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## Effects of Innovation Types on Performance of Manufacturing Firms in Turkey

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### Abstract

The purpose of this study is to explore the effects of innovation types on the firm performance. This study was conducted on 197 manufacturing firms in İstanbul in Turkey. Factor analyses and multiple regression analyses were conducted to the data. The questions of the innovation types measure were determined by Günay (2007) from the typology of Oslo Manual (OECD, 2005). The author determined the questions of the firm performance measure based on the Balanced Scorecard approach. The product innovation, process innovation and organizational innovation have positive impacts on financial performance, customer performance, internal business processes performance and learning and growth performance. The marketing innovation has positive impacts on financial performance, customer performance, and internal business processes performance. However, the marketing innovation has a negative impact on learning and growth performance. The innovation type explains customer performance more than other dimensions of firm performance.

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### 1. Innovation and Innovation Types

Innovation is a strategic tool for firms to survive and gain competitive advantages in the global marketplace. Innovative firms can improve their performances, defeat their competitors and provide value to their stakeholders.

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Innovation is a source of competitive advantage for a firm (Zawislak et. al., 2012, p. 15). According to Oslo Manual (OECD, 2005, pp. 46-47), an innovation is “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations.” Oslo Manual (OECD, 2005, p. 47) classified innovation as product innovation, process innovation, marketing innovation and organizational innovation. Oslo Manual (OECD, 2005, p. 29) links innovation to performance: “the ultimate reason is to improve firm performance, for example by increasing demand or reducing costs.”

Several studies show that there is a positive relationship between innovation and firm performance (Griliches and Mairesse, 1990; Crépon et al., 1998; Lööf and Heshmati, 2001, 2002; Mairesse and Mohnen, 2003; Kafourous et al., 2008) (Basterretxea and Ricardo Martinez, 2012, p. 362). Ul Hassan et al. (2013, p. 243) showed a positive impact of innovation types on firm performance in Pakistani manufacturing firms. Prajogo (2006) reveal that innovation in manufacturing industry is more radical and has a stronger impact on performance than it is in service sector. Günday et al. (2011) highlight that there are studies which explore relationship between innovation types and performance. Damanpour et al. (2009) found a positive impact of innovation types on firm performance. Bowen et al. (2010) revealed a relationship between innovativeness and future firm performance. Subramanian and Nikalanta (1996) showed a positive effect of innovation on firm performance. Cingoz and Akdogan (2011) proposed the positive linkage of expected positive performance outcomes with innovative behaviour (Ul Hassan et al., 2013, p. 244-248).

### *1.1. Product Innovation*

A product innovation can be recognized easily by stakeholders of a firm. It usually requires continuous research and development to be competitive in the market.

According to Oslo Manual (OECD, 2005, p. 48), a product innovation is “the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.” Oslo Manual (OECD, 2005, p. 48) highlights that product innovation can utilise new technologies and knowledge. It may be based on new uses or combinations of existing technologies and knowledge. A product innovation is the introduction of new goods and services and significant improvements in the functional or user characteristics of existing goods and services (OECD, 2005, p. 48). Günay (2007, p. 12) states that a new product can be developed by combining current technologies and using them differently or using radical technologies. Deming (1996, p. 143) believes that firms have to understand customer needs and expectations, design products and services to create better lives to them to survive in the long term. Bish (2006) believes that a product innovation may be in two dimensions namely new products and new innovations in current products. Tübitak (2006, p. 13) acknowledges that there is a relationship between product innovation and technology. It (2006, p. 13) adds that technology makes contribution to increase production level, product characteristics, product value and decrease product costs (Günay, 2007, pp. 11-12). Polder et al. (2010) believe that a product innovation is introducing new products or making significant improvements in the current products. They (2010) add that firms make product innovation to create efficiency. Atuahene-Gima (1996) acknowledges that the product innovation has the following dimensions; the product should be new to customers from the perspective of the customer, the product should be new to the firm from the perspective of the firm, product modification means making product variation in the current products of the firm. Adner and Levinthal (2001) claim that the purpose of the product innovation is to attract new customers. They (2001) add that firms launch new products or modify current products based on customer needs. Ettlé and Reza (1992) believe that a product innovation is a key factor which contributes to firm success. They (1992) point out that new product development and product innovation is an important strategy to increase market share and performance of a firm. They (1992) add that several studies reveal that new product development has a positive impact on firm performance (Ul Hassan et al., 2013, p. 245).

### *1.2. Process Innovation*

A process innovation is a tool to improve organizational efficiency. A firm may adopt new technologies, buy new machineries, train their employees and reorganize their processes to make a process innovation.

Oslo Manual (OECD, 2005, p. 49) defines a process innovation as “the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.” Oslo Manual (OECD, 2005, p. 49) acknowledges that a process innovation may decrease unit production or delivery costs to increase quality, produce or deliver new or significantly improved products. It covers new or significantly improved techniques, equipment and software in support activities namely accounting, purchasing, maintenance and computing. The implementation of new or significantly improved information and communication technology is a process innovation if it improves the efficiency or quality of a support activity (OECD, 2005, p. 49). Akyos (2006: 4) acknowledges that a process innovation can be defined as a new production method. Özdemir and Öner (2006) believe that a process innovation is changing to do work. Keizer et al. (2002, pp. 1-13) state that a process innovation covers changes caused by new information and communication technologies to improve productivity and quality of support activities. Davenport (1993, p. 5) believes that a process innovation consists of production, work, management and operational processes. Acuner (2000, p. 15) states that a process innovation is integrated method which covers interfunctional innovation besides innovation in a production process (Günay, 2007, pp. 13-14). Polder et al. (2010) believe that a process innovation is improving logistics and manufacturing methods significantly or improving support activities such as accounting, information technologies, purchasing, and maintenance significantly. Adner and Levinthal (2001) state that firms make a process innovation to manufacture innovative products. Olson et al. (1995) acknowledge that firms make a process innovation to decrease the production cost. Ettlie and Reza (1992) claim that firms apply new processes to compete with other firms and satisfy their customers. They (1992) point out that making the process innovation in manufacturing firms may have significant impact on productivity (Ul Hassan et al., 2013, pp. 245-246).

### *1.3. Marketing Innovation*

A marketing innovation can be easier and cheaper compared to product innovation for a firm. It might help to rejuvenate the firm's position in a market. A firm may penetrate to its market and increase its sales revenues.

Oslo Manual (OECD, 2005, p. 49) defines a marketing innovation as “the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.” Oslo Manual (OECD, 2005, p. 49) highlights that a marketing innovation may open new markets, address customer needs, reposition products in the market to increase sales.

Akyos (2006, p. 5) believes that a marketing innovation consists of new sales and marketing techniques. Günay (2007, p. 15) adds that marketing innovation is comprised of marketing product performance, production system and services (Günay, 2007, p. 15). Polder et al. (2010) believe that a marketing innovation is a non-technological innovation. They (2010) add that firms make innovation in marketing methods to increase efficiency. Chen (2006) state that a marketing innovation is developing new methods and techniques for marketing. He (2006) claims that developing new methods, techniques and tools for marketing have significant role in organizational success. He (2006) adds that marketing innovation is ‘changed ways for collecting customer's information’ (Ul Hassan et al., 2013, p. 246).

### *1.4. Organizational Innovation*

An organizational innovation expands the capabilities and vision of a firm, improves employee satisfaction, leads to organizational transformation.

Oslo Manual (OECD, 2005, p. 51) defines an organizational innovation as “the implementation of a new organizational method in the firm's business practices, workplace organisation or external relations.” Oslo Manual (OECD, 2005, p. 51) acknowledges that an organizational innovation which is the result of managerial strategic decisions may increase performance of a firm by reducing administrative costs, transaction costs and supplies costs; accessing to nontradable assets, improving workplace satisfaction and labour productivity.

Akyos (2006, p. 5) believes that an organizational innovation can be related to new communication and cost

system. Hage (1999) states that an organizational innovation can increase product quality and productivity, information exchange among business functions, improve information and technology usage capacity (Günay, 2007, pp. 16-17). An organizational innovation is in the center of other types of innovation and required to initiate other types of innovation. An organizational innovation consists of new work techniques. It can be related to organizing knowledge, having access to knowledge and preparing new databases. Also, it can be related to developing organizational model to encourage employee participation to decision making. It can be related to integrating R&D and manufacturing, and structuring commercial activities. It can be concluded that an organizational innovation creates time and economic benefits by facilitating the cooperation of business functions. Mergers and acquisitions cause an organizational innovation (Günay, 2007, pp. 17-18). Polder et al. (2010) believe that an organizational innovation is defined as introducing new business practices, organizing methods, decision making systems and new approaches to manage external relations. Ettlíe and Reza (1992) state that firms change their approaches to organize things to satisfy their customers and compete with their competitors (Ul Hassan et al., 2013, p. 246).

## **2. The Balanced Scorecard For Firm Performance**

The Balanced Scorecard is an approach which links a firm strategy to firm performance. It categorizes firm performance as financial performance, customer performance, internal business processes performance and learning and growth performance. The Balanced Scorecard starts with organizational learning and growth which improve internal business processes to provide more value to customers to reach high financial performance. It was developed by Kaplan and Norton. It is widely used in the literature to measure firm performance.

The Balanced Scorecard plays operational and strategic roles in firms. According to Olve, Roy and Wetter (1999), the Balanced Scorecard which focuses on learning and growth performance, financial performance, customer performance, and internal business processes performance has been used in nonprofit, public, manufacturing and service organizations in the World. Kaplan and Norton (2001) believe that a successful Balance Scorecard implementation should facilitate an organizational change. Firms which use the Balance Scorecard can improve strategic thinking, teamwork and organizational learning. Kaplan and Norton (2001) claim that the following elements are essential for the Balanced Scorecard approach; making investments in systems and people to improve processes and deliver differentiated value propositions to grow, making innovation of services and products, proposing value to convince customers to do more business at higher margins with the firm, and targeting customers for profitable growth (Phillips and Louvieris, 2005, p. 202). The Balanced Scorecard has been used by several firms such as Mobil, DuPont, Motorola, AT&T and Tata Motors to improve their organizational performance and meet their objectives. According to Kaplan and Norton (1992) the Balanced Scorecard is a popular strategy implementation tool which helps organizations to translate strategy into operational objectives which drive both behaviour and performance. Kaplan and Norton (1996, 2004) claim that the strategy is broken down into operational strategic objectives considering the customer value proposition and financial results. Kaplan and Norton (2004) believe that the performance drivers in the financial and customer perspectives are placed in the internal business processes and learning and growth perspectives to form a causal relationship (Yemeshvary et al., 2013, pp. 447-448). There are few studies that show the effect of innovation on firm performance using balanced scorecard approach in the literature (Öncü et al., 2013; Luo et al., 2012).

Brewer and Speh (2000) define perspectives of the BSC as follows (Phillips and Louvieris, 2005, pp. 202-203):

Financial Perspective: It is the most important factor which acts as a system of checks and balances.

Customer Perspective: Measures which capture customers' opinions lead the business to succeed. They can be specific (cost, response time, product quality etc.) or general (customer value, customer retention etc.)

Internal Business Processes: Internal business processes should meet and exceed customer needs. These are mostly nonfinancial measures (quality measures which are time based and flexibility oriented).

Innovation and Learning: Things to be done on a continuing basis to satisfy and keep customers. Future capabilities are more important than current capabilities. Measures can be related to process improvement rates, new product development, and percentage of sales from new products, and human resources.

### 3. Methodology

#### 3.1. Research Goal

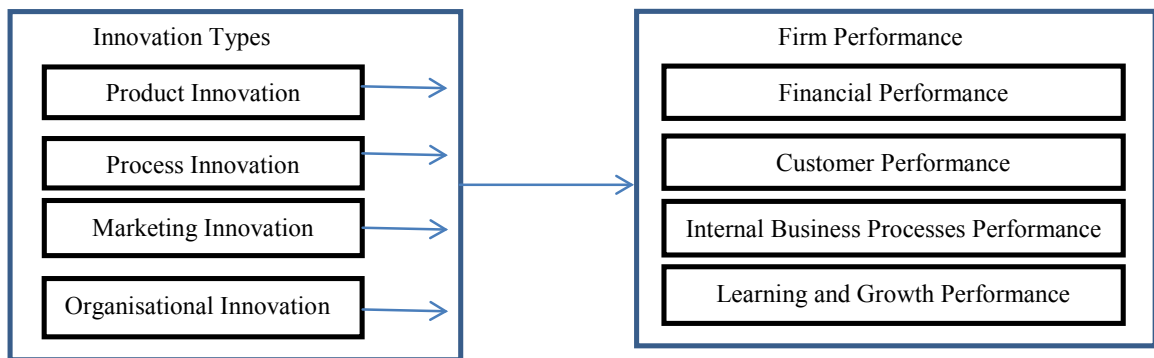
The purpose of this study is to explore the effects of innovation types on the firm performance.

#### 3.2. Sample and Data Collection Method

The population is based on 12500 manufacturing firms which are members of Istanbul Chamber of Industry. The questionnaire was e-mailed to general managers of these firms. 197 firms which filled the questionnaire is the sample of this study. Time restriction affected to receive more questionnaires.

#### 3.3. Research Model of the Study

The research model of the study is as follows:



#### 3.4. Hypotheses of the Study

The hypotheses of the study are as follows:

- H1a: Product innovation has a positive impact on financial performance.
- H1b: Process innovation has a positive impact on financial performance.
- H1c: Marketing innovation has a positive impact on financial performance.
- H1d: Organizational innovation has a positive impact on financial performance.
- H2a: Product innovation has a positive impact on customer performance.
- H2b: Process innovation has a positive impact on customer performance.
- H2c: Marketing innovation has a positive impact on customer performance.
- H2d: Organizational innovation has a positive impact on customer performance.
- H3a: Product innovation has a positive impact on internal business processes performance.
- H3b: Process innovation has a positive impact on internal business processes performance.
- H3c: Marketing innovation has a positive impact on internal business processes performance.
- H3d: Organizational innovation has a positive impact on internal business processes performance.
- H4a: Product innovation has a positive impact on learning and growth performance.
- H4b: Process innovation has a positive impact on learning and growth performance.
- H4c: Marketing innovation has a positive impact on learning and growth performance.
- H4d: Organizational innovation has a positive impact on learning and growth performance.

#### 3.5. Measures of the Study

First of all, 4 questions which were developed by the author were asked to understand the general state and approach of firms to an innovation. Günay (2007) conducted a study to explore the relationship

between innovation types and innovation barriers in Turkish SMEs. The author was inspired from this study. The questions of the innovation types measure were determined by Günay (2007) from the typology of Oslo Manual (OECD, 2005). They are used in this study as the questions of the innovation types measure. The author determined the questions of the firm performance measure based on the Balanced Scorecard approach. The five point Likert scale is used for both measures. Innovation types concept is composed of product innovation, process innovation, marketing innovation and organizational innovation. There are seven questions to determine product innovation, four questions to determine process innovation, five questions to determine marketing innovation and four questions to determine organizational innovation. Firm performance is composed of financial performance, customer performance, internal business processes performance and learning and growth performance. There are seven questions determining financial performance, four questions determining customer performance, nine questions determining internal business processes performance and six questions determining learning and growth performance.

### 3.6. Analyses

The cronbach alpha values of the dimensions of the both measures were calculated for the reliability of the scales. Factor analyses were conducted to figure out factor loadings of each dimensions. Multiple regression analyses were conducted to explore the effects of the independent variables of innovation types on the dependent variables of firm performance.

### 3.7. Findings

Table 1. Annual Sales Revenue of the Firm

	Frequency	Percent
0-1 million TL	43	21,8
1,01-8 million TL	85	43,2
8,01-40 million TL	45	22,8
40 million and more TL	24	12,2
Total	197	100,0

Table 2. Does a Firm Make Research and Development?

	Frequency	Percent
Yes	170	86,3
No	27	13,7
Total	197	100,0

Table 3. Ratio of Research and Development Budget to Annual Sales Revenue

	Frequency	Percent
0%-2%	98	57,7
3%-5%	49	28,8
6%-8%	7	4,1
9% or more	16	9,4
Total	170	100,0

Table 4. A Firm's Innovation Type

	Frequency
Product Innovation	131
Marketing Innovation	33
Process Innovation	30
Organizational Innovation	22
Total	216

Table 5. KMO and Bartlett Test Result for Independent Variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.848
Bartlett's Test of Sphericity	Approx. Chi-Square	1509.434
	df	190
	Sig.	0.000

The factor loadings of independent variables is greater than 0.3. A KMO value of 0.848 shows that the data is appropriate for investigating further. The result of Bartlett’s test which is 0.000 is smaller than 0.05. It shows that the variables are suitable for conducting factor analysis. 62.861% of variance is explained as a result of factor analysis. It is good for validation. The Cronbach’s alpha values of the independent variables are acceptable for testing reliability of the scale.

Table 6. Factor Analysis Results of Independent Variables

	Factor Loading	% Variance Explained	Cronbach $\alpha$
<b>Product Innovation</b>		22.204	0.811
We developed a new model of a product which is manufactured in our firm to use for different purposes	0.792		
We were manufacturing our product from a different material before, we are using a new material now	0.729		
We have at least one product which is innovated and manufactured in our firm	0.729		
We launched at least one product which we manufactured in a market	0.685		
Our firm has at least one patent of products which we manufactured	0.559		
We improve an existing product in a sector and launch to a market as a new product	0.533		
Tools and equipment which can be considered as high technology are used for products which are manufactured in our firm	0.527		
<b>Process Innovation</b>		21.421	0.802
There are changes in manufacturing methods in our firm compared to earlier years	0.660		
We can finish manufacturing earlier by the help of computer aided softwares which are used in our firm	0.537		
Costs are controlled during the production process in our firm and savings are achieved by getting rid of unnecessary ones	0.528		
We keep records of time from materials to delivery of products for each product in our firm	0.469		
<b>Marketing Innovation</b>		11.868	0.786
There are changes in packaging, design or price of a product to increase sales in our firm	0.662		
We have shown at least once to our customers that a product which we have sold can be used for other purposes except its main purpose	0.656		
There are new methods to promote products in our firm	0.635		
Marketing method which was used before in our firm was different than the the one which is used now	0.621		
It is possible to see attributes, usage areas, prices of products in our firm’s web site	0.621		
<b>Organizational Innovation</b>		7.367	0.703
There are intranet, database training etc. practices to improve knowledge share in our firm	0.782		
Outsourcing (purchasing, recruiting, technological support, consulting etc.) which has not been used before is used recently in our firm	0.696		
Cooperation among functions provide time and cost benefits in our firm	0.665		
Quality management systems such as ISO 9001 is applied in our firm	0.432		
Total Variance Explained (%) : 62.861			

The factor analyses of firm performance are as follows:

Table 7. KMO and Bartlett Test Result for Dependent Variables

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.858
Bartlett's Test of Sphericity	Approx. Chi-Square	2663.553
	Df	325
	Sig.	0.000

The factor loadings of dependent variables is greater than 0.3. A KMO value of 0.858 shows that the data is appropriate for investigating further. The result of Bartlett’s test which is 0.000 is smaller than 0.05. It shows that the variables are suitable for conducting factor analysis. 58.74% of variance is explained as a result of factor analysis. It is good for validation. The Cronbach’s alpha values of the dependent variables are acceptable for testing reliability of the scale.

Table 8. Factor Analysis Results of Dependent Variables

	Factor Loading	% Variance Explained	Cronbach $\alpha$
<b>Financial Performance</b>		21.18	0.697
Market share	0.830		
Sales revenues of new products	0.761		
Profitability	0.711		
Productivity	0.634		
Sales revenues of all products	0.596		
ROI	0.596		
Inventory turnover	0.573		
<b>Customer Performance</b>		19.39	0.722
Number of new customers	0.526		
Sales to new customers	0.446		
Sales to current customers	0.415		
Number of customers who left the firm	0.344		
<b>Internal Business Processes Performance</b>		11.11	0.755
Technology for new processes	0.784		
Ratio of number of new products to total	0.761		
Technology for new product development	0.711		
Production costs	0.698		
Duration of production	0.691		
Duration to launch a new product	0.687		
Customer satisfaction	0.647		
Defective product rate	0.589		
Ratio of on time delivery of products	0.583		
<b>Learning and Growth Performance</b>		7.05	0.707
Employee hapiness	0.785		
Gathering information about new products	0.736		
Gathering information about customers	0.728		
Employee turnover rate	0.658		
Number of employee suggestions	0.636		
Number of implemented employee suggestions	0.634		
Total Variance Explained (%) : 58.740			

Table 9. Multiple Regression Results of Innovation Types and Firm Performance

Independent Variables	Financial Performance		Customer Performance		Internal Business Processes Performance		Learning and Growth Performance	
	Standardized Coefficients Beta	Sig.	Standardized Coefficients Beta	Sig.	Standardized Coefficients Beta	Sig.	Standardized Coefficients Beta	Sig.
1 (Constant)		0.040		0.086		0.224		0.475
Product Innovation	0.231*	0.062	0.172**	0.031	0.051**	0.032	0.085**	0.036
Process Innovation	0.159**	0.011	0.151**	0.048	0.016*	0.099	0.102*	0.056
Marketing Innovation	0.099*	0.071	0.045*	0.053	0.053**	0.046	-0.012*	0.087
Organizational Innovation	0.014*	0.085	0.112**	0.012	0.071**	0.015	0.062**	0.039
R	0.319		0.450		0.361		0.298	
R square	0.101		0.202		0.130		0.088	
F	1.691		1.09		3.490		1.053	

\*p&lt; 0.10, \*\*p&lt; 0.05

The innovation type explains 10.1% of financial performance, 20.2% of customer performance, 13% of internal business processes performance and 8.8% of learning and growth performance. The innovation type explains customer performance more than other dimensions of firm performance.



H1a: Product innovation has a positive impact on financial performance.  
Product innovation has a positive impact on financial performance. H1a is accepted at 0.10 significance level.

H1b: Process innovation has a positive impact on financial performance.  
Process innovation has a positive impact on financial performance. H1b is accepted at 0.05 significance level.

H1c: Marketing innovation has a positive impact on financial performance.  
Marketing innovation has a positive impact on financial performance. H1c is accepted at 0.10 significance level.

H1d: Organizational innovation has a positive impact on financial performance.  
Organizational innovation has a positive impact on financial performance. H1d is accepted at 0.10 significance level.

H2a: Product innovation has a positive impact on customer performance.  
Product innovation has a positive impact on customer performance. H2a is accepted at 0.05 significance level.

H2b: Process innovation has a positive impact on customer performance.  
Process innovation has a positive impact on customer performance. H2b is accepted at 0.05 significance level.

H2c: Marketing innovation has a positive impact on customer performance.  
Marketing innovation has a positive impact on customer performance. H2c is accepted at 0.10 significance level.

H2d: Organizational innovation has a positive impact on customer performance.  
Organizational innovation has a positive impact on customer performance. H2d is accepted at 0.05 significance level.

H3a: Product innovation has a positive impact on internal business processes performance.  
Product innovation has a positive impact on internal business processes performance. H3a is accepted at 0.05 significance level.

H3b: Process innovation has a positive impact on internal business processes performance.  
Process innovation has a positive impact on internal business processes performance. H3b is accepted at 0.10 significance level.

H3c: Marketing innovation has a positive impact on internal business processes performance.  
Marketing innovation has a positive impact on internal business processes performance. H3c is accepted at 0.05 significance level.

H3d: Organizational innovation has a positive impact on internal business processes performance.  
Organizational innovation has a positive impact on internal business processes performance. H3d is accepted at 0.05 significance level.

H4a: Product innovation has a positive impact on learning and growth performance.  
Product innovation has a positive impact on learning and growth performance. H4a is accepted at 0.05 significance level.

H4b: Process innovation has a positive impact on learning and growth performance.  
Process innovation has a positive impact on learning and growth performance. H4b is accepted at 0.10 significance level.

H4c: Marketing innovation has a positive impact on learning and growth performance.  
Marketing innovation has a negative impact on learning and growth performance. H4c is rejected at 0.10 significance level.

H4d: Organizational innovation has a positive impact on learning and growth performance.

Organizational innovation has a positive impact on learning and growth performance. H4d is accepted at 0.05 significance level.

#### 4. Conclusion

The product innovation, process innovation and organizational innovations have positive impacts on financial performance, customer performance, internal business processes performance and learning and growth performance. The marketing innovation has positive impacts on financial performance, customer performance, and internal business processes performance. On the other hand, the marketing innovation has a negative impact on learning and growth performance. This finding may change if the sample size will be greater. Firms need to conduct appropriate types of innovation to improve their firm performance. The innovation type explains customer performance more than other dimensions of firm performance. It can be concluded that the innovation type of Turkish manufacturing firms leads them to improve their customer performance. Also, innovation strategy leads these firms to improve their internal business processes performance, financial performance, and learning and growth performance. Time restriction is the main limitation of this study. More data can be gathered to analyze in further studies. Firms should choose the appropriate innovation types to reach high performance. This study is expected to make contribution to academicians and firms in the field of innovation.

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