

# CHAPTER 1

## OPEN INNOVATION PARADIGM: THE CASE OF TÜRKİYE

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### INTRODUCTION

Technological innovation is the competitive battleground of the companies for decades. Tough global competition, and significant changes in the business environment urge companies to be agile and be aggressively more enthusiastic to innovate. Open innovation is a new paradigm recommending companies to go beyond their boundaries and allowing inflows and outflows of knowledge [Chesbrough (2003)]. In other words, the firms should open their internal resources, innovation and knowledge to external environment and exploit external innovation and knowledge [Dahlander and Gann (2010)].

Open innovation has been one of the prominent research topics of the innovation studies that consistently attract scholarly attention along with the practitioners. In the growing body of the open innovation literature, there are still some gaps to be considered. For example, studies have mostly focused on the status of open innovation practices in developed economies [Verbano *et al.* (2015); Oduro (2019); Sabando-Vera *et al.* (2022) ] and there are limited findings about open innovation utilization level of the firms located in developing countries. Therefore, to remedy this void in the literature, the current study attempts to provide insights into in-depth, multi-faceted explorations of open innovation paradigm in a developing country. Hence, open innovation approaches pursued, tools used, networks established and comprehensive managerial insights about barriers, motives and benefits of open innovation are aimed to be identified within a single case study of a leading foundry and valve manufacturer firm in Turkey.

The study is organized in five sections where the first section embodies the

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pertinent literature on open innovation types, networks, tools, benefits, and barriers. These open innovation studies are used to generate frameworks to analyze open innovation practices adopted by the firm and enable the comparisons between developed vs. developing countries. Section two describes methodology of the study and presents the firm, whereas section three depicts the findings of the study. Discussion and future directions of the study is discussed in section four and the last section involves the conclusion and limitations of the research.

## **LITERATURE REVIEW**

### **Approaches to Open Innovation**

Scholarly interest has been growing on identifying the types of open innovation practices pursued by firms. Qualitative and quantitative analyses are conducted to identify open innovation practices of low-tech small-medium enterprises [Oduro (2019)], to reveal the characterization of open innovation profiles of SME [Verbano et al. (2015)]. Chesbrough [2006] defines open innovation as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the market for external use of innovation, respectively.” On the other hand, Gassmann and Enkel [2004] categorize open innovation in three different dimensions: inbound (outside-in), outbound (inside-out) and coupled. The inbound dimension focuses on transmitting ideas into the organizations through the corporation of stakeholders such as suppliers, firms in industry, customers, and academia. Thus, firms seek to enhance their innovativeness by incorporating the external ideas in their new product/service and process development stages. The outbound dimension concentrates on transferring firms’ internal knowledge/innovations through selling or licensing out, so that, the firms obtain financial benefit. The last dimension of open innovation is called the coupled that is a combination of the inbound and outbound dimensions. Under this dimension, the firms seek to create alliances, joint venture, strategic networks, and cooperation with other firms.

Dahlander and Gann [2010] conducted a bibliographic analysis to clarify the open innovation concept and provided a conceptual framework. The framework points out two types of openness, which are inbound and outbound. The first type of open innovation is inbound which is comprised of two sub-dimensions, which are; inbound sourcing (firms seek to use external sources of innovation) and inbound acquiring (firms acquire license, innovations and expertise from external environment). The second type of open innovation is outbound, which has two sub-dimensions that are; outbound revealing (firms reveal their internal resourc-

es to the external environment) and outbound selling (firms sell or licensing out their innovations and technologies). Empirical evidence pinpoint that inbound open innovation activities of firms are more than outbound ones [Chesbrough and Crowther (2006); Cheng and Huizingh (2010)]. Ebersberger et al. [2012] with a diverse point of view, examine the breadth and depth of open innovation practices with respect to external sourcing, search, collaboration, and protection. The variety of partners or activities reflect the breadth, and the depth refers to the intensity of the activity. Drawing on the pertinent literature, the following research question is developed:

**RQ1:** What are the open innovation approaches embraced by the firm?

### **Open Innovation Tools**

Open innovation aims to embody various forms of external and internal contribution to enhance the innovativeness of firm. Thereby, organizations use a range of open innovation tools to encourage and support their open innovation activities. Möslein and Bansemir [2011] examine open innovation tools in five categories which are innovation contests, innovation markets, innovation communities, innovation toolkits and innovation technologies. Innovation contests, which is a well-known and the mostly embraced open innovation tool by the firms, is defined as a competition organized by the firm to receive best solutions for its specific innovation challenges where best ideas and projects are rewarded [Bullinger and Moeslein (2010)]. Open innovation web portal, a web-based online platform, is a basic innovation contest tool to capture innovative ideas and solutions for problems and explore innovative talents out of the whole world with cost effective way. [Gumus and Cubukcu (2010)].

Innovation markets is the second category of open innovation tools and represent virtual places in which innovation seekers (firms which seek to solutions for their innovation problems) and innovation providers (a person or team offer solutions to firms) are brought together. Innocentive [which is the world's first open innovation markets, <http://www.innocentive.com>], NineSigma [<http://www.ninesigma.com>], TüsiadSD2 [<https://tusiad2.org/>] and Atizo [<http://www.atizo.com>] are some examples of innovation markets. The next open innovation tool is innovation communities which provide a special environment for inventors who have similar interest to share, argue and enhance innovative ideas. Oscar [a community to plan and develop a new car virtually, (<http://www.theoscarproject.org>)] and Apple Developer Connection [a community that is formed by Apple to develop applications and to provide solutions for Apple's products ([developer.apple.com](http://developer.apple.com))] are the examplers of innovation communities. The fourth open innovation tool

category is innovation toolkits. Toolkits create an appropriate environment for consumers to design and develop a product through trial-and-error [Von Hippel (2001)]. Development Impact and You (DIY) innovation toolkit, for example, is used to trigger and support social innovation [<https://diytoolkit.org/>]. Innovation technologies, which is the last open innovation tool, comprises of all manufacturing technologies which allows to advance from a concept level to production level.

Furthermore, Atrek et al. [2016] clarified the online user innovation tools as depicted in Table 1. The study reveals that online user innovation tools enable the firms to incorporate the knowledge of user into the firm. Online suggestion boxes, virtual communities established both by firms and users, online customer advisory panels, online concept testing, market intelligence services, and online toolkits emerge as the user tools that have a significant relationship with firms' innovativeness.

Building on the foregoing, the related research question of the current study is:

**RQ2:** What are the open innovation tools used in the firm?

**Table 1: Online User Innovation Tools**

<b>Online questionnaires</b>	Understanding articulated or explicit customer needs
<b>Online suggestion boxes</b>	Users might express their own innovative ideas and suggestions
<b>Online virtual community</b>	Brings together users sharing the same interests and willing to exchange opinions and experiences
<b>Advisory panels</b>	Way of reaching lead users in the idea generation phase
<b>Idea and design contests</b>	Way of reaching new idea and design concepts
<b>Online market intelligence</b>	Understanding the trends that may be useful for product development
<b>Listening-in</b>	Recording and analyzing ongoing dialogues created when customers use the Internet to search for information and advice about products
<b>Virtual concept testing</b>	Allows companies to develop product concepts in detail so that consumers can compare product features and select the most convincing concept
<b>Online focus groups</b>	Enable firms to meet with people in a more convenient way whereby in virtual teams consumers could discuss different product concepts
<b>Open-source projects</b>	In open source software projects, users develop the particular bits of the software that they individually need—and then “contribute” those innovative bits to the project by openly revealing the details of what they have done
<b>Online toolkits</b>	Enable customers to design and develop their own products
<b>Computer simulation</b>	Allows customers to quickly try out ideas and design alternatives without having to manufacture the actual products (A type of an online toolkit)

Reference: Atrek et al. [2016]

### **Forms of Open Innovation Network**

Implementing open innovation requires inter-organizational partnerships to receive external innovation sources and transferring or selling the internal outputs to the markets. Thus, firms establish partnership with various networks in order to enhance their innovativeness, to reduce research and development cost, to increase the probability of launching new products/services to the market [Spithoven et al. (2013)] and to get financial benefits through selling or licensing out of their internal knowledge and innovations [Gassmann and Enkel (2004); Chesbrough (2006); Chiaroni et al. (2011)]. For example, companies may collaborate with universities or research institutes [Balietta and Callahan (1992); Conway (1995); Perkmann and Walsh (2007)], suppliers and/or customers [Helper et al. (2000); Emden et al. (2006); Lettl et al. (2006); West and Lakhani (2008)] or create alliances or joint ventures with competitors or non-competitors in the industry [Chiesa and Manzini (1998)]. Resting on these, the following research is developed:

**RQ3:** What are the forms of open innovation network in the firm?

### **Benefits of Open Innovation Practices**

Adoption and usage of open innovation practices result in unique benefits for firms. An empirical analysis reveals that innovation performance of firms are significantly affected by the open innovation performance (Ebersberger et al. (2012); Parida et al. (2012)). Moreover, Lichtenthaler [2009] support the relationship between outbound open innovation strategies and firm performance. Inauen and Schenker-Wicki [2011] seek to unveil the impact of outside-in open innovation on innovation performance of firms. The study reveals that openness towards universities in R&D processes has a positive impact on product, process innovation and firm's share of sales of new products. Moreover, innovation performance of a firm is positively affected by the firm's openness towards customers, suppliers and intra-industry, however, cooperation with cross-industry has a negative effect on firm's innovation performance. The literature reveals that saves on R&D expenditure, fast entry into the market, reaching global market, low commercialization cost and network reputation are some of the benefits that firms receive [Usman and Vanhaverbeke (2017); Odura, (2019)]. Thereby, the fourth and the fifth research questions are as follows:

**RQ4:** What are the motives/drivers of adopting open innovation practices for

the firm?

**RQ5:** What are the benefits of adopting open innovation practices for the firm?

### **Barriers and Challenges of Open Innovation Practices**

Despite the benefits of the open innovation applications, firms have to concern with some challenges which affect the adoption level of their open innovation practices. For instance, Verbano et al. [2015] empirically analyzed 105 small-medium manufacturing enterprise (SME) in Italy to identify the motives and barriers of adopting open innovation practices. Economic and financial challenges, quality of partnership, managerial problems and cultural resistance inside the company are among the barriers identified. Bigliardi and Galati [2016], also pinpoint the obstacles behind open innovation processes which negatively influence the level of adoption. The study categorizes the obstacles under four groups which are knowledge barriers (e.g., losing know-how knowledge or losing the availability of internal and external knowledge of firm), collaboration barriers (e.g., to be able to find the right partners and to be able to settle the cultural problems that may occur between partners), organizational barriers (e.g., managerial, cultural, administrative and legal problems within the firm) and financial & strategic barriers (e.g. the organization lacks a strategic vision focused on its creative expertise and current costs of open innovation processes are higher than expected). Besides that, several empirical studies aimed to identify the open innovation barriers operating in high-tech (high technology) industry report that knowledge acquisition, knowledge transfer and the lack of highly motivated and qualified personnel are among the main obstacles faced by the firms [Casprini et al. (2017); Matulova et al. (2018)]

**RQ6:** What are the barriers of open innovation practices faced by the firm?

## **RESEARCH DESIGN**

### **Research Setting**

This study is an exploratory study designed to shed light into open innovation efforts of the firms operating in Turkey which is a developing economy. The pertinent literature reveals extensive innovation practices embraced by the firms globally. However, there are limited studies conducted within this context in Turkey and very little is known about the approaches, tools, benefits, and barriers of open innovation practices of firms operating in Turkey. Besides, the topic requires a holistic in-depth investigation. Thus, this study analyzes the case of a leading found-

ry and valve manufacturer firm for a comprehensive understanding of open innovation approaches, networks, tools, benefits, and barriers [Yin (2017)]. The firm is identified through convenience sampling technique and the selection rationale is that this firm is among the well-known foundry and valve manufacturers not only in Turkey but in the world. Moreover, it is the first company which established the first research and development center in the sector which promotes the commercialization of technological knowledge, the development of pre-competition cooperation, investments in technology intensive production, entrepreneurship, and investments in these fields, and accelerating the entry of foreign direct investment into the country for innovation and R&D. Another criterion sought in selecting this company as a case is their willingness to share their experiences and knowledge on the subject. Thereby, this company is chosen as it offers a convenient setting for the researchers.

### **Data collection**

Data was collected via in-depth interviews, which were conducted online (due to the pandemic) with the key informants who are the company's R&D managers. There were 30 personnel in R&D department of the firm. However, four of them are managers and the core staff that produces innovative ideas, Thus, in-depth interviews were conducted with them. Semi-structured questions were used in the interviewing process, and the interviews were tape-recorded upon the consent of the respondents. The recordings were later transcribed verbatim into documents for data analysis. Before the analysis, each author independently reviewed the verbatims to enhance the validity. Multiple sources of evidence were used to enhance the objectivity and to increase the construct validity. Hence, archival records, firm announcements, and news published are collected within the scope of the secondary research which also strengthened the affluence of primary data used for analysis. Moreover, the combination of diverse data collection techniques is deemed to detain the researchers from collecting misleading, false or conflicting information. Data were collected in multiple stages between August 2020 and November 2020. Interviews were conducted online during August 2020, whereas the secondary data were collected during August, September, and October 2020.

### **Data Analysis**

Data collected were compiled in an Excel document. The content analysis was employed in order to analyze the data collected. A coding protocol is established by the researchers to extract information and to form the basis of the development of categories which were developed both from the extant literature drawing an

emphasis on the studies of Dahlander and Gann [2010], and Atrek *et al.* [2016] and the data collected. Data were coded separately by the two authors where the coding process encompasses several steps. The first step incorporates the open coding process undertaken by reading data several times and taking notes. Through the axial coding process, the connections between the open codes were checked. Open innovation approaches, tools were coded based on the framework of Dahlander and Gann [2010], and the classification of Atrek *et al.* [2016] respectively. Open innovation drivers and barriers of the firm were coded regarding the business functions and subgroups of Brown [2008]. The differences between the coding of the authors were discussed and the coding protocol was revised until a full agreement was reached. The inter-coder reliability demonstrated a satisfactory level of agreement (95%).

## **FINDINGS**

### **Open Innovation Approaches: Inbound and Outbound**

The first research question of the present study sought to explore the open innovation types embraced by the firm. The findings reveal that the firm practices inbound acquiring (acquiring license, innovations and/or expertise from external environment) and outbound selling (selling and/or licensing out innovations/technologies). Openness regarding the inbound acquiring is acquiring expertise from external environment. The results of the findings further revealed that the firm especially collaborates with the universities. Comments from the managers confirm this:

“We get support from universities in product development phases and for the interpretation of analysis.” (Manager 1)

“We receive academic consultancy services from universities in new product projects, especially in projects supported by TÜBİTAK (The Scientific and Technological Research Council of Turkey) and , KOSGEB (Small and Medium Enterprises Development Organization of Turkey).” (Manager 3)

“We collaborate with professors and benefit from their experiences in the projects.” (Manager 4)

Moreover, the firm communicates the expert suppliers and time to time exploits the expertise of them during research and development process of the new product development. Furthermore, the firm frequently communicates with their customers and fulfills the requests and specifications retrieved from customers during the new product design and testing stages. Indeed, some prototypes are sent to the customer for testing for a certain period, later the firm receive custom-



er feedback on the product to improve the performance of the product and to fix the problems if any.

The results unveiled that the firm embraces outbound selling open innovation type via licensing-out. The company commercializes technological knowledge by selling the patents of its innovations and new products. For instance: The firm licenses out its new product (RFID smart bolt) to market. RFID smart bolt is rigged with artificial intelligence can transfer technical features or maintenance situation of the valve information to the firm, regardless of where it is installed, whatever its accessibility. Thus, the customers immediately can reach technical assistant of the firm to solve the problem.

### **Open Innovation Tools**

The RQ<sub>2</sub> of the study aimed to explore which open innovation tools are used by the case study firm where operated in Turkey. For this purpose, this paper researchers analyzed of interviews, firm's archival document, announcement, and news, and later all the data was categorized based on the study of Atrek *et al.* [2016]. The research finding disclosed that the firm uses three online tools: online suggestion boxes, listening-in and computer simulation.

Firstly, the firm has used online suggestion box to understand customer needs. The company has collected information from its customers through online box that customers enter the firm web site and write comment. Moreover, the firm has used ERP, that a system the employees record all information about customers' needs, and the firm has analyzed the ERP system data to find out customer needs. Listening-in, secondly, is the most preferred online tool by the firm. Information from the managers when asked about the innovation tools used by the firm highlights different listening-in tool. However, the findings reveal that majority of the respondents mention about the customer complaint analysis. For instance, Manager 1 noted:

“On the customer side, customer complaints are constantly monitored and taken into account in the designs.”

Similarly, Manager 3 hinted:

“Direct customer complaints are archived online and later, they are transferred to related department unit, which are executed by a team of experts. Later, this team take complaints into consideration when designing the new product or service.”

Recording and analyzing mail, tele/video conferencing dialogues with customers, receiving customer request and making in-depth interview with customers are the other listening-in method is preferred by the company. Lastly, the firm

has virtual product testing application that allows the customers rapidly test their innovative ideas in computer environment.

**Open Innovation Network**

The RQ<sub>3</sub> aimed to explore the network types of the firm in its open innovation practices. The findings reveal that the firm collaborates with suppliers, competitors, customers and universities in their innovation process. Table 2 depicts the relationships with the different partners in their network.

<b>Table 2: Open Innovation Network</b>	
<b>The Forms of Open Innovation Network</b>	<b>Explanations</b>
<b>Suppliers</b>	-Receiving support from suppliers for R&D processes -Taking advantage of experiences of suppliers -Establishing project-based business partnerships with suppliers
<b>Competitors</b>	-Analyzing competitor products -Following other companies' products and innovation activities
<b>Customers</b>	-Taking consideration customer demands and complaints -Consulting to customers in new product design phases
<b>Universities</b>	-Getting support from universities in product development phases -Receiving academic consultancy in new product projects -Consulting to professors in new product design phases

Suppliers provide direct/indirect support to firm in their R&D activities. Moreover, the company exploits their experiences and collaborates with them in different projects during new product design and development phases. Competitors are the driving force for the company to make innovations and improving the product and services via benchmarking. Customers are among the other open innovation partners of the firm. The company takes customer demands and complaints into consideration to improve the product/service and consults them in new product design phase. Universities act as a knowledge provider to supply additional knowledge for the company. Thus, the firm acquires their support and experiences in product development phases.

**Motives/Drivers of Open Innovation Adoption**

The fourth research question of this study aimed to examine the motives/drives of

the open innovation practices adoption. The coding process framed on the study of Brown (2008: 17-18) revealed five main themes of motives/drivers. Strategic management, technology and process development, marketing, human resource

<b>Table 3: Motives/Drivers of Open Innovation Adoption</b>			
<b>Third Order Theme</b>	<b>Second Order Theme</b>	<b>First Order Theme</b>	<b>f</b>
Strategic Management	Corporate Strategy Development	Management Support and Guidance	4
		Developing Innovative Corporate Perspective	2
		Encouraging Innovative Personnel Skills	2
		Improving Innovative Corporate Image	1
		<b>Total</b>	<b>9</b>
	Gaining Differentiation Advantage	Gaining Competitive Advantage	2
		Improving Technological Infrastructure	1
		<b>Total</b>	<b>3</b>
	<b>Overall Total</b>	<b>12</b>	
Technology and Process Development	Developing process	Business Process Improvement	2
		Having a R&D Center	1
		Improving Functions and Quality of Products	1
	<b>Overall Total</b>	<b>4</b>	
Human Resource Management	Recruiting Customer Relations	Enhancing Customer Satisfaction	2
		Following Needs and Expectations of Customers	2
	<b>Overall Total</b>	<b>4</b>	
Human Resource Management	Recruiting	Having Qualified Human Resources	2
	<b>Overall Total</b>	<b>2</b>	
Product and Service Development	Researching & Developing Products and Services	Following Trends of Markets	1
	<b>Overall Total</b>	<b>1</b>	
<b>Grand Total</b>	<b>23</b>		

management and product/service development are the themes identified as the motives and drivers where strategic management is mentioned with a higher frequency (f=12). As presented in Table 3, strategic management theme is comprised of corporate strategy development and gaining differentiation advantage with a greater emphasis on corporate strategy development (f=9). *Management support and guidance* is identified as the mostly repeated motive (f=4) within corporate strategy development. *Developing innovative corporate perspective* and *encouraging innovative personnel skills* share the same frequency of two whereas improving innovative corporate image is mentioned only once.

Technology and process management and marketing themes are equal in terms of the frequency of their repetition. Developing process which is categorized under technology and process development is identified as the second order theme and is comprised of *business process improvement, having a R&D center and improving functions and quality of products*. Marketing theme involves providing customer relations where *enhancing customer satisfaction* and *following needs* (f=2) and *expectations of customers* (f=2) constitute the themes under this category.

### **Benefits of Adopting Open Innovation Practices**

The RQ<sub>5</sub> of the present study aimed to explore the benefits captured by adopting open innovation practices. Benefits that firm acquired were analyzed and categorized under five themes: strategic management, operations, technology and process development, product and service development and marketing. As seen in Table 4, it is apparent that strategic management is the most repetitive theme (f=19) in terms of benefits. This business process has two sub-categories: gaining differentiation advantage and corporate strategy development.

Gaining competitive advantage (f=6), protecting intellectual property of new technology (f=2), improving technological infrastructure (f=1) and decreasing costs (f=1) are grouped under gaining differentiation advantage sub-category under strategic management. Corporate strategy development is the second sub-category and is comprised of six benefits in which developing innovative corporate skills (f=3) and improving stakeholder cooperation (f=2) are the mostly stated benefits. Operations is the second category of business process that is mentioned mostly (f=12) which involves process development and quality assurance or quality control sub-groups. Process development involves five benefits where the emphasis is mostly put on the benefit of business process improvement (f=4).

<b>Table 4: Benefits of Open Innovation Practices</b>			
<b>Third Order Theme</b>	<b>Second Order Theme</b>	<b>First Order Theme</b>	<b>f</b>
<b>Strategic Management</b>	Gaining Differentiation	Gaining Competitive Advantage	6
		Protecting Intellectual Property of New Technology	2
		Improving Technological Infrastructure	1
		Decreasing Costs	1
		<b>Total</b>	<b>10</b>
	Corporate Strategy Development	Developing Innovative Corporate Skills	3
		Improving Stakeholder Cooperation	2
		Commercialization of Technological Information	1
		Developing Environmental Corporate Strategy	1
		Developing Innovative Corporate Perspective	1
		The Sustainability of the R&D Center	1
		<b>Total</b>	<b>9</b>
	<b>Overall Total</b>	<b>19</b>	

<b>Operations</b>	Process Development	Business Process Improvement	4
		Enhancing Product Performance	2
		Enhancing Productivity	2
		Integration of Robots into Manufacturing Systems	2
		Improvement Efficient Production	1
		<b>Total</b>	<b>10</b>
	Quality Assurance or Quality Control	Improving Functions and Quality of Products	2
		<b>Total</b>	<b>2</b>
<b>Overall Total</b>	<b>12</b>		

**Table 4: Benefits of Open Innovation Practices (continued)**

<b>Third Order Theme</b>	<b>Second Order Theme</b>	<b>First Order Theme</b>	<b>f</b>
<b>Technology and Process Development</b>	Developing and Testing Software	Developing Data Collection System	2
		Developing Remote Product Control System	1
		Developing Data Analysis System	1
		<b>Total</b>	<b>4</b>
	Product or Service Designing	Conducting Digital Designing	3
		<b>Total</b>	<b>3</b>
	Developing Process	Business Process Improvement	2
		Improving Functions and Quality of Products	1
		<b>Total</b>	<b>3</b>
	<b>Overall Total</b>	<b>10</b>	
<b>Product and Service Development</b>	Researching & Developing Products or Services	Improving Market Share	4
		Decreasing Cost Through Innovations	2
		Gaining New Market	1
		Decreasing Customer Complaint	1
		Improving Product's Features	1
	<b>Overall Total</b>	<b>9</b>	
<b>Marketing</b>	Providing Customer Relations	Enhancing Customer Satisfaction	5
	<b>Overall Total</b>	<b>5</b>	
<b>Grand Total</b>	<b>56</b>		

## Barriers to Applying Open Innovation

Nevertheless, the aforementioned benefits of open innovation adoption, the firm disclosed some key barriers that interfere with its abilities of open innovation adoption. Mostly repeated barrier is the time constraint which has a frequency of four. All the managers mention about time constraint. As the following statements pinpoint:

“Our biggest obstacle is time; the limited time, which is actually a triggering driving force, can be counted as both plus and minus. The desire to respond quickly to demands can sometimes create stresses.” (Manager 1)

“In innovation processes, there may be time and budget constraints in the implementation of solutions for situations that we could not predict at the beginning.” (Manager 3)

The other barriers include *budget constraints, prejudice and habits of people* and *the difficulty of new product acceptance* sharing the same frequency (f=2). All barriers that firm is confronting with during the adoption of open innovation practices are summarized in Table 5.

Table 5: Barriers to Open Innovation Adoption	
First Order Theme	f
Time Constraint	4
Prejudice and Habits	2
The Difficulty of New Product Acceptance	2
Budget Constraint	2
Limited Personnel	1
Lack of Cross-functional Teamwork	1
Quick Response to Demand	1
Grand Total	13

Regarding prejudice and habits of people the following quotation was stated:

“In general, people have negative prejudices and the difficulty of breaking the habits appear as the most important obstacle.”

*Limited skilled personnel, lack of cross functional teamwork* for innovation activities, and the pressure to *respond quickly to demand* are the other barriers for the company.

## DISCUSSION AND FUTURE DIRECTIONS OF THE RESEARCH

The purpose of this article is to unveil the current status of open innovation practices embraced by a firm in FVM sector in a developing economy. As mentioned

in the literature review, there are four types of open innovation; however, the firm encapsulates only inbound acquiring and outbound selling approaches. The firm acquires expertise from external environment, especially collaborates with the universities, suppliers, and customers and sells licensing of its innovations and new products. These results confirm the findings of Barrett *et al.* [2015] and Pilav-Velic and Jahic [2021] which assert that when compared with the developed countries, developing countries rely heavily on knowledge from external environment to enhance the innovative performance of the companies due to the economic structural differences. Thus, the firms located in developing countries have to make innovations under restrictive resources and diverse market conditions to survive in the market [Pilav-Velić and Marjanovic (2016)].

Receiving expertise from the external environment is very beneficial for the firm, however, there is an important obstacle encountered in this type of outsourcing support which is the threat of copying ideas and products. This also accords with earlier studies, which exhibited that the tendency of developing countries to protect their intellectual property rights is lower than the developed countries [Chin and Grossman (1988); Chen and Puttitanun (2005)]. The firm overcomes this barrier by signing contracts with the experts. Moreover, regarding the open innovation types used by the firm, findings pinpoint that the firm does not use inbound sourcing and outbound revealing open innovation types. The firm established the first R&D center therefore, all innovations, engineering and design activities of the firm are performed by R&D center, so that the firm creates new product without using external sources.

Furthermore, the findings reveal that the firm's strategy is designed to encourage openness, and managers support the innovative organizational culture and assist the employees for the innovation. This result is consistent with literature highlighting the effects of the firm's strategy on innovative capabilities [Cottam *et al.* (2001); Van der Panne *et al.* (2003); Anderson *et al.* (2004); Cagle *et al.*, (2020)]. Innovative behaviors and ideas of the employees are one of the sources [Anderson *et al.* (2004); Shalley *et al.* (2004)] of radical or incremental innovation process of the firm [Vincent *et al.* (2002)]. In addition, individual level (personnel ability and willingness to be create innovative ideas), [Woodman *et al.* (1993); Ford (2000), Chaudhary *et al.* (2022)], job level (contextual characteristics of the job), [Vincent *et al.* (2002)], team level (tasks and characteristics of the team), [West and Hirst (2003)] and organizational level factors (organizational factors such as culture, strategy), [Axtell *et al.* (2000); Anderson *et al.* (2004)] are among the essential determinants of personal innovativeness. In addition, the research



findings disclosed that the firm has improved innovative corporate skills by increasing their ability to offer pioneering, innovative, and environmentally friendly products and solutions and following new technologies and developments. The findings of this study reveal that employees of the firm are open to continuous improvement, and their approaches and efforts are suitable for innovations. So that, these results further support the idea of importance of the organization level factors on the employee and firm innovativeness.

Moreover, the current study highlights the potential benefits of open innovation usage on business process of the company. The study has disclosed that scientific, innovative product and production systems have boosted the business process of the firm. Besides, open innovation helps digitalization of operational processes, for example, the firm has used the 3D and advanced design programs to transfer the certain parts of the production line to simulation environment. Furthermore, innovations improve the market share and product quality of the firm and decrease both the production cost and customer complaint. These results are in line with the recent studies indicating that open innovation process helps to obtain valuable knowledge and new technology from external environments with a lower price [Lichtenthaler and Lichtenthaler (2009); Sisodiya (2009); Cagle (2020)] and with a better understanding of customer needs and expectations [Boudreau (2006); Usman and Vanhaverbeke (2017); Odura (2019)].

As well as the benefits accruing to the firm in open innovation adoption, the study uncovers that the firm enhances customer satisfaction by having a strong service network and developing valuable technology for them. Moreover, the firm create new applications for customer to assist them to select the right product and give necessary technical information and support. In addition, the findings have disclosed that needs and expectations of the customers are effective trigger to enhance innovativeness of the firm. The findings reveal that the firm uses data collection and new robotic systems to improve customer satisfaction through understanding needs of customers and help them. This result is consistent with studies revealing that open innovation is a good way to explore the needs, and expectations of the users [Chesbrough (2003); Boudreau (2007)]. Thus, customers' preferences and company's offerings can be better matched.

## **CONCLUSION**

Extant literature on open innovation paradigm has mainly focused on the effect of open innovation practices on firm performance. However, especially in the developing countries like Turkey, it is crucial to convey the paradigm of open innova-

tion within a holistic point of view. Unfolding the current open innovation practices embraced, tools used, networks established in Turkey is believed to enhance the awareness towards open innovation. Moreover, findings obtained contribute to the conceptualization efforts of open innovation paradigm. The current study unveils that the firm embodies open innovation practices with a large concentration of in-bound and coupled modes of interaction across a relatively narrow range of network. Findings also illuminate that the user innovation tools have to be enhanced to better exploit the user experience. We chose to focus on a single industry (foundry and valve) to eliminate industry effects and increase internal validity. On the other hand, the research strategy embraced is being criticized as limiting the generalization of the findings due to external validity problem. Therefore, this study should be replicated in diverse research settings like different sectors and other developing economies.

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