on health and safety conditions in the firms.

During the literature review, we saw that there has not been enough studies conducted especially in Turkey, about the subject of positive contributions of technological investments on the safety and health conditions at firms. With this in mind and in order to make contribution to the literature and want to be guide for the firm owners to improve the safety and health conditions of their firms, this research subject was carefully selected.

In the literature review section we presented what we found about our research subject in literature, in methodology section we presented how this study and how the analyses were carried on, in results section we presented the results of our data analysis, in discussion section we compared our results with the findings of the literature and in conclusion section, we presented a summary and the last comments about our research.

Literature Review

Workplace innovation is a term, defined by Pot (2011) and differs from technological innovation. Workplace innovation can also be as non-technological innovation. Workplace innovation is as the implementation of new and combined interventions in the fields of work organisation, human resource management and supportive technologies. Thus innovation is not a goal but a means of improving process performance. Workplace innovation can be defined as overall process optimization and changing the organizational system, whereas non-technological innovations can be counted as, high performance work systems and new ways of working, which are organizational innovation [7,8]. Workplace innovation can be grouped as; production methods, organizational policies, redesign, workplace improvements and refreshment of the systems. In this study both the technological aspects and their positive contributions on occupational safety and health have been searched. Empirical findings suggest that technological investments account for 25% of the success in radical innovation, whereas workplace innovation accounts for 75% of success (Volberda Vanden Bosch, and Jansen 2006 cited in Pot and Koningsveld 2009; Jansen *et al.* 2011 cited in Pot *et al.* 2012a) [8]. Although workplace innovation does not cover the whole range of occupational safety and health (OSH) topics and performance, it includes low stress risks, high job autonomy, lower physical workload, continuous development of competences and better labour relations that reduce the risk of work accidents and occupational diseases (Pot and Koningsveld 2009; Ramstad 2009; Westgaard and Winkel 2011). Workplace safety refers to the working environment comfort for employees including, but not limited to, applicability of working methods for the recommended operation, reliability of machine design, controllability of machine operation, illumination, noise reduction, chemical control and other hazardous issues [6].

Utilizing innovation on health and safety culture contribute the developmental process of the firms. There are so many examples of the firms that utilizing innovation principles on their health and safety culture, and attain growth. Zwetsloot, (2001) [4] carried a study about the firms that are the frontrunner of that culture, and analyse the innovations on health and safety culture. As seen above, there do not exist any detailed studies that examined the technological effects on health and safety conditions at firms. One of the reason that we carry this study is the gap in the literature about this subject. In this study, we analysed the effects of comminment of the management, coorprate culture and live learning as Zwetsloot, (2001) [4] suggested in his research. However, innovations on health and safety do not always guarantee growth and positive contribution to the development of the firm that sometimes it may have negative effects as Chung and Snyder 1999; Davenport 2000; Kim *et al.* 2005; Stefanou 2001 suggested. The negative impacts can be

sourced from financial problems, the sociocultural values of the public, or vice versa (Ter Bogt and van Helden 2000). There can be a work accident caused by a new high-tech machine [10]. These negative effects can also be seen in terms of safety and health. For instance, it can be a work accident that may be sourced from unskilled empoyee's usage of high-tech equipment, or some technological investments have negative impacts on the employees' health. Geraci *et al.* (2018) [11] demonstrated that the 3D printer usage in the manufacturing process can cause dust powder which is harmful for respiration that causes the exposure to fine and nanoscale metal powders. It may also lead to the presence of combustable powders in the ambient air of working environment. The relationship between innovation, productivity and operational efficienciy at the firm level requires better understanding. The occupational trainning of the employees is as important as adapting to the technological investments. Other technological risks sourced from technological investments and causing disease or accident at work environments are some drawbacks of the innovation [10]. With this in mind in this study, the negative effects of the technological investments are analaysed by the applied questionnairrie as well.

Corparete culture is the another aspect of improving innovation and its positive effects in the firms [12]. Brown (1998) [1] concluded that economic, organizational and project-oriented are the main drivers for the innovation. These are also inspirations for the health and safety promotion, so we can conclude that somehow innovation is a driving factor in developing health and safety culture.

Generally the organized firms and the firms which have strong connections with the international firms developed the strong structure of health and safety culture, so it is important to build the same culture in small and medium sized entreprises. The technological investments in the SMEs, can be effected from external environment, structural factors and the specific characters of the firms. Recent studies also focus on firms' absorptive capacity, capabilities, patterns of skills, training and education, growth, and performance related to innovation (Freel & Robson, 2004) [13]. Besides these, some researches showed that innovation can have negative effects in addition to the positive ones [9]. These negative effects can also be seen in terms of health and safety. For instance, it can be a work accident that may be sourced from unskilled empoyee's usage of high-tech equipment. From this reason, the relationship between innovation, productivity and operational efficienciy at the firm level requires better understanding and we took this concept into consideration in this study, too. The occupational trainning of the employees is as important as adopting innovation. Other technological risks sourced from innovation and cause disease or accident at work environments are some drawbacks of the innovation [9].

In a study carried by Laforet (2015), the outcomes of the innovation have been searched, the methodology is structured based on the interviews with CEOs, co-directors, and two executive experts. In our current study, we conducted a questionnaire to the managers and the safety specialists of the firms.

In another study, which analyses the organizational innovation and outcomes in SMEs, it is mentioned as the sample size will not affect the output of the study. Mariampolski (2001) noted that most studies are effectively conducted with 15 to 30 personal in-depth interviews, so in this study, we aimed to reach at least 15 firms, then if possible to increase the sample size.

Studies have shown that the firms, which use external networks are more successful for the innovation process. Laforet (2011) [14] suggested that process innovation has a positive impact on product efficiency.

From this, we can conclude that it has positive impact on improving health and safety culture. If a firm does not have to spend much on occupational diseases and work accidents, it can have the chance to improve its production yield. Employees' satisfaction is the another benefit of innovation. '*As a result of introducing these processes . . . we have improved ways of working, and working environment and safety, which leads to employees' satisfaction*' this sentence belongs to a firm, concluded from Laforet's study.

All innovations sourced from a need, since workplace innovation is sourced by a need. Maybe a work accident could have been occured, then a workplace innovation will be used in an operation [15].

During our research on literature, we have found that there has not been enough studies conducted on such a place and about a subject that resembles our research topic. The main driving force carrying of this study is that with the aim of filling the gaps in literature.

Methodology

This study has been conducted in two selected organized industrial zones in Ankara during November-December 2018. It is a cross-sectional type of the study that the observed conditions were used during the data collection time period.

The selection criteria for the firms is both the attempts to the technological investments and taking them into practice while utilizing health and safety culture. Before preparing the questionnairrie the two selected zones were visited twice and made an interview with the managers of both zones in order to understand the conditions of the firms then prepare the questionnairrie and apply it to the participants. The literature search was conducted through Science Direct, Taylor and Franchis, Google Scholar etc. with the help of the key words such as technological investment, the impact of technological investments on health and safety at firms, organized industrial zones etc. After the literature search, a 40 questions questionnairrie (Appendix 1) was prepared in order to determine the current conditions of the firms in terms of the selected subject. The applied questionnairrie is not the one that was used directly in an another study, but we constracted it by a comprehensive research on literature on similar studies. The questions of the questionnairrie examine the general properties of the participants such as the operational duties, firm operational subject, duration time of the firm, number of the employees in the firm, wheather there exists a relationship between the university or not, wheather or not the firm has experienced any work accident or occupational disease, the communication level within the firm, questions about technological investments and the research and development department of the firm, questions about legislation concerns the technological investments and so on.

16 from the first zone and 14 of from the second one attended (N=30) to the questionnairrie. The questionnairrie was applied onsite, which gave the chance to make an interview with the participants at the same time.

Results

We used the data obtained from the surveys and analysed them by using SPSS 15.0 (Statistical Package for Social Sciences) for Windows 16.0. According to the frequency table, 40 percent of the participants are firm

owners and 46 percent of them stated that they have other duties in the firm such as, research and development engineer, general manager, human resources manager, production manager and vice versa. 80 percent of the participants are men and the whole participants have university degree. All the firms have been operating more than five years. About 96 percent of the firms have employee number of greater than 50, but smaller than 250, which means that the firms can be classified as medium sized.

In Table 1, the demographic properties of the respondents are being showed.

Table 1: *Demographic properties of respondents*

Duty on the firm		**Gender**		**Education level**		**Operation type of the firm**		
Firm owner	Shareholders	Male	Female	University	Other	Defence/ aviation	Electronics/ Communication	Other
9	21	3	7	30	-	7	4	99

In Table 1, we have seen that 0,30 of the respondents are firm owners. The duty of the respondents in the firm are generally detected as defence/aviation, electronics and communication. In the other group there exist food production, otomotive, furniture, machines of recycled metals, production of transformators, medicine and vice versa.

67 percent of the participants found their firms in a well condition around the other ones.

After making the frequency tables we made the crosstables, which are used in order to evaluate data.

The crosstables are used if

- non-parametric statistical analysis will be done,
- variables do not show a regular distrubition,
- the sample is not big enough [16].

The data of our survey is non-parametric, do not show any regular distribution and the sample size is not big enough, so we used crosstables in order to analyse the data.

52 percent of the respondents said that they have university relationship in a well-level, which can give the firms the opportunity of improving themselves in terms of health and safety conditions. Also we found a significant relationship between the university interaction and work day lost due to work accidents at the 90 percent confidence level, which means that if the relationship increases, the workday lose will decrease and health and safety conditions will improve.

During the period of adopting/utilizing technological investments at firms, communication, especially with blue collar workers with the managament of the firm plays the most important role. If the firm management plans an investment on technology, it should give attention to the feedback of workers about that investment in terms of their framework. We found a significant and strong relationship between the technological

investments in order to make better conditions of health and safety and the communication with blue collar workers. These investments, made by the firm can be cathogerized mostly in machine/equipment and improvements on working conditions. Also we found a significant relationship between communication with blue collar workers and encouragements on investments.

Except three participants, all the other ones have research and development department at their firms. 37 percent of the participants said that they have spent 21-50 percent of their annual budget on research and development areas.

We found a significant and a strong relationship on the 95 percent confidence level with the application of technological investments and the communication with blue collar workers, which means that in order to be successful, firms should test wheather or not the investment can be applicable to the whole process and is it practical for the blue collar workers. In order to prevent work accidents, the new systems and/or processes should be adaptable to the workers, which means that they are compatible with them.

We found a significant and a strong relationship between governmental support and interaction with universities on the 95 percent confidence level. This means that if a firm has a strong relationship with university, it is easy to get governmental support in order to make technological investments and have the potential to make innovations. There is also a significant relationship between the governmental support and improvements on the process in order to get better health and safety conditions at firms. From this, we can conclude that the more investments done for technology and make the conditions better at firms, the more a firm has the chance of getting more support from the government.

There is a significant relationship between university interaction and improvements made with the aim of preventing environment, such as prevention of pollution caused by firm's debris. We can conclude that the university interaction may enhance such sensibility. In addition to this, from data analysis, we found that governments support the firms for being sensitive to the environment, which means that a significant relationship exists between the governmental support and technological investments for preventing enviroment from the pollution caused by the firms.

43 percent of the respondents said that they had experienced work accidents which were deadly injured or losing organs. Work accidents may cause financial problems for the firms, especially if they are resulted in mortality or losing organs, so during the operational process, preventing the accidents is so important.

50 percent of the respondents replied that they follow the novalties about the subject of health and safety. There is a significant relationship with this variable and technological investments in order to improve health and safety conditions at firms.

Miskeen *et al.* (2017) found that there is a significant relationship between the firm performance level and the effort of improving health and safety conditions. During the interview, we noted that the firm owners improved their product quality and reliability when they increase the standarts of health and safety conditions at their firms. These quality level will be doubled when they use technology in the health and safety process.

We also analysed whether the technological investments pose a safety risk for the firm by asking; if they have experienced any work accident due to the technological investment in terms of machinery or equipment. All of the participants except 2 of them replied that question by saying "no". Saying "yes", the 2 of the participants replied than they did not well planned their investment throughly.

Discussion

We presented the positive contributions of technological investments on health and safety conditions at firms. Although in literature there exist the negative effects of these investments, we omitted these effects in this study.

Yinbing (2013) [17] proposed that work accident frequencies are directly proportional to the effectviness of human efforts. This can be explained by many of accident causation models (Bird, 1974; Weaver, 1971) [18]. According to these models, people are the fundamental reasons behind the accidents and the management is responsible for preventing these accidents. Due to the domino model (Bird, 1974; Weaver, 1971) [19], management failure is the root cause of accidents. Also the existing legislation in Turkey attributes the main responsibility to the management in order to prevent work accidents or the other responsibilities after the accident has been occurred. The same phenomena is grounded on this study, so one of the responsible to make technological innovations/investments in order to prevent work accidents is the management of the firm, also these innovations/investments should be compitable with the employees, who are the users of them in the operational process.

Before deciding to make a technological investment in the firm, the entire processs, the capabilities of employees and its applicability should be taken ito consideration by the decision makers. Safety is an outcome of a work system with components that cooperate, so one subsystem can not take the whole responsibility of keeping the entire system and its employees' safety [20]. In this manner the communication with blue collar workers and the other employees at the firm is important. We found a significant relationship between the interaction with coworkers and improvements on health and safety conditions.

50 percent of the participants of this study replied that they follow the novelties about health and safety at their firms. Toivo et. al (2016) [21] demonstrated that it has a positive contribution while eliminating risks of the work accidents. He also demonstrated that trainning of the employees is another aspect to improve health and safety conditions at work. All of the participants except one replied that when a new machinery system is adopted to the firm, a trainning session is applied to the workers and during our interview we noted that these trainnings are so important on preventing the work accidents and improving the safety conditions.

Rodríguez (2016) [22] declared that developments via research and development department at a firm may serve better conditions at a firm. Also we found a similiar result in our study.

Andersson *et al.* (2010) [23] demonstrated that the outcome of the innovation process and the activities mainly depends on the financing and conjunction with external supportive forces, such as governmental or other authorities. Also in our study, we presented the importance of governmental support, especially the financial one is so crucial during the attempt of technological investment process of a firm. Both from the

interviews and the questionnairrie we noted that firms gain more encouragement if they get support at a higher level.

Another aspect is, while adopting itself to the technological innovations and trying to taste novel production methods, a firm should strongly take into account the possible new and unpredicted risks coming from this new production system. Geraci *et al.* (2018) [10] investigated this situation in his research. He stated that advancing manufacturing techniques may pose occupational and enviromental risk profile, that the firm never has tested before, so it can be unprepared for the condition. In order to avoid this, before taking into practice the technological investments/innovations a risk analysis should be done wheather the conditions are suitable both for the operational process and employess [24-28].

Conclusion

We conducted our study in two organized industrial zones in Ankara, which include firms that make technological investments. 30 participants were participated to this study. We analysed the research and development attempts and their impacts on firms. Besides these, we analysed the technological investments on improving the health and safety conditions at firms. We found a significant relationship between the technological investments and improving the health and safety conditions at the firm. Our findings found as parallel with the results that were found in similar studies in literature. The most important things that enhance health and safety factors at firms are; open interaction, existing research and development department, external source supportings and so on. The findings have shown that the more the company gets support, the more it encourages itself for making investments. We should also note that in order to avoid additional risks sourced by technological investments, a risk analysis must be taken into practice in terms of health and safety.

In Turkey, when a firm decides to make an investment, it can face some bureucratic problems and sometimes because of these firms avoid to make investments. To prevent this, some improvements should be done on legislation.

The most important limitation of this study is duration of time. Since the time necessary to complete this study is limited, we reached just two organized zones in Ankara. Since Ankara is not an industrilized city of Turkey, the selected zones were the most developed ones in this city. However, if we had the opportunity to reach more, we can conduct the zones placed in Eskişehir or Bursa. Since the sample size is small, we could not have the chance of to differentiate the data analysis. This study was conducted to be guide for further studies, which are about technological investment/innovation effects on health and safety conditions at firms and to built a perspective to the researchers.

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