IMPACT OF INNOVATION PERFORMANCE ON FINANCIAL PERFORMANCE AND FIRM VALUE: AN APPLICATION IN BORSA ISTANBUL

Master's Thesis

Atakan ERDOĞAN

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MASTER'S THESIS

Department of Business Administration

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ÖZET

İNOVASYON PERFORMANSININ FİNANSAL PERFORMANS VE FİRMA DEĞERİ ÜZERİNE ETKİSİ:
BORSA İSTANBUL'DA BİR UYGULAMA

Atakan ERDOĞAN

İşletme Anabilim Dalı-İşletme Yönetimi Bölümü

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Danışman: Dr. Öğr. Üyesi Özlem SAYILIR

Bu çalışmanın temel amacı, işletmelerin inovasyon performanslarının, finansal performanslarıyla ve firma değerleriyle olan ilişkisini araştırmaktır. Çalışma kapsamında 2018 yılında en çok Ar-Ge harcaması yapan firmalar arasından BIST'da işlem gören 30 firma seçilip, web sitelerindeki finansal raporlardan ve Finnet altyapısından veriler toplanmıştır. Faktör analizi, regresyon ve korelasyon analizleri ile elde edilen sonuçlar doğrultusunda işletmelerin, inovasyon performanslarının finansal performanslarıyla istatistiksel olarak anlamlı ve pozitif yönlü bir ilişkisi olduğu bulunmuştur. Ancak inovasyon performansının firma değeriyle bir ilişkisi saptanamamıştır. Ayrıca, şirketlerin öz kaynak karlılığı hariç diğer finansal performans göstergelerinin fiyat/kazanç oranı ile negatif yönlü bir ilişkisi olduğu gözlenmiştir. Bulgulara göre, inovasyon performansının belirlenmesinde temel olarak araştırma ve geliştirme faaliyetlerine yapılan yatırımların en önemli etken olduğu fakat proje sayılarının etkisinin en az olduğu sonucuna varılmıştır.

Anahtar Sözcükler: inovasyon, finansal performans, firma değeri, regresyon, korelasyon

ABSTRACT

IMPACT OF INNOVATION PERFORMANCE ON FINANCIAL PERFORMANCE AND FIRM VALUE:
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The main purpose of this study is to investigate the relationship between innovation performances, financial performances and firm values of companies. Within the scope of the study, among the companies that made the most R&D expenditures in 2018, 30 companies traded in BIST were selected and data were collected from financial reports and Finnet infrastructure on their websites. In accordance with the results obtained with factor analysis, regression and correlation analysis, it was found that the innovation performance of companies has statistically significant and positive relationship with the financial performance. However, a relationship between innovation performance and firm value could not be determined. In addition, it was observed that other financial performance indicators of companies excluding return on equity have a negative relationship with price / earnings ratio. According to the findings, it was concluded that the investments made in research and development activities were the most important factor in determining innovation performance, but the impact of the number of projects was the least.

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Keywords: innovation, financial performance, firm value, regression, correlation

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ETİK İLKE VE KURALLARA UYGUNLUK BEYANNAMESİ

Bu tezin bana ait, özgün bir çalışma olduğunu; çalışmamın hazırlık, veri toplama, analiz ve bilgilerin sunumu olmak üzere tüm aşamalarında bilimsel etik ilke ve kurallara uygun davrandığımı; bu çalışma kapsamında elde edilen tüm veri ve bilgiler için kaynak gösterdiğimi ve bu kaynaklara kaynakçada yer verdiğimi; bu çalışmanın Anadolu Üniversitesi tarafından kullanılan "bilimsel intihal tespit programı"yla tarandığını ve hiçbir şekilde "intihal içermediğini" beyan ederim. Herhangi bir zamanda, çalışmamla ilgili yaptığım bu beyana aykırı bir durumun saptanması durumunda, ortaya çıkacak tüm ahlaki ve hukuki sonuçları kabul ettiğimi bildiririm.

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LIST OF ABBREVIATIONS

ANOVA : Analysis of variance

ATM : Automated Teller Machine

BIST : Borsa Istanbul

CA : Cronbach Alpha

CFA : Confirmatory Factor Analysis

CFI : Comparative Fit Index

CMIN : Chi-square

CR : Critical Ratio

DF : Degree of Freedom

EBIT : Earnings Before Interest and Taxes

EFA : Exploratory Factor Analysis

EVA : Economic Value Added

FATO : Fixed Asset Turnover Ratio

GDP : Gross Domestic Product

GFI : Goodness of Fit Index

GII : Global Innovation Index

GMM : Generalized Method of Moments

GPM : Gross Profit Margin

HP : Hewlett-Packard

ICT : Information and Communications Technology

IFI : Incremental Fit Index

KMO : Kaiser-Meyer-Olkin Measure

MVA : Market Value Added

NFI : Normed Fit Index

NOPAT : Net Operating Profit After Tax

OLS : Ordinary Least Squares

OPM : Operating Profit Margin

OROA : Operating Return on Assets

P/B	: Price to Book Ratio
P/E	: Price to Earnings Ratio
R&D	: Research and Development
RCA	: Radio Corporation of America
RMSEA	: The Root Mean Square Error of Approximation
ROA	: Return on Assets
ROE	: Return on Equity
ROIC	: Return on Invested Capital
SE	: Standard Error
SEM	: Structural Equation Modelling
SPSS	: Statistical Package for the Social Sciences
SRMR	: Standardized Root Mean Square Residual
TATO	: Total Asset Turnover Ratio
TLI	: Tucker-Lewis index
TOPSIS	: Technique for Order of Preference by Similarity to Ideal Solution
UK	: United Kingdom
UPS	: United Parcel Service
USA	: United States of America
WACC	: Weighted Average Cost of Capital

INTRODUCTION

Businesses struggle to introduce innovations that will make a difference in their products, services, processes and ideas in order to survive and succeed in a highly competitive business environment in the 21st century. Thus, they develop practices, policies and strategies that will make them one step ahead in this intense competition. It is clear that even the smallest value added resulting from successful innovations will lead to significant differences in achieving the goals of companies such as growing market share, increasing profitability, maximizing shareholder wealth and strengthening stakeholder relations. Hence, R & D and innovation have emerged as important concepts in business research.

As the importance of innovativeness is gradually increasing for businesses in order to generate competitive advantage and leap out from the competition, companies tend to allocate more share from their budgets to innovation expenditures. Especially beginning from the new millennium, many companies attempt to enhance their innovation capacity by establishing R & D departments and providing them with considerable resources. New products, services and processes developed as a result of innovation activities will lead to increase in profit margins. Consequently, the increase in profits will allow companies to provide more resources for R & D and innovation expenditures.

Innovativeness aim to create appropriate new products, services or processes by identifying the problems of today's consumers and identifying their needs well. Innovation is the process of creating a product or service that has not been in the market before or adding different values and abilities to existing products. The objectives of innovative activities for businesses are developing new products, increasing the quality standards of the manufactured products and ensuring competitive advantage by providing cost advantages. In terms of national economy, the objectives of the research and development activities are utilizing resources effectively, increasing know-how and generating national technologies.

Innovation activities are still lagging behind for developing countries such as Turkey in comparison with developed countries. Companies in Turkey have not allocated sufficient time and funds to R & D activities although they seem to increase the resources committed for these activities recently. In this context, 30 Turkish companies which are traded on BIST have been examined in this research, in order to see whether there is a

relationship between innovation performance and financial performance as well as between innovation performance and firm value.

By considering innovation performance of companies, the research aimed to find out if there is a direct or indirect relationship between innovation performance with financial performance and firm value. For this purpose, in the first three chapters of the study, the concepts of innovation, financial performance and firm value has been presented. Besides, determinants of innovation performance, financial performance and firm value have been explained. In the fourth chapter, literature has been presented in two sections as research studies in Turkey and research studies in the World. In the fifth chapter, methodology of the study has been explained. Then, findings of the study analysis have been presented in the sixth chapter. The last chapter consists of the conclusion of the study and suggestions for future research.

1. INNOVATION

1.1. Concept of Innovation

The concept of innovation is seen as one of the most important factors to be successful, to survive and to keep sustainable competitive advantage for companies. Although there is no specific definition about the concept of innovation; The classic economist Schumpeter first described the concept of innovation as the driving force of development (Atalay, Anafarta, & Sarvan, 2013, p. 227).

The concept of innovation is conceptualized in several ways as a process and output. However, many of the definitions made about the concept of innovation share the idea that innovation means adoption of a new idea or behavior. Researchers argue that innovation is a critical concept for businesses in a competitive and fast-changing environment. Therefore, innovation is defined as a tool for businesses to gain and maintain competitive advantage (Jiménez-Jiménez & Sanz-Valle, 2011, p. 408).

The concept of innovation contributes to maintaining the existence of the company, becoming a leader in the market and increasing the profitability in the long term. It is not only the costs that determine the competitive advantage, but also quick response to market needs, consistent product and service quality, development of new products and services. Today, these components play a crucial role to allow businesses to move into new markets, increase their existing market share and increase their competitiveness (Gürkan & Gürkan, 2017, p. 215).

1.2. Necessity of Innovation

Tough competition that arises with globalization and changing market conditions obliges businesses to innovate. Increasing demands of consumers and technological developments have brought the need for innovation. In order to increase competitiveness, R&D activities that will generate innovations are necessary. Boosted competition is a factor that triggers the need for innovation. All kind of innovation which will increase profitability will increase the competitiveness. In order to survive and achieve their goals, companies must innovate continuously (Önal, 2011, p. 11).

Table 1 *The number of companies in different areas in 1970s, 1990s and 2006 (Ateş, 2007, p. 22)*

Product	1970s	1990s	2006
Vehicle models	140	260	400
PC models	0	400	1000
Cake Brands	3	29	50
Software Names	0	250000	400000
Soft Drink Brands	20	87	100
Water Brands	16	50	70
Magazine Brands	339	790	1100
Radio Stations	7000	14500	16000

As seen in Table 1, it is remarkable that the alternatives in front of the customers have increased rapidly over time. Increasing competition tend to lead to lower profitability for business in the market. Therefore, innovation has become inevitable in order to create and persevere value in the minds of the consumers, and to enhance profitability.

Innovation is the key aspect for the success of the businesses in commercial life and it is vibrant in all areas where commercial activity takes place. Businesses, which are struggling to survive with the threat of low profitability in intense competition conditions, can only bear the burden of the production costs by converting innovative and creative ideas into products or services. Investing to innovation activities means investing to the future. Moreover, it is an insurance against the intensely competitive environment arising from globalization (Mutlu, 2008).

1.3. Importance of Innovation

In the business world, many products with similar attributes are produced and launched in the market. Although it is important to produce products at low cost, this is not enough to compete. The production of many products with similar qualities leads to decrease in profitability. On the other hand, innovation could provide the competitive power in order to compete, outlast and also profitability (Ünlü, 2019, p. 36).

Most importantly, businesses can make efficient use of knowledge and technological abilities, in addition to capital, in order to generate new products, processes and services to sustain competitive advantage. Innovation provides several advantages to businesses in various ways. New products help businesses maintain and increase market

share, besides strengthen profitability in the markets they operate (Tidd, Bessant, & Pavitt, 2005, p. 30).

Innovation is vital for sustainable growth, enhanced employment and welfare in the economy. All businesses operating in different sectors feel the need for continuous innovation. The products, services and processes developed and improved as a result of innovation ensure that consumers' needs are satisfied more effectively. For example, innovations in the medical industry facilitate consumers to benefit from health services better and innovations in the automotive industry can facilitate improvements in transportation (Önal, 2011, p. 13).

In general, the importance of innovation for businesses can be listed as follows (Göydağ, 2019, p. 12):

- Innovation protects companies from negative fluctuations that may occur while businesses continue production,
- Businesses provides convenience to its customers via innovation,
- Innovation provides competitive power and advantage,
- Innovation supports to maintain market shares,
- Innovation ensures re-determination of the position of the activities and increasing the position of the company in the market where these activities take place,
- Innovation strengthens corporate reputation by reinforcing corporate leadership in the market in which the business is located,
- Innovation leads the way for new ideas and increases profit margins,
- Innovation facilitates finding new resources,
- Increases productivity and profitability,
- Innovation provides stability in the labor force by increasing the potential of the labor force,
- Innovation creates new opportunities by encouraging the employees,
- Innovation makes companies more attractive for partnership.

New knowledge and novel ideas become essential in the current era of knowledge economy (Göydağ, 2019, p. 13). Innovation is an available tool in every field both in terms of businesses and the national economies. It is very important in the new world

economy and must be considered carefully. Otherwise, first the profitability of businesses will decrease and then the economic failure will be inevitable (Önal, 2011, p. 13).

1.4. Characteristics of Innovation

Innovation has some characteristics effects on individuals in the society in general. Innovation provides both economic and social benefits. Thus, it provides socially positive outputs and improves the welfare of the society. At the same time, the continuous development of innovative thinking and innovation in organizational wisdom may solve many challenges, help businesses to adapt to the environment and by this means ensure sustainable competitiveness. In this context, it is possible to list some characteristics of innovation as follows (Göydağ, 2019, p. 10):

- Significant changes in human life,
- Continuity,
- Provides economic and social benefits,
- Generates improvements in employment,
- Increases the number of patents and exports,
- Contributes to entrepreneurship,
- Ensures efficient use of resources and distribution of resources in efficient fields,
- Including the risk factor and the output levels can not totally estimated,
- It consists of R & D activities.

The sense underlying the concept of innovation is to add mobility and vitality to the business and increase their performance by implementing marketing, product, process and organizational innovations via in competition. Likewise, to respond to market expectations of businesses, to produce services and goods with increased value added, to provide businesses competitive power has led to occur of the idea of innovation (Kalay & Kızıldere, 2015, p. 55).

1.5. Types of Innovation

The types of innovation vary depending on the object, sector, scope or its intensity. However, these types are not independent from each other (Carayannis, Samara, & Bakouros, 2015, p. 39).Thus, in the literature, the concept of innovation is subject to many

different classifications. Although there is no major innovation classification in the literature, innovation classifications are generally made according to two criteria, which are function and size. While innovation is divided into two groups as disruptive and incremental innovation according to the size criteria; in terms of function, it is divided into service, process, product, marketing, organization, and customer experience and business model innovations (Hobikoğlu, 2015, p. 1).

1.5.1. Disruptive innovation

Disruptive innovation is a type of innovation in which implementing the services, products or activities that were created by offered radical ideas and which were never implemented and tested before (Elçi, 2007, p. 16). In addition, it is observed that in this type of innovation, the products, services or activities that have been changed, which cause a significant change in the wishes and desires of the consumers, are developed and at the same time transformed into economic benefits (Göydağ, 2019, p. 18).

In disruptive innovation, however, there is the discovery of something new that has not been discovered before, which abolishes the current technological product, service or activity. Hence, it means disruptive innovation eliminates the existing product or service from the marketplace (Hobikoğlu, 2015, p. 3).

Unmanned aerial vehicles, mobile phones and credit cards are examples of disruptive innovation (Göydağ, 2019, p. 19).

The main features of destructive innovation are listed as follows (Hobikoğlu, 2015, p. 4):

- Costs of a product, service or process should reduce at least by 30%.
- It should be capable of changing the basis of competition.
- Disruptive innovation must include completely new performance features.
- The product must come to the stage of commercialization to be considered destructive innovation.
- Five and more attributes of the product, require performance improvement.

On average, disruptive innovations are implemented less frequently compared to incremental innovations. They pose a greater challenge for the existing structure in determining the roles of managers and cause strong reactions on its implementation. Often, larger businesses with higher success rates than smaller businesses implement

disruptive innovations because the type of these innovations requires technical knowledge and resources (Carayannis, Samara, & Bakouros, 2015, p. 40).

1.5.2. Incremental innovation

The type of incremental innovation is defined as innovation activities that are created by using existing technology to change, improve or reorganize the existing structure. Therefore, in incremental innovation, only the existing product is developed without creating added value in the product (Göydağ, 2019, p. 19). An example is the Intel Pentium 4 computer chip, based on the same technology as the Pentium 3 based on the gradual development of information (Hobikoğlu, 2015, p. 2).

Incremental innovation features and factors to be avoided in this process can be listed as (Hobikoğlu, 2015, p. 2):

- Incremental innovation can be done with budgets that support the time frame. It has less risk and the results can be achieved within a logical time frame. Therefore, it is a more preferred structure even in corporate companies.
- Incremental innovation is safer and cheaper.
- Systematic incremental innovation strategy ensures to reach desired growth target and will be able to generate units that can produce competitive new products.
- Investments in the incremental innovation strategy produce less risky but faster results.
- It is necessary to establish a balance between the selection of disruptive innovation, which links existing and future technologies, and incremental innovation, which provides faster results.
- In the process of incremental innovation, it is necessary to avoid making unnecessary add-ons that very few consumers may want that may disturb many consumers.

Incremental innovation is a type of innovation that causes a relatively small deviation from existing applications. It is implemented in order to advance old products or procedures without interfering with the existing structure and strategy of the business (Carayannis, Samara, & Bakouros, 2015, p. 40).

1.5.3. Product innovation

Product innovation can be defined as modifying the proposed use and properties of a product or introducing a new product to the market. Product innovation includes major improvements in specifications, materials, ease of use, built-in software and other functional features (Ünlü, 2019, p. 37). Therefore, product innovation refers to consumer-oriented innovations that satisfy the needs of consumers at the same time. This type of innovation not only includes innovative activities in products, but also innovations in service are considered within the scope of product innovation (Göydağ, 2019, p. 20).

Product innovation can be expressed as the creation of a new product that improves the existing feature set when used individually or in combination with other products from the consumer's point of view. A new product can be designed as a lower-cost service offer or product offer than existing alternatives. A product or service may not be preferred if it is not found when it is searched by consumers or if it is late due to timing (Georges, 2015, p. 4).

Product innovation, which is the result of innovative thinking, is explained in terms of acquiring and introducing new products that have been diversified, innovated and newly planned. Innovation has a significant impact on the competitive advantage of businesses. Many situations affect product innovation, such as being open to different ideas, production and introduction of new projects, stopping the project when necessary, the sector in which the businesses operate and the expenditures made for innovation (Ünlü, 2019, p. 37).

Product innovation can come from internal or external sources. For example, while colored television was first developed by RCA, which is a black and white television producer, electronic calculator was produced by electronic companies not by companies that produce mechanical calculators (Hobikoğlu, 2015, p. 5).

1.5.4. Process innovation

The new production technique, which is formed to create new or improved products, is called process innovation. Process innovation includes innovations in the process from the beginning of the production of raw materials to the emergence of products. Process

innovation arises from the adaptation of new or improved production methods in terms of technology (Gümüş, Dayal, & Bilim, 2014, p. 35).

Businesses can sometimes go through process innovations indirectly and sometimes directly to gain advantage in competitive environments. Process innovations in businesses either improve existing processes or add new ones to existing processes. Process innovations can achieve more effective competitive power if they occur in core processes of businesses. Process innovations involve more extensive innovations because businesses sometimes consist of hundreds of processes (Pınar & Arıkan, 2015, p. 69).

Process innovation includes new or improved practices for supplying and producing services. Nevertheless, applications include significant changes in the hardware, software or methods that are used to provide services in service-centric businesses and institutions. The service provided by banks through ATM machines is the most common example of process innovation (Ünlü, 2019, p. 38). Moreover, one of the best examples in process innovation is the assembly line with conveyor belt which is implemented for mass production by Henry Ford who is founder of Ford Motor Company in 1913 (Goss, 2020).

1.5.5. Marketing innovation

Finding new ways to reach the customer or defining new customers to reach is referred to as marketing innovation. It is a new marketing method that includes significant adjustments about product design and packaging, product positioning, product launch or pricing. Marketing innovation includes use of new concepts for the promotion of goods and services of an enterprise, branding processes such as the development and promotion of a new brand symbol that is intended to position the product of the company in a new market or to introduce a new image to the product and also adopt new pricing strategies (Önal, 2011, p. 34).

The market reached by the consumer in marketing innovation can be an unexpected market or a place, which was never tried before, and it can create successful opportunities for market innovation in organizations targeting different markets. Receiving food orders over the internet and delivering these orders to customers is an example of marketing innovation. Moreover, a brand or beverage dressing over a hero in computer games can create a marketing strategy in a different media. Another example is a famous economy magazine advertising on the top of buses. At first sight, even though they are perceived

as advertisements given to the unseen part of the bus, the main purpose is to be seen by senior executives with offices on the upper floors of the skyscrapers (Hobikoğlu, 2015, pp. 8-9).

Marketing innovations are intended at improving the satisfaction of customer needs, entering new markets, or newly positioning a firm’s product on the market, with the purpose of increasing the firm’s sales. Moreover, a distinctive feature of a marketing innovation compared to other innovations in a firm's marketing tools is the application of a novel marketing method that was not previously used by the business. It has be part of a new marketing concept or strategy that represents an important distinction from the current marketing approaches of the business (OECD, 2005, pp. 49-50).

1.5.6. Organizational innovation

Organizational innovation emerges in the management division and it affects the organization system of a business consisting of company managers and their relationships. In other words, organizational innovation is the introduction of a new administrative system or a new administrative process. Although, it does not involve directly in introducing a new product or service, it affects the production or promotion processes of new products or services indirectly (Carayannis, Samara, & Bakouros, 2015, p. 40).

Organizational innovation is defined as implementing the organizational innovations in production techniques and business methods in order to increase competitiveness and generate sustainable competitive power. In this regard, with organizational innovation, companies will be able reduce production costs and produce high quality products and services. Thus, businesses will dominate their competitors and achieve real growth via organizational innovation. Through this type of innovation, companies contribute to the country's economies by increasing employment and supporting development (Göydağ, 2019, pp. 22-23).

Organizational innovation is the re-organization of operations in new methods and as a result, encouraging competitive advantage. Implementing organizational innovation is vital for the innovation process. Innovation is made as part of the system that produces it. With organizational innovation, the values to be obtained through learning are important, as well as access to information and production of information. Because if the meaning of innovation is change, new ideas and understanding other organizations,

continuous learning is essential to the success of organizational innovation (Burmaoğlu & Şeşen, 2011, p. 5).

The great evolution experienced by organizations over the years has increased the importance of organizational innovation at the point reached today. In the 1960s, efficiency was a very important matter for the businesses. The focus in this period is to keep production costs as low as possible. Therefore, the organization is generally focused on structural issues. In the 1970s, the presence of quality in addition to the efficiency was considered as an important indicator that led the organization to success. In this period, cultural factors became to be considered instead of structural factors. In the 1980s, companies were forced to be as flexible as possible in production. The diversity of products and services has increased, and modular structure has gained importance. During this period, structural issues became the focus point of the organizations again. The 1990s were the period when companies were entrepreneurs. Unique, new and innovative products and services have been very important for companies. Through innovation, cultural issues have been reconsidered and the importance of the appropriate organizational environment in creating innovation has been recognized. As a result, the creation of an appropriate organizational environment has forced firms to focus on organizational innovation (Burmaoğlu & Şeşen, 2011, p. 5).

1.5.7. Customer experience innovation

Customer experience innovation is described as all innovation activities that making the experience of consumers more enjoyable while they are using products or services which they purchased. In other words, it is the activities of the companies in order to attract the interests of the customers by differentiating in the products and services they produce. The creation of the desire to have that service or product in the customers by the companies is considered within the scope of experience innovation. ~~So~~ Thus, the impact of product or service on customers is evaluated within the scope of customer experience innovation (Göydağ, 2019, pp. 23-24).

Customer experience innovation includes inventions that will make the consumer's experience of using products and services enjoyable. For example, the tracking system developed by DHL, which allocates the users to track where their packages are, provides positive experiences to consumers (Hobikoğlu, 2015, pp. 9-10).

It is important that customer experience innovation builds on creative foundations as it is an action that arouses the curiosity of discovery. Therefore, Turkey is an excellent market with geographical beauties and colorful culture in terms of customer experience innovation. For example, presenting the Turkish coffee tradition to the consumers with Ottoman sherbets or in various ways enables them to be curious about the past and to enjoy different experiences.

1.5.8. Service innovation

Service innovation refers to a business offering a new service in the market. In some cases, the difference between product innovation and service innovation is not clear. The distinction depends on the organization involved (Carayannis, Samara, & Bakouros, 2015, p. 39).

Service innovation refers to newly designed or significantly modified service approaches. It is the development of a new service to the customers or revamping the existing service to attract more customers. As with product innovation, service innovation is not necessarily a service that has not been previously offered. Altering and differentiating the services already offered to attract more customers also means service innovation (Önal, 2011, pp. 35-36).

Innovation in the service sector is different from the manufacturing sector. A new or significantly altered service approach, modification in the delivery and distribution system of the service and the use of new technologies in the delivery of service results in service innovation. Such innovations allow the companies operating in the service sector to demonstrate their technological and organizational skills, as well as to improve their human resources skills and to restructure them in accordance with market requirements (Yücel, 2009, p. 13).

In a research study conducted with 615 middle level managers in the USA, it has been concluded that service quality is in the forefront of activities such as efficiency, availability and suitability of raw materials and legal regulations. When a consumer encounters a service that is unsatisfactory, the consumer communicates his/her complaints and dissatisfaction to an average of twenty potential customers. Therefore, service innovation is one of the most important factors in the competitive market

environment and it requires bearing high costs to achieve concrete benefits (Hobikoğlu, 2015, p. 11).

1.5.9. Business model innovation

Business model innovation is the renewal of two or more elements of the business model to create value in a different way, beyond just products, services or technology. Business model innovation occurs when a business adopts a unique approach to commercializing its core assets (Ataman, 2016, p. 3).

Businesses bring technology to the market through an enterprise shaped by a specific business model. The value of technology remains hidden until it is commercialized in some way. When technology does not match with market opportunities, technology managers need to expand their perspectives to find the right business model to capture the value that technology will provide (Ataman, 2016, p. 3).

Business model innovation is to design and implement business activities that have never been considered before. UPS logistics company is a good example. While the known logistics services take the product from the customer to the destination, UPS company takes Toshiba brand computers from customer's address and repairs them with its own personnel in its own maintenance center and delivers them to the customer very quickly. Moreover, UPS delivers all orders from Nike.com to customers from its own store. Besides, they bring the part of the defective HP printer to your door. Through all these innovations, USP has become one of the world's most renowned and constantly growing logistics companies (Önal, 2011, p. 34).

1.6. Innovation Strategies

Innovation, which is important for companies in many terms, includes a long process of planning and strategy development. Companies generates various strategies for new or differentiated products to be offered to the market. The purpose of these strategies is to benefit both the market and the company (Kalaycı, 2019, p. 20).

The aim of innovation is to make the business one step further or sustain its life by gaining a competitive advantage over competitors. Thus, companies must determine the most appropriate strategy for them based on the market conditions, opportunities in the

market and the resources they have. Businesses can implement several of them simultaneously according to various product groups, instead of choosing and implementing one of these strategies. In addition, as in basic strategies, the business may change these strategies in order to adapt to changing situations (Gökcek, 2007, p. 69).

Although innovation has always been a well-known concept, it has not become an issue as it is today. Businesses that have focused on being a brand in the past, increasing quality, decreasing costs and increasing sales with various marketing techniques have pushed innovation into the background. However, since all businesses deal with the same issues, de-differentiation has started in the products and services offered by businesses. Today, while creating strategies, the power of innovation is considered by many companies (Gökcek, 2007, p. 69).

In this section, which includes innovation strategies; offensive strategy, defensive strategy, imitative and dependent strategies, traditional and opportunist strategies will be explained respectively.

1.6.1. Offensive strategy

The offensive innovation strategy aims to develop a new product or production stage before competing companies and offer it on the market and take the leadership in the technical field. Offensive strategy requires businesses to engage closely with science and technology around the world, have a good R&D department, and quickly take advantage of new techniques. Companies that adopt offensive strategy carry high profitability opportunities and risks together (İyigün, 2015, p. 3).

Offensive innovation strategy aims to gain technical and market leadership ahead of its competitors in the promotion of new products. This strategy should be based on a special relationship with a science and technology system or strong independent research and development capacity. In the offensive strategy, R&D departments play an important role. Businesses adopting this strategy should generate scientific and technical information that cannot be accessed from the outside and move the proposed innovation to the point where normal production can be started (Freeman & Soete, 2000, p. 266).

Businesses intending to be a leader in innovation implement offensive strategy. Companies aiming for leadership in innovation have an important share in the market through their R&D-based work areas, special sanctions on R&D and innovation. Today

initiatives made by businesses offer great risk, but they also offer an opportunity to high profits and making it difficult for other businesses to enter the market. Companies adopt an offensive strategy when they must constantly innovate to maintain their leadership in innovation (Ünlü, 2019, p. 42).

While innovations are seen more frequently in high-tech sectors, all businesses can pay more attention to this issue in order to stay in advance of the competition. Competition is even more intense in high-tech sectors, where many businesses implement offensive innovation strategies. For example, offensive innovation strategies can be seen as the most basic strategy in the electronics and chemistry sectors (Gökcek, 2007, p. 72).

Due to the high resource utilization, it may be considered natural that the businesses which implement such strategies to be large-scale companies with substantial financial means. However, it seems possible even for small businesses to follow such strategies. Since innovation is not just about technological innovation, it is possible to achieve successful results with lower budget innovation activities (Gökcek, 2007, p. 73).

In order for this strategy to be successful, it is not correct to focus only on research and development activities. Therefore, the production and sales functions of the business must also be strong for innovation to be accepted in the market and bring profit to the business (Gökcek, 2007, p. 73).

1.6.2. Defensive Strategy

A defensive strategy does not mean that there is no R&D. Conversely, a defense policy can be as research-intensive policy similar to the offensive policy. The difference stems from the nature and timing of innovations. Defensive innovators do not want to be leaders in the world, yet they do not want to lag behind technical change as well (Freeman & Soete, 2000, p. 269).

Implementing an offensive strategy is not easy for every business. Especially due to the high risks and financial burdens, businesses that adopt the aggressive innovation strategy is scarce. Defensive strategy will be a strategy to follow in this direction, especially for the companies that want to benefit from the experiences of the companies entering the market firstly and not to make the mistakes they made. In addition, benefiting from the markets created by the businesses that pursue offensive strategies is one of the advantages of the defensive strategy. Businesses that implement this kind of strategy do

not produce the same innovation as a previous innovation. In many cases, different products are produced from pioneering innovation in terms of technique and design (Gökcek, 2007, p. 73).

High risks and costs are not the only reason companies turn to defensive strategy. In other words, a business that has been left out of competition by a more successful aggressive opponent that tries to implement an aggressive strategy may have to follow a defensive strategy, even though it is not included in their agenda (Kalaycı, 2019, p. 23).

It is not entirely true that companies implementing this type of strategy do not have research and development activities. Some differences are observed only in the duration of entering the market and features of the innovation introduced by the activities. Especially with the arrangements that will take innovation one step further, it is also possible to produce more successful results than the product of the pioneer business. However, in order to implement defensive strategy, the business must have well track and analysis of its competitors and have knowledge of reverse engineering. In addition, existence of a production system with a flexible structure to adapt to the changes to be made will ensure that the time entering to market is not extended (Gökcek, 2007, p. 73).

For businesses to implement a successful defensive strategy, they need to make use of the existing product in the market and observe the market well. In this way, they will be able to find the reasons for deficiencies and mistakes in the first product, thus, they will make their research and strategy planning accordingly. In addition, the company should measure performance of the new product through pilot applications and research in the market (Durna, 2002, p. 134).

1.6.3. Imitative and dependent strategies

Defense innovators do not intend to produce imitations of products normally offered by early innovators. Contrarily, they hope to make use of previous faults to advance the design, thus they must have the technical ability to do so (Freeman & Soete, 2000, p. 272).

Businesses that implement imitative strategy do not want to take the high risks and the costs of R&D studies, production and marketing activities like the businesses which implement offensive and defensive strategies. They produce exactly the same products

and offer them to the market by following the developments in the market remotely (Kalaycı, 2019, p. 24).

Companies try to make imitation products by following the developments in new technology, marketing and distribution process, design, new product etc. Competence and ability to use technical knowledge and skills are also important in this strategy, as they try to use existing technology (Kalaycı, 2019, p. 24).

Low costs and entrepreneurial skills are important matters in imitative strategy. Companies that adopt the imitative strategy produce the same product at low cost and work with satellite companies producing parts and intermediate goods. In the imitative strategy that produces with low costs, the level to achieve high profit is reached in a short time (Ünlü, 2019, p. 44).

Businesses that implement imitative strategy try to gain competitiveness by producing products in the market at lower costs. Businesses implementing imitative strategies follow strategies such as being passive in technology production, renting technology when needed, creating economies of scale by keeping the product production wide and monitoring the leading companies (Ünlü, 2019, pp. 44-45).

On the other hand, in the dependent strategy, the companies adopt the role of the satellite or subsidiary of another strong company. The subordinate business does not attempt technical exchange in its products unless there is a clear request from the user or the main company. It is expected from the users to determine the technical features of the new product and technical services related to the market launch (Gökcek, 2007, pp. 74-75).

Many large businesses work with several satellite businesses that provide intermediate goods, parts manufacturing and various services by contract. Dependent businesses are generally small and capital-intensive businesses that have almost no initiatives in product design and research and development. Fully dependent businesses operate, in a way, as part of a large business or a workshop of it. However, they may not want to lose their formal independence with the thought of changing their situation by going to differentiation or expanding their markets in the future (Barutçugil, 1981, pp. 38-39).

Product design and R&D studies are not included in the dependent innovation strategy. Although these businesses have weak bargaining power, they can provide sufficient profits due to low general and administrative costs, enterprise capabilities,

specialized knowledge and special local advantages. The reason for such businesses ,why they are try to be innovative , is the increase in the demand and competition in the market (Barutçugil, 1981, p. 38).

1.6.4. Traditional and Opportunist strategies

Traditional innovation strategies are generally implemented by businesses in stable and low-competition markets. The need for innovation is extremely low due to the low demand for change from outside and not forcing competitors to innovate. It is not possible to talk about such an innovation strategy in technology intensive sectors (Önal, 2011, p. 28).

The traditional strategy is based on professional skills and abilities. Since businesses that use traditional strategies have jobs that require talent and expertise, the demand for their products is increasing. Businesses that implement traditional strategy do not need to make changes in the market, and they also do not have the equipment to innovate products (Deniz, 2011, p. 156).

The biggest difference between the business applying the traditional strategy and the dependent business is the attribute of the product. There are changes in the products produced in dependent companies on the basis of design and the nature of the product that comes from outsourcing. Businesses that adopt the traditional strategy method do not need to make changes to their products, as there is no different demand or no obvious stimulus in the competitive environment in the market. Moreover, businesses which do not have technical and scientific features, can make product innovation or change. However, businesses make some modifications in design under the name of fashion rather than developing new techniques (Ünlü, 2019, p. 46).

On the other hand, opportunist strategy is a type of strategy that introduces innovation by monitoring the deficiencies and gaps in the market and by offering a product that will satisfy a need that has not been considered before and that can create demand. Entrepreneurship spirit and creativity of the company implementing opportunist strategy should be high. This way, important innovations can emerge without conducting research activities which carry high risks and costs, and significant profits can be obtained from these low-cost innovations. It is possible for companies that have low direct

competitiveness with respect to large companies to make breakthroughs with such innovations to be able to grow the company (Gökcek, 2007, p. 76).

1.7. Relationship between R&D and Innovation

Competition between companies and countries is getting harder day by day due to many factors such as globalization, deregulation, new entrants in the market, new technological products and widespread e-commerce. Innovation activities are one of the most effective ways for countries to maintain their performance in an ever-changing dynamic environment, to achieve economic growth and development. Innovation is a strategic tool to gain a competitive advantage in such mixed environments. At the same time, innovative activities are regarded as an imperative for successful growth and sustainable performance in the long term, in terms of survival in the sector and growth in market shares (Göydağ, 2019, pp. 27-28). For this reason, innovation activities for companies or countries are essential. Countries or companies that make technological and scientific research and development must perform more sensitive attitude towards environmental dynamics in a globalized and rapidly changing economic environment (Yılmaz & Akman, 2008, p. 70).

Innovation includes the activities carried out in order to generate economic income as a result of the establishment of new or improved products, services and production methods. Thus, businesses or countries should generate new ideas in order to take an innovative structure in production and services. Innovation has a continuous structure. Therefore, it is necessary to develop new ideas and transform them into a competitive position in the market, and to transform these new ideas into effective marketing tools. Only in this way, new ideas bring innovative activities. In other words, the economies of the countries that attach importance only to research and development activities cannot provide economic growth and development, if the new information is not be supported with innovation. Therefore, R&D can be defined as efforts to turn capital into ideas, while innovation can be defined as turning ideas into capital (Zerenler, Türker, & Şahin, 2007, p. 662).

Innovation is not possible without R&D activities. So, it means that R&D is one of the innovation requirements. Innovative activities carried out as an output of R&D are transformed into innovation activities as a result of their commercialization within the

interventional framework. However, the point to be considered here is that if the ideas occurred as a result of research and development are not commercialized or implemented, which means if they remain only at the project stage, this situation causes inefficiency in resource separation for companies or countries, in other words, it causes waste of resources (Göydağ, 2019, p. 28).

Countries must develop their scientific and technical skills and expertise and determine their technological conditions according to social and economic conditions. Identification and grading of the technological abilities and competencies of countries or companies arises as a result of investment in R&D expenditures (Kalaycı, 2019, p. 49). Therefore, in the following tables Turkey's central government budget appropriations and outlays on R&D by socio-economic objectives have been given.

Table 2 *Central government budget appropriations and outlays on R&D by socio-economic objectives, 2008-2019 (TurkStat, 2019)*

Year	Exploration and exploitation of the Earth	Environment	Exploration and exploitation of space	Transport, telecommunication and other infrastructures	Energy
2008	88 827 881	39 192 670	16 936 313	38 283 202	48 343 443
2009	56 381 671	46 624 803	28 562 399	31 475 015	60 135 856
2010	109 044 055	48 636 949	46 013 396	22 170 797	78 321 242
2011	116 893 753	82 672 451	33 379 617	21 663 857	82 819 685
2012	136 923 816	65 878 341	14 804 872	21 854 335	79 683 493
2013	124 621 571	55 418 412	9 151 470	48 609 277	70 662 195
2014	151 575 148	62 214 153	12 317 182	28 158 022	39 055 039
2015	214 098 148	152 300 444	23 503 078	209 312 443	177 686 914
2016	165 625 300	116 997 161	26 722 152	581 902 161	152 301 445
2017	250 556 521	103 082 305	30 598 106	470 125 136	176 703 796
2018	302 870 740	113 114 651	215 794 169	584 885 047	184 193 114
2019	325 015 001	98 036 480	122 515 963	427 597 961	119 739 597

The tables below and above show the central government budget appropriations and outlays on R&D by socio-economic objectives. The last eleven years in Turkey, the budget in R & D investment has increases and decreases spent on various sectors. Generally, it can easily be seen there is a sharp increase in R&D investments year 2015 accordingly previous year. But unfortunately, almost all sectors' R&D budgets decrease in the last year. "General advancement of knowledge: R&D financed from General University Funds (GUF)" has the most share from R&D budged.

Table 3 *Central government budget appropriations and outlays on R&D by socio-economic objectives, 2008-2019 (TurkStat, 2019)*

Year	Industrial production and technology	Health	General advancement of knowledge: R&D financed from General University Funds (GUF)	General advancement of knowledge: R&D financed from other sources than GUF	Defense
2008	210 785 673	82 446 054	1 320 445 292	214 349 268	460 471 110
2009	398 446 159	80 361 101	1 842 059 527	253 420 912	894 037 244
2010	393 304 256	113 944 096	2 071 046 705	263 583 219	837 998 131
2011	391 427 703	64 997 041	2 636 686 466	382 892 055	892 712 389
2012	478 736 520	58 395 033	2 993 639 096	418 776 294	747 725 529
2013	848 123 212	13 014 866	3 258 424 429	451 511 871	1 753 203 150
2014	989 548 918	20 012 864	3 674 888 710	627 868 783	764 515 158
2015	1 136 106 426	177 968 892	4 273 390 434	205 835 976	858 994 317
2016	901 831 202	174 795 171	4 674 174 631	254 702 882	1 191 443 863
2017	1 008 666 883	279 687 920	5 165 422 877	470 194 278	1 856 075 216
2018	1 155 263 413	224 729 394	5 946 565 698	817 535 197	2 605 912 978
2019	1 064 385 461	138 713 809	6 305 536 740	666 242 758	5 365 851 749

Table 4 *Central government budget appropriations and outlays on R&D by socio-economic objectives, 2008-2019 (TurkStat, 2019)*

Year	Total (Table 2 + Table 3 + Table 4)	Agriculture	Education	Culture, recreation, religion and mass media	Political and social systems, structures and processes
2008	**2 670 782 540**	75 223 929	57 076 544	1 333 801	17 067 359
2009	**3 916 776 991**	140 250 690	55 867 570	2 966 472	26 187 573
2010	**4 188 287 268**	114 304 973	67 105 725	1 619 472	21 194 251
2011	**4 960 647 288**	146 518 896	59 701 193	2 283 170	45 999 013
2012	**5 304 618 213**	133 510 727	98 515 006	2 306 989	53 868 161
2013	**6 853 307 873**	127 815 898	60 197 995	1 842 407	30 711 121
2014	**6 732 520 879**	128 177 789	159 778 201	44 177 298	30 233 614
2015	**8 036 509 879**	255 355 684	262 382 660	10 107 414	79 467 049
2016	**9 115 985 990**	237 586 733	581 549 138	7 284 862	49 069 288
2017	**10 710 207 817**	272 483 016	570 167 459	4 341 275	52 103 028
2018	**13 024 439 520**	297 062 245	521 120 280	2 810 403	52 582 191
2019	**15 597 123 116**	280 703 318	625 266 848	1 810 100	55 707 332

In addition, R&D expenditures of 30 firms, which are examined in this thesis, in the year 2018 is 5.342.125.806 in total. Thus, this number equals to %41 of 2018 central government budget appropriations and outlays of R&D (13.024.439.520 TL).

1.8. Innovation Performance

Performance measurement is an important concept for evaluating the adaptation of the individual and the business to the environment and the success level in technical, technological and socioeconomic fields, at various levels. Productivity, efficiency, profitability and job quality are the principles in performance measurement (Atakan, 2017, p. 21).

Innovation performance is one of the most important issues for businesses in today's global world and it is considered essential for survival. The innovation performance of the business is an important criterion used in measuring the overall success of the business. (Atakan, 2017, p. 21).

There are some measures in determining and developing a company's innovative performance process. Innovation in measuring performance the best result gives the following conditions; frequency of services or products offered to market as compared to competitors, quantitative excess of new products or services than existing products or services, budget allocated to R&D studies and characteristics and numbers of employees, business's technological leadership in the market where it operates, revision of the administrative structure according to environmental changes, performance of the business's HR department and the budget and time the business has allocated to produce new products or services (Atakan, 2017, p. 24).

Turkey's innovation performance should be examined first in order to better understand the innovation performance of companies in Turkey. One of the important reports regularly published about the innovation performance of countries in the world is the Global Innovation Index (GII) prepared in cooperation with Cornell University and INSEAD. The last 6 years of data of Turkey from GII has been given in the following table. In 2018, Turkey was in the 50^{th} rank among 126 countries. In 2019 Turkey increased its rank one step further and become 49^{th} rank among 128 countries in 2019 (Çubukcu, 2019).

Table 5 *Turkey's GII Ranking for Last 6 Years (Global Innovation Index 2019 Report, 2019)*

Year	Rank
2014	54
2015	58
2016	42
2017	43
2018	50
2019	49

GII is composed of 2 basic sub-indicators this year. These are innovation input sub-indices and innovation output sub-indices. The sub-indices are calculated in accordance with different performance indicators among themselves and the ranking of the countries emerges.

Table 6 *Turkey's Global Innovation Index 2019 Year Ratings (Global Innovation Index 2019 Report, 2019)*

Global Innovation Index	Score/Value	Rank
General	36.95	49
1. Innovation Input Sub-Index	45.26	56
1.1 Institutions	57.4	85
1.2 Human Capital & Research	36.3	46
1.3 Infrastructure	52.2	41
1.4 Market Sophistication	50.8	52
1.5 Business Sophistication	29.5	71
2. Innovation Output Sub-Index	28.64	49
2.1 Knowledge & Technology Outputs	23.0	59
2.2 Creative Outputs	34.2	40

Turkey's report card when compared to 2018 shows that there is rise in areas marked with green in the sub indicators in the following table. In the area indicated by red, it is seen that Turkey's ranking is declining with respect to these indicators.

Infrastructure and Institutions are the most prominent indicators among the improving sub indicators, while the most prominent worsening sub indicators are Knowledge & Technology Outputs.

Table 7 *Turkey's 2018 Global Innovation Index 2019 Year Comparison Ratings (Global Innovation Index 2019 Report, 2019)*

Global Innovation Index	**2018**	**2019**
General	50	49
Innovation Input Sub-Index	62	56
1.1 Institutions	96	85
1.2 Human Capital & Research	49	46
1.3 Infrastructure	52	41
1.4 Market Sophistication	55	52
1.5 Business Sophistication	72	71
Innovation Output Sub-Index	43	49
2.1 Knowledge & Technology Outputs	52	59
2.2 Creative Outputs	39	40

When we look at the infrastructure components, it consists of sub-indicators such as investments in information and communication technologies, investments in electricity, energy, supply and environmental infrastructures. The rise of Turkey's rank is a significant issue in these components.

On the other hand, Turkey's, rank regarding knowledge and technology outputs deteriorated this year. Here, measurements were made in the sub-indicators of information creativity, impact and diffusion. With respect to creativity, criteria such as innovation and invention outputs, patent and utility model outputs, and scientific publication numbers were examined. The impact of innovation activities on micro and macroeconomic indicators was examined within the impact sub indicator. Components such as intellectual property revenues, the export of ICT services and the ratio of foreign direct investments in the Gross National Product were examined within the diffusion sub-indicator (Çubukcu, 2019).

2. FINANCIAL PERFORMANCE

2.1. Financial Performance Evaluation

In general terms, performance evaluation is the assessment of a person or organization by comparing its performance against some pre-determined criteria. The purpose of performance evaluation is to enable employers in the private or public sector to measure their employees' performance give them the opportunity to determine whether employees are working at the desired level and whether businesses are achieving the desired efficiency or not (Şit, 2018, p. 22).

On the other hand, financial performance evaluation is the assessment of financial aspects of business performance. In other words, it is related to the financial structures, investments, profitability, risks and continuity of the businesses. People or institutions evaluating financial performance will make financial assessment and future planning based on the historical data of the business. Future investments, financing decisions, resource utilization and profit / loss are among the ingredients to be planned (Şit, 2018, p. 24).

Financial performance is an important concept for managers in terms of internal auditing of companies and due to investments made in the business, it is prominent for investors and the capital market. Performance measurement and standards have been developed by the private sector and it is used especially in the manufacturing industry. The information obtained with these measurements is crucial at the stage of economic decisions to be taken for the current and future periods of the business (Kalaycı, 2019, p. 85).

Information is one of the most important resources necessary for the sustainability of businesses. Financial information is generated by reporting the analysis of the assets and resources of businesses. Information system structures to be established in order to make rational decisions in business management should include all functional management areas of the organization because financial performance auditing consists of equivalent criteria that can be applied to all businesses (Kalaycı, 2019, p. 85).

2.2. Financial Performance Measurement Methods

By evaluating the financial performance of businesses by assessing the financial position and the results of the activities, business managers can identify those aspects that are not effective and efficient and they can take actions for necessary modifications (Gülcan, 2019, p. 21).

Financial performance measurement methods used in this thesis will be examined under six sub-titles. These are:

- Operating Return on Assets (OROA),
- Return on Equity (ROE),
- Fixed Asset Turnover Ratio (FATO),
- Total Asset Turnover Ratio (TATO),
- Operating Profit Margin (OPM),
- Gross Profit Margin (GPM).

2.2.1. Operating Return on Assets (OROA)

Operating return on assets (OROA) is an efficiency or profitability ratio. In fact, it is a modified version of the usual return on assets ratio. This ratio is considered an indicator of how effectively a company is utilizing its resources to generate profits before the time legally binding commitments must be paid. OROA measures the profit level related with the company's assets. However, it is using tighter description of its assets unlike the return on assets ratio (http-1).

The operating return on assets' formula is as follows:

$$\text{Operating Return on Assets} = \frac{\text{Earnings Before Interest and Taxes (EBIT)}}{\text{Average Total Assets}}$$

Operating return on assets is look-alike to the usual return on assets ratio, but in OROA formula operating income is used instead of net income (http-1). This ratio is important due to the fact that ~~the~~ long-term lenders focus on the profit remaining after the operating expenses. There is no perfect OROA ratio, but it can be said that a high ratio is preferable and makes the interest safer on capital loans.

2.2.2. Return on Equity (ROE)

Return on equity (ROE) ratio refers to profit per unit of capital put into operation by the business owners or partners. Thus, this ratio is the efficiency rate of the investment made by the shareholders. Moreover, the fact that businesses' existence, making new investments and deciding on increasing the business activities depends on the positive trend of the return on equity ratio (Helfert, 2001, p. 116).

The return on equity formula is as follows:

$$Return\ on\ Equity = \frac{\text{Net Income}}{\text{Shareholders}'Equity}$$

People or organizations that invest in the business want this ratio to be high, with the expectation that they will have a high return on the risk they take. In case this ratio is low, investors may want to withdraw their capital from the business.

2.2.3. Fixed Asset Turnover Ratio (FATO)

Fixed Asset Turnover Ratio (FATO) is a ratio that is used to measure the efficiency of fixed assets in the business. This ratio is a measure used in determining whether an excessive investment is made in fixed assets. If there is excessive change in fixed assets, its average should be calculated (http-2).

The fixed asset turnover ratio formula is as follows:

$$Fixed\ Asset\ Turnover\ Ratio = \frac{Net\ Sales}{Fixed\ Assets}$$

A low rate or a tendency to fall over time may indicate that the business is not operating at full capacity or there is not enough income from fixed assets. The fact that this ratio is too high indicates that the fixed assets of the business are used higher than their capacities (http-2).

2.2.4. Total Asset Turnover Ratio (TATO)

Total Asset Turnover Ratio (TATO) is the ratio that gives information about whether the assets of the business are used efficiently or not. Indeed, total assets turnover

ratio is a ratio that indicates to what extent the total assets consisting of current assets and fixed assets are used effectively in business activities. A high ratio indicates that assets are used efficiently and a low ratio indicates that the assets are not used efficiently (Helfert, 2001, p. 113).

The total asset turnover ratio formula is as follows:

$$Total\ Asset\ Turnover\ Ratio = \frac{Net\ Sales}{Total\ Assets}$$

The total asset turnover ratio is a ratio that measures the success of the sales volume created by the companies' assets. This ratio shows whether the assets are over-invested. Besides, this ratio can be a measure of technology use in a business. In reality, if the fixed assets within the total assets hold an important place, the asset turnover ratio will be low. This situation mostly will appear in capital-intensive industrial companies. On the other hand, it is natural for this ratio to be high in businesses with less fixed investments, such as trade or finance businesses (Yıldız, 2013, p. 76).

Total asset turnover ratio is an important indicator in determining the profitability of the business. If the other conditions remain the same, the profitability ratios of the businesses are high when total asset turnover ratio is high. In companies with high fixed assets and low total asset turnover rates, future profitability of the company is uncertain since it depends on the future development of demand. Therefore, the total asset turnover ratio can also be used as a risk indicator. In companies whose total asset turnover ratio tends to decrease, this may be due to idle capacity (Yıldız, 2013, p. 76).

2.2.5. Operating Profit Margin (OPM)

Operating Profit Margin (OPM) ratio shows how profitable the firm's core business is. In other words, the operating profit margin shows the profit of the firm from the goods and services that constitute its core business (Helfert, 2001, p. 103).

The operating profit margin formula is as follows:

$$Operating\ Profit\ Margin = \frac{Operating\ Profit}{Total\ Revenue}$$

The operating profit margin shows the core profitability of the firm's business, which means how firm managers can better manage the firm. Actually, this ratio measures

the effect of the operating expenses that should be made for the continuation of the main activities together with the change in sales prices and sales costs. Moreover, it can give direction to the company managers as to whether a restriction in operating expenses should be made or not (Temizer, 2015, p. 29).

A high ratio indicates that the main activities of the company are profitable and efficient. However, in order to interpret the obtained result better, the ratio should be compared with the previous year data of the company or the rates of the companies in the same industry (Martin & Fernando, 2002, pp. 281-282).

2.2.6. Gross Profit Margin (GPM)

Gross Profit Margin (GPM) shows what percentage of net sales is gross profit. Gross sales profit gives information about the efficiency of the activities of the companies as well as price policies, and it can be said that the business has a successful management if the gross sales profit is high. GPM also shows the dependency degree of tax and interest on the effectiveness of sales in businesses (Martin & Fernando, 2002, pp. 282-283).

The gross profit margin formula is as follows:

$$Gross\ Profit\ Margin = \frac{(Revenue - Cost\ of\ Goods\ Sold)}{Revenue}$$

The fact that gross profit margin tends to increase over time is a positive development for firms. However, a low gross profit margin indicates that the cost of sales is relatively high. Therefore, the gross profit margin of the firm in the current year should be compared with the gross profit margin of the previous year or other firms in the industry (Temizer, 2015, p. 28).

3. FIRM VALUE

3.1. Concept of Firm Value

The main purpose of all businesses operating in business life is to achieve success by generating value continuously via sustainable performance and to get the financial return that corresponds to this success. Therefore, the main concept required for transferring firms to future generations with stable fundamentals can be defined as creating “continuous value” in all operations in the company (Çalı, 2015, p. 2).

The value of a firm can be defined as the purchase price perception of a willing buyer and seller with full knowledge appreciate without any pressure. It is the total value of the current debt and equity of the firm, which is generally expressed by the firm value. According to another definition, the value of the company is a concept that has been occurred after influenced by the factors starting from the establishment of the companies, such as the quality of the goods produced, customer satisfaction, having a quality management understanding, positive internal and external relations, the station of the economy and the general route of the industry (Temizer, 2015, p. 39).

Firm value is obtained by analyzing the assets of the firm, its organizational structure, technology and human resources, and the cash flows expected to be created in the future. Since firms extract a value as long as their assets can generate cash, firm value is tried to be determined by estimating cash flows. Due to the time value of money, valuation is made by finding the present value of cash flows over the years. Similarly, the equity value is calculated by discounting the cash flows to the present value (Chambers, 2009, pp. 5-6).

3.2. Firm Value Measurement Methods

Since the fact that "maximizing the current value of the company for the partners" idea is underlying in the basic policies of financial management such as financing, investment and dividend distribution policies, these policies should also be implemented for the purpose of the company. The performance indicator of an effective financial management should be to reveal the effectiveness of firm valuation within the framework of all these basic policies (Aydın, 2012, p. 94).

With this importance, firm value measurement methods used in this thesis will be examined under five sub-titles. These are: Tobin's Q, Price to Earnings Ratio (P/E Ratio), Price to Book Ratio (P/B Ratio), Economic Value Added (EVA), Market Value Added (MVA).

3.2.1. Tobin's Q

Tobin's Q ratio is a rate developed by Nobel laureled economist James Tobin (Yalama, 2005, p. 21). It is another valuation alternative for those who believe that the book value is not a good measure when investigating the true value of the assets is to use the replacement cost of the assets. According to the Tobin's Q theory, investment is expressed as a positive reflection of an additional unit capital (q) on today's reduced firm value. If the capital's marginal efficiency is high and the capital's financial cost to the firm is low, the value of q will increase. As a result, if firms are open and ready for domestic financing as well as foreign financing in terms of debt and equity, investment decisions of these firms will be determined entirely by the formation of q, which is determined by the marginal efficiency of capital and the behavioral structure of capital cost. Here, the ratio of firm value to replacement cost is known as the Tobin' Q ratio (Çalı, 2015, p. 58).

The Tobin's Q formula is as follows:

$$Tobin's\ Q = \frac{Total\ Market\ Value\ of\ Firm}{Total\ Asset\ Value\ of\ Firm}$$

If the rate is greater than one, returns over the cost of replacing the assets are obtained. Investment trends of businesses increase and the reason for the high ratio can be explained as intellectual capital. If the rate is less than one, that is, if the value of the asset is smaller than the replacement cost, the enterprise may not make new investments (Yalama, 2005, p. 21).

The difference of the Tobin q ratio from the market value / book value ratio, the concept of the market value of the assets refers to the market value of all financial assets, not just the stocks. And instead of book value, replacement value of assets is used (Gülcan, 2019, p. 27).

3.2.2. Price to Earnings Ratio (P/E Ratio)

The Price to Earnings ratio shows the relationship between the profit earned per share and the stock price. In other words, it shows the amount to which people or institutions investing in stocks issued by businesses earn in return for their investments (Gülcan, 2019, p. 25). The accepted rate of this ratio is 10. That is to say, if the market value of a firm is 10 times its profit, it is considered normal (Çalı, 2015, p. 56).

The Price to Earnings Ratio formula is as follows:

$$Price\ to\ Earnings\ Ratio = \frac{Market\ Value\ Per\ Share}{\text{Earnings Per Share}}$$

This ratio shows how much investors are willing to pay in stock to earn a unit of money. For a stock with a high price / earnings ratio, investors think that the business has good growth possibilities or that their earnings are consistent and consequently more valuable. However, this may also mean that earnings are under pressure. If a firm has zero earnings, its price earnings ratio will be infinite (Temizer, 2015, p. 36).

Although the price / earnings ratio is a known and frequently used market multiplier, it is likely to make mistakes. If the ratio takes net profit as an indicator in calculations and the net profit is not affected by different accounting practices and inflation, the results achieved can be misleading (Türk, 2013, p. 77).

3.2.3. Price to Book Ratio (P/B Ratio)

The Price to Book Ratio shows the number of times the business's market value is its equity. As this rate grows, it means that the stock has appreciated (Çalı, 2015, p. 56). This ratio helps stock investors in their decisions to buy, sell or hold. In other words, if the increase of this coefficient is the sale of the stock, its decrease supports the tendency to purchase (Temizer, 2015, pp. 36-37).

The Price to Book Ratio formula is as follows:

$$Price\ to\ Book\ Ratio\ = \frac{\text{Market Price Per Share}}{\text{Book Value Per Share}}$$

The Price to Book ratio is used especially in sectors with high fixed assets. In addition, since the asset value of firms in financial services sector is closer to market

values, this is a method frequently used in the valuation of firms in this sector. One of the advantages is that this ratio can be calculated for businesses that make a loss. However, this ratio is affected by the accounting policies of the companies. In practice, the fact that businesses can use different accounting standards prevents businesses from being compared with each other. Another disadvantage is that it is not meaningful to apply this ratio in sectors such as service sector with a low level of fixed asset investment (Türk, 2013, pp. 77-78).

3.2.4. Economic Value Added (EVA)

The Economic Value Added method is a financial performance measurement method developed by Stern Stewart. It examines the difference between business' net operating profit after tax and the total capital cost. When this difference is positive, it shows that the business creates a positive value in favor of the financiers, while the minus difference indicates that the capital invested in the business has depreciated (Yalama, 2005, p. 20).

The Economic Value Added formula is as follows:

$$Economic\ Value\ Added = NOPAT - (WACC * Invested\ Capital)$$

NOPAT= Net Operating Profit After Tax
WACC= Weighted Average Cost of Capital
Invested Capital= Total Assets - Current Liabilities

Economic Value Added is the guider indicator to provide real information about the performances of businesses to increase market values and it considers both accounting and market data. Moreover, this method has various benefits, such as establishing a single performance measure in all financial decisions, controlling the economic profit, considering cost of capital, combining executive and shareholder objectives, providing foundations for generating incentive salaries. (Gülcan, 2019, p. 28).

3.2.5. Market Value Added (MVA)

Market Value Added is the difference between the book value of the whole invested capital and the market value of the numerous forms of capital. It requires plenty of modifications to the recorded values and a cautious assessment about how representative current share values are (Helfert, 2001, p. 401).

The Market Value Added formula is as follows:

$$MVA = Market\ Value\ of\ Shares - Book\ Value\ of\ Shareholders' Equity$$

Market Value Added completes Economic Value Added when determining the values of businesses. While Economic Value Added is measured periodically, Market Value Added informs about the extent to which shareholder values have been increased or decreased since the first time businesses started operating. Also, since this is the core of market capitalization, there is an assumption that the market is efficient (Gülcan, 2019, pp. 28-29).

A low Market Value Added shows that the company has not used the capital efficiently in the past. Moreover, a low Market Value Added may also be caused by the impact of market factors not related with the company's management. Furthermore, a low Market Value Added as a result of price drops may be due to a temporary situation. Therefore, low EVA shares may yield higher returns than high MVA shares in the future. MVA functions as a risk factor that affects the balance of future returns (Şamiloğlu, 2005, p. 81).

4. LITERATURE REVIEW

There are many theoretical and empirical studies in the literature that investigate the relationship between the firms' innovation performance and financial performance or firm values. Some of the research studies conducted in Turkey and in the World are listed below.

4.1. Research Studies in Turkey

According to general findings of research studies in Turkey, there is a significant positive relationship between R&D activities or innovativeness and financial performance of businesses except Demir and Alpaslan's research.

Table 8 *Summary of Literature Review of Research Studies in Turkey*

Author(s)	Data	Methodology	Variables	Results
(Karacaer, Aygün, & İç, 2009)	84 firms traded on the BIST, 2005-2006	Regression, Correlation Analysis	ROA, Number of employees, Size, R&D Expenses, R&D / Net Sales, Stock Return	There is a positive and statistically significant relationship between stock returns and ROA and R&D expenditures.
(Yavuz, 2010)	Çanakkale Seramik Company, 2005-2009	Longitudinal Case Study	Innovation performance, production performance, marketing performance, financial performance	All innovations to be carried out in the business will significantly affect the financial performance of the business.
(Erdem, Gökdeniz, & Met, 2011)	44 Five-Star Hotels in Antalya	Survey, Regression, Factor Analysis, T-test	Innovation, Business performance	A significant and positive relationship has been identified between innovation and business performance.

(Çiçek & Onat, 2012)	9 information and technology companies	Data Envelopment Analysis	Percentage Change of Intangible Asset, Share of Intangible Assets in Total Assets, Research and Development Expenses, Percentage Change in Return on Assets, Percentage Change in Sales	It is found that intangible asset investments and R&D expenditures have a positive effect on firm performance in proportion to firm scale.
(Erdem, Gül, & Gül, 2013)	40 Four and Five-Star Hotels in Ankara	Survey, KMO Test, Bartlett Test, Factor Analysis	Innovation Orientation, Market Orientation, Firm Performance	It has been determined that innovation directionality has a significant and positive relationship with firm performance.
(Kocamış & Güngör, 2014)	16 firms traded in BIST Technology Industry, 2009-2013	Regression, Correlation Analysis	Operating profit / loss, Profit / loss before tax, Net profit / loss for the period, R&D Expenses	It has been observed that there is a significant positive relationship between R&D expenditures and the company profitability values consisting of operating profit, pre-tax profit and net profit for the period.
(Öncü, Bayat, Kethüda, & Zengin, 2015)	65 medium-sized manufacturing enterprises in Düzce	Survey, Factor Analysis, KMO Test, Bartlett Test, Regression	Financial Performance, Innovation Performance, Customer Performance	Innovation performance positively affects financial performance in medium-sized manufacturing enterprises. In addition, innovation

				performance affects customer performance in positive way.
(Albeni & Doğan, 2015)	25394 firms operating in the Turkish manufacturing industry, 2005-2011	Heckman correction	Firm Growth, Survival, Age, Number of employees, Innovation, R&D	A significant relationship was found between firm performance and R&D activities.
(Şişmanoğlu & Akçalı, 2016)	7 information and technology companies, 2005-2014	Panel Data Analysis (Swamy's Random-Coefficients Model)	R&D expenditure, Total assets, Net Sales	R&D spending of 2 firms has a positive effect on sales.
(Doğan & Yıldız, 2016)	136 firms whose shares are traded at BIST, 2008-2014	Regression analysis, T-test method	Return on Asset, Return on Equity, R&D Expenditures / Total Sales, Total Liabilities / Total Equity, Current Assets / Short Term Liabilities	The increase in R&D expenditures positively affects the profitability of the companies.
(Paksoy & Ersoy, 2016)	100 Four and Five-Star Hotels in Antalya	Survey, Kruskal Wallis- H test, Spearman Correlation Analysis	Innovation, Business Performance	A low but positive and significant relationship was found between innovation and business performance sub-dimensions.
(Kaygın, Yılmaz, & Kaygın, 2016)	20 companies operating in Metal, Furniture, Machinery and Equipment Building sector in BIST, 2010-2015	Multiple Linear Regression, Correlation Analysis	R&D expenses, intangible fixed assets, ratio of R&D expenses to operating expenses, and ratio of intangible fixed assets to total assets, ROE,	A positive relationship between R&D variables and Financial performance variables was found.

			ROA, gross profit to net sales ratio, operating profit to net sales ratio, net sales income, domestic sales income, foreign sales income, net profit	
(Demir & Alpaslan, 2016)	The world's top 20 R&D spender firms and the world's top 20 innovative firms, 2008-2012	K-Means Cluster, ANOVA, Spearman Correlation Analysis, T-test, Fisher's exact test, Pearson Correlation Analysis	ROA, ROE, R&D expenses, Employment	No significant relationship between R&D expenditure increase and productivity.
(Akgün & Akgün, 2016)	ASELSAN Company, 2006:Q1-2016:Q3	Ordinary least squares method, Unit Root Test, Johansen Cointegration Test	Net operating profit, R&D expenses	There is a long-term and linear relationship between R&D expenditures and net operating profit.
(Demirhan & Aracıoğlu, 2017)	Listed firms in BIST Technology index	TOPSIS	Intangible Assets/Total Assets, R&D Expenses/Sales Revenues, TOPSIS Score, Return on Asset, Return on Equity	There is weak relationship between innovativeness and TOPSIS scores, however the results show statistically significant and medium level relationship between return on assets and R&D expenses, and market-to-book value and R&D expenses.

(Gürkan & Gürkan, 2017)	20 companies traded on the Borsa İstanbul Corporate Governance Index, 2012-2016	Panel Data Analysis (Unit Root Test, Correlation Matrix, Standard F-Test, Hausman Test, Wooldridge Panel Data Autocorrelation Test, Breusch-Pagan LM Panel Değişen Variance Test)	Innovation Level of Business, Return on assets	There is a linear and statistically significant relationship between the level of innovation of companies and their financial performance.
(Aytekin & Özçalık, 2018)	7 companies traded on Borsa İstanbul Technology and IT Indices, 2011:Q1-2018:Q1	Panel Data Analysis (Unit Root Test, Correlation Matrix)	EBIT, ROIC, Net Sales, R&D Expenditures, R&D/Net Sales, R&D/Total Operating Expenses, Market Value/Book Value	Found a positive relationship between EBIT and R&D Expenditures and Market Value/Book Value, and a negative relationship between R&D/Total Operating Expenses.
(İlarslan & Bıyıklı, 2018)	One of Turkey's largest pharmaceutical companies 1994-2016	Almon Model	Gross Profit Margin, R&D spending intensity	Gross profit margin has been positively affected by the intensity of R&D expenditures in the past 6 years. In addition, it has been observed that the effect of R&D expenditures on gross profit is greater than in previous years.
(Erdil, et al., 2018)	Businesses that made mergers and acquisitions between 2010 and 2017.	Survey, Structural Equation Modeling	Innovation Performance, Company Performance, Export Performance,	Innovation performance of companies which carried out merger and acquisition have positive impact on firm

			Product Competitiveness, Operational Competitiveness	performance, export performance and competitiveness.

4.2. Research Studies in the World

According to general findings of research studies in the world, there is a significant positive relationship between R&D activities or innovativeness and financial performance of businesses from 1965 to 2019.

Table 9 *Summary of Literature Review of Research Studies in the World*

Author(s)	Data	Methodology	Variables	Results
(Scherer, 1965)	448 firms which are on the 500 largest U.S. industrial companies, 1955-1959	Regression	Number of Patented Inventions, Sales Revenue, inventive output, profitability, sales growth	Innovation activities increase the company's sales, thereby contributing to the company's profitability. In addition, firm growth measured by patent issuance is observed to be related to invented products.
(Mowery, 1983)	The 200 largest manufacturing firms in USA, 1921-1946	Regression	Research employment, Firm size.	R&D activities between 1933-1946 affected firm growth more than in 1921-1933. In addition, R&D spending positively affects

				the size of both large and small firms.
(Geroski, Machin, & Reenen, 1993)	721 manufacturing companies in the U.K.	Regression	Innovation, profitability	The number of innovations positively affects the operating profit margin. In addition, innovative firms generally profit more than non-innovative firms.
(Deshpande, Farley, & Webster, 1993)	50 firms traded on the Nikkei stock exchange in Tokyo.	Survey, Quadrat Analysis	Innovativeness, Business performance, Customer Orientation, Culture	The degree of innovation affects business performance positively.
(Banbury & Mitchell, 1995)	Pacemaker manufacturing companies	Least squares linear regression, Logistic regression	Market growth, Entry first, Entry adoption, Prior Life, Start-up Firm, Entry year	Companies that promote increasing innovations in this sector and support them in the market are more likely to survive.
(Baldwin & Johnson, 1996)	Firms operating in Canada	Survey, Principal Component Analysis	Innovation, management, human resources, marketing, services, production efficiencies, government program, financing	More innovative firms place a greater emphasis on financing. Also, more-innovative firm are more successful than less-innovative firms.
(Geroski & Toker, 1996)	The leading 54 firms in UK	Regression	Logarithm of 1979 Sales, number of	Higher ranked firms more

	manufacturing industries, 1979-1986		innovations produced, total advertising spending, industry growth rates, industry concentration	intensively advertised and innovated than their lower ranked firms.
(Roper, 1997)	Small businesses in Germany, UK and Ireland, 1991-1993.	Survey	Product Innovation, Growth	Product innovation has a positive effect to the performance of the company.
(Roberts, 1999)	The Pharmaceutical Industry Firms in USA, 1977-1993	Regression	Innovation, Competition, Profitability	Long-run profit rates are positively related to firm innovative propensity.
(Freel, 2000)	228 small manufacturing firms in England	Mann-Whitney U Test	Sales turnover, Employment, Profits and profitability, Productivity, Exporting and export intensity, Firm growth, Firm performance	Firms which are implementing R&D activities are more likely to grow.
(Calantone, Cavusgil, & Zhao, 2002)	400 R&D vice presidents were randomly drawn from the CorpTech Directory of Technology Companies	Survey, Path analysis	Firm innovativeness, Firm performance, Commitment to learning, Shared vision, Open-mindedness, Intraorganizational knowledge sharing, Organization age	Firm innovativeness is positively related to firm performance.
(Monte & Papagni, 2003)	500 Italian manufacturing firms, 1989-1997	Panel Data Analysis, Unit root test, Regression	Profitability, Productivity growth rate, Productivity, Growth rates, Size, Innovation proxies (R&D/sales, patents,	The growth rate of firms is positively related with research intensity.

			Propensity to innovation)	
(Mairesse & Mohnen, 2003)	Data of the innovation surveys of firms operating in Germany, France, Britain and Spain.	Structural model	Size, labor productivity, R&D intensity and growth in employment, production, labor productivity	There is a positive relationship between product innovation and efficiency level, but there is no relationship between process innovation and efficiency.
(Cainelli, Evangelista, & Savona, 2004)	The innovations of the companies in 1993-1995 and their economic performance between 1996-1998 in the Italian Community Innovation Survey database	Regression	Annual average growth rate of sales, Annual average growth rate of employment, Sales per employee, the expenditures per employee devoted to R&D, new machinery and equipment, design activities and the acquisition of know-how	Innovative firms have higher labor productivity and sales growth than non-innovative firms.
(Becheikh, Landry, & Amara, 2006)	108 empirical studies about manufacturing sector, 1993-2003	Multiple regression analysis	Innovation, Innovation count, Patents, Firm-based surveys, R&D, Index,	Firm-based surveys and Index are linear linked with innovation.
(Coad & Rao, 2008)	American Firms in High-tech sector, 1963-1998	Principal component analysis, Regression	R&D Expenditure, Number of Patents, Innovation, Sales	R&D investments and patents negatively affect the increase in sales because of uncertainty of future.

(Cassia, Colombelli, & Paleari, 2009)	Companies listed on London Stock Exchange, 1995-2006	Generalized Method of Moments (GMM)	Proxies of firm growth, Firm size, Firm age, Patents, Students, Industry, Research funding, Ratio between regional business research and development investments and regional GDP.	There is a positive relationship between investments in research activities and small & young firms' growth.
(Rhee, Park, & Lee, 2010)	333 Technology-innovative small firms in South Korea	Survey, Common-method variance, Structural model	Year of establishment, Age of founder, Number of employees, Number of R&D staff	Innovation has been found to have a positive impact on firm performance.
(Dunk, 2011)	119 managers from manufacturing sector in Australia	Survey, Factor analysis	Product innovation, Role of budget, Financial performance	There is a positive relationship between product innovation and financial performance.
(García-Manjón & Romero-Merino, 2012)	754 Highest R&D Spending Firms From 18 Different European Countries, 2003-2007	Generalized Method of Moments (GMM), Regression, Ordinary least squares, Quantile regression	Growth, Firm Innovation, Sales	A positive relationship has been found between sales growth of companies and R&D expenditures.
(Choi & Williams, 2013)	897 firms in Korea and China, 2000-2003	Panel Data Analysis, Multicollinearity	Intensity of innovation, Scope of innovation, Financial performance	Innovation has been observed as strong predictor of financial performance.
(Wang & Fan, 2014)	3,664 firms operating in China, 2007-2012	Multi collinearity test, Regression	Market value, ROE, ROA, CROA, Tobin's Q, stock price	R&D investments affects the value

				of firms. It is also found that capitalized R&D investments are positively connected to stock price, while expensed R&D expenditures are negatively related to stock prices.
(VanderPal, 2015)	103 companies with high value of R&D, 1979-2013	Panel Data Analysis, Regression, Unit Root Test, Hausman Test	R&D expense/operating income, Revenue, Equity, ROE, ROA, net income	There is a positive link between R&D and subsequent operating performance. Also, intense positive connections have been found between R&D, profitability and the organization's market value.
(Min & Smyth, 2016)	3403 firms listed on the Korea Stock Exchange, 2007-2012	Panel Data Analysis, Instrumental variables estimation	Leverage, R&D intensity, growth opportunities, firm value	Growth opportunities have a positive effect on R&D intensity. Moreover, R&D causes an increase in firm value.

(Gupta, Banerjee, & Onur, 2017)	82,367 firm-year observations from 75 countries, 2004-2013	Regression	Tobin's Q, R&D Intensity, Sales Herfindahl–Hirschman Index, Blockholding, Capex Ratio, Leverage	There is a significant and positive effect of R&D intensity on Tobin's Q.
(Kim, Park, Lee, & Kim, 2018)	563 Chinese firms, 2005-2013	Generalized Method of Moments (GMM), Ordinary Least Squares (OLS), Panel Data Analysis, Regression	Tobin's Q, R&D intensity, State ownership, Leverage, Percentage of annual growth in total assets, Natural logarithm of total assets, Profitability	There is a U-shaped relationship between R&D investments and firm value.
(Tan & Wei, 2019)	18 listed equipment manufacturing firms in Liaoning, 2015-2017	Correlation analysis	R&D intensity, ROE, GPM, operating cash flow ratio, total asset turnover, growth rate of operating income, size of firm, asset-liability ratio	R&D investment is helpful to improving corporate financial performance, and R&D investment has a delay in return to the company.

5. METHODOLOGY

This chapter describes the aim of the study, the research strategy and analysis tools. Moreover, it includes sample selection and data collection methods.

5.1. Importance and Aim of the Study

In the fast changing world, innovation based on information and technology has become a crucial factor-that enables countries and businesses to reach their targets on a micro and macro dimensions. Businesses that want to survive have to reduce their costs and increase their sales and relatively their profitability to ensure sustainability. In all these processes, it is very important to gain competitive advantage and to identify the determinants of the factors that can be defined as performance indicators. In this instance, R&D expenditures, despite being included in the operating expenses of the businesses, provide great opportunities for businesses to increase their market shares (Aytekin & Özçalık, 2018, pp. 67-68).

Innovation has been seen as an important competitive tool for businesses and countries in recent years. As a reflection of this, the effects of innovative activities on the financial performances and firm values of companies have become one of the topics that are intriguing for researchers. It is believed that innovation has an important role in increasing the performance of the businesses and thus increasing the country's welfare. Thus, the number of studies that reveal a statistically significant relationship between innovation and economic performance has reached considerable levels (Demirhan & Aracıoğlu, 2017, p. 196). With the idea that the main purposes of businesses are shareholder value or firm value maximization through superior financial performance, the level of financial performance and value creation achieved related with innovation performance is among the topics worthy of research. For this purpose, the effect of innovation performance of companies on financial performance and firm value is investigated.

5.2. Scope of Research

This study investigated relationship between innovation performance and financial performance and firm value in Turkey by sampling 30 firms, which are traded on BIST. We started collecting data of 250 non-financial companies which had the highest amount of R&D expenditures in year 2018. After the elimination of missing values of the variables used in the study, only 30 companies were left for the research with full data.

In order to calculate future effect of innovation performance, 2018 innovation performance data of companies have been used and for the financial performance and firm value, the change percentage between 2018 data and 2019 data was utilized.

- The data are obtained from the 12-month activity and financial reports published on the websites of the companies in the sample.
- Closing stock price information, number of employees were obtained from www.borsagundem.com, tr.investing.com and tr.tradingview.com.
- 2018 R&D expenditures, number of R&D employees of the companies were obtained from http://turkishtimedergi.com/arge250/pdf/ARGE250-2018.pdf
- All other data were obtained from the database of FINNET Electronic Publishing Data Communication company.

While determining the companies to be included in the study, attention was paid to ensure that the innovation performance criteria data were complete, and all companies have published annual reports. Within the framework of these criteria, 30 businesses were included in the research. The list of companies and sector information included in the study are presented in Table 10.

Table 10 *List of Enterprises Included in the Study and Sector Information*

NO	COMPANY NAME	ABBREVIATION	SECTOR
1	AKSA AKRİLİK KİMYA	AKSA	MANUFACTURING INDUSTRY
2	ANADOLU ISUZU OTOMOTİV	ASUZU	MANUFACTURING INDUSTRY
3	ARÇELİK	ARCLK	MANUFACTURING INDUSTRY
4	ASELSAN ELEKTRONİK	ASELS	TECHNOLOGY
5	AYGAZ	AYGAZ	MANUFACTURING INDUSTRY
6	BANVİT	BANVT	MANUFACTURING INDUSTRY
7	BRİSA BRIDGESTONE LASTİK	BRISA	MANUFACTURING INDUSTRY
8	DEVA HOLDİNG	DEVA	MANUFACTURING INDUSTRY
9	DÖKTAŞ DÖKÜMCÜLÜK	DOKTA	MANUFACTURING INDUSTRY
10	DYO BOYA FABRİKALARI	DYOBY	MANUFACTURING INDUSTRY
11	EREĞLİ DEMİR VE ÇELİK	EREGL	MANUFACTURING INDUSTRY
12	FORD OTOMOTİV SAN.	FROTO	MANUFACTURING INDUSTRY
13	JANTSA	JANTS	MANUFACTURING INDUSTRY
14	KLİMASAN KLİMA	KLMSN	MANUFACTURING INDUSTRY
15	KORDSA TEKNİK TEKSTİL	KORDS	MANUFACTURING INDUSTRY
16	LOGO YAZILIM	LOGO	TECHNOLOGY
17	MENDERES TEKSTİL	MNDRS	MANUFACTURING INDUSTRY
18	NETAŞ TELEKOMÜNİKASYON	NETAS	TECHNOLOGY
19	OTOKAR OTOMOTİV	OTKAR	MANUFACTURING INDUSTRY
20	TOFAŞ TÜRK OTOMOBİL	TOASO	MANUFACTURING INDUSTRY
21	TRAKYA CAM	TRKCM	MANUFACTURING INDUSTRY
22	TURKCELL	TCELL	COMMUNICATION
23	TÜRK TRAKTÖR	TTRAK	MANUFACTURING INDUSTRY
24	TÜRKİYE PETROL RAFİNERİLERİ	TUPRS	ENERGY
25	TÜRKİYE ŞİŞE VE CAM	SISE	MANUFACTURING INDUSTRY
26	ULUSOY ELEKTRİK	ULUSE	MANUFACTURING INDUSTRY
27	ÜLKER BİSKÜVİ	ULKER	MANUFACTURING INDUSTRY
28	VESTEL BEYAZ EŞYA	VESBE	MANUFACTURING INDUSTRY
29	VESTEL ELEKTRONİK	VESTL	MANUFACTURING INDUSTRY
30	YÜNSA YÜNLÜ	YUNSA	MANUFACTURING INDUSTRY

5.3. Determinants and Hypotheses

In the study, in which the effect of innovation performance on the financial performance and firm values of the businesses was investigated, firstly, the criteria regarding the determinants of the innovation performance of the enterprises were determined and listed in Table 11. After that financial performance and firm value determinants were determined (see Table 12 and Table 13).

5.3.1. Determinants of innovation performance

Considering the literature review and obtainable data, five different determinants of innovation performance have been identified. Table 11 presents these determinants.

Table 11 *Determinants of Innovation Performance*

Codes	Content
IN1	R&D Investment / Sales
IN2	R&D Investment / Total Assets
IN3	R&D Investment / R&D Projects
IN4	R&D Projects / R&D Employees
IN5	R&D Employees / Total Employees

5.3.2. Determinants of financial performance

Considering the literature review and obtainable data, six different determinants of financial performance have been identified. Table 12 presents these determinants.

Table 12 *Determinants of Financial Performance*

Codes	Content
FP1	OROA (Operating Return on Assets)
FP2	ROE (Return on Equity)
FP3	FATO (Fixed Asset Turnover)
FP4	TATO (Total Asset Turnover)
FP5	OPM (Operating Profit Margin)
FP6	GPM (Gross Profit Margin)

5.3.3. Determinants of firm value

Considering the literature review and obtainable data, five different determinants of firm value have been set. Table 13 presents these determinants.

Table 13 *Determinants of Firm Value*

Codes	Content
FV1	Tobin's Q
FV2	Price / Earnings Ratio
FV3	Price / Book Ratio
FV4	EVA (Economic Value Added)
FV5	MVA (Market Value Added)

5.3.4. Hypotheses

The hypotheses to be tested in the research based on the literature reviews are listed below.

H1: There is a positive relationship between innovation performance and financial performance

H2: There is a positive relationship between innovation performance and firm value

H3: There is a positive relationship between financial performance and firm value

5.4. Data Analysis

In this study, Exploratory Factor Analysis (EFA) , Regression Analysis and Correlation Analysis method have been implemented. With the aim of analyze the data, reliability tests, factor analysis, regression analysis, correlation analysis and other analysis have been conducted by IBM SPSS Statistics 22.0 software.

5.4.1. Exploratory Factor Analysis (EFA)

Exploratory factor analysis is a complex statistical method, which has been very commonly used analysis lately. Exploratory factor analysis determines a factor model for a group of variables. EFA has several fundamental functions to do. Firstly, it analysis the correlation between observed variables. Secondly, it reduces the data into a few factors, then tests the theory (Taherdoost, Sahibuddin, & Jalaliyoon, 2014, p. 376).

Exploratory factor analysis cannot be applied to all kind of data. The data should be ordinal or scale. Besides, multivariate normal distribution is necessary, which indicates that the relationship between the variables is linear (Haig, 2010, p. 308).

5.4.2. Reliability test

One of the most important issues in scientific research is reliability. Although there are many reliability analyzes, the most popular of these is the Cronbach Alpha method. Cronbach's alpha (α) coefficient is used to estimate the reliability of a test. The Cronbach's alpha reliability test measures how compatible the variables are with each other (Bonett & Wright, 2014, pp. 3-4). According to this method there is no universally accepted level of α in the world. For example, (Bonett & Wright, 2014), says value of Cronbach's alpha should not be acceptable below 0,7. However, according to (Samuels, 2015), α below 0,6 can be acceptable depending on sample size and number of items. Moreover, in another research α value is acceptable (0.45–0.98), satisfactory (0.58–0.97) and reasonable (0.67–0.87). So, depending on sample size, this research's Cronbach's alpha (α) value should be accepted between 0,45 and 0,98 (Taber, 2017, p. 6).

5.4.3. Regression and Correlation Analysis

Regression is a target value modeling method based on independent predictors. It is a statistical tool used to find the relationship between the result variable, also known as a dependent variable, and one or more variables, often called an independent variable. This method is mostly used to estimate and find the cause and effect relationship between the variables. Regression techniques mostly differ according to the number of independent variables and the type of relationship between independent and dependent variables (Fox, 2016, pp. 13-15).

Regression is performed when the dependent variable is of the continuous data type and when predictors or independent variables can be of any data type, such as continuous, nominal. In regression, the dependent variable is a function of an independent variable and its coefficient and error term (Cohen, Cohen, West, & Aiken, 2003, pp. 1-3).

The relationships between the two variables can occur in various ways. The most widely used of the relationships is the situation where there is a linear relationship between the variables. Linear regression analysis with a dependent and an independent variable is called simple linear regression. However, regression models with more than one argument number are called multiple regression models. In multiple regression analysis, there is one dependent variable and more than one independent variable that is

thought to affect this dependent variable. That is, multiple regression analysis can be considered as an expanded form of simple linear regression. In addition, it uses partial correlation analysis (Cohen, Cohen, West, & Aiken, 2003, pp. 2-3).

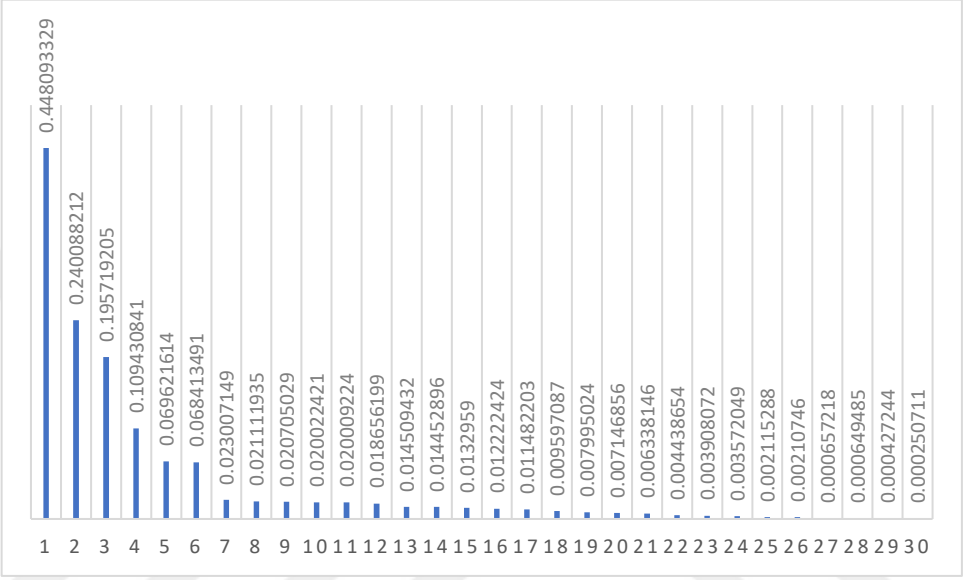
Correlation shows the linear relationship between two or more variables. The relationship of a variable with two or more variables is calculated by multiple correlation, and the relationship of one of these variables with other variables is calculated by partial correlation techniques (Cohen, Cohen, West, & Aiken, 2003, pp. 79-80).

6. FINDINGS AND DISCUSSIONS

6.1. Descriptive Statistics

Figure 1-5 presents the data of our innovation variables.

Figure 1 *R&D Investment / Sales*

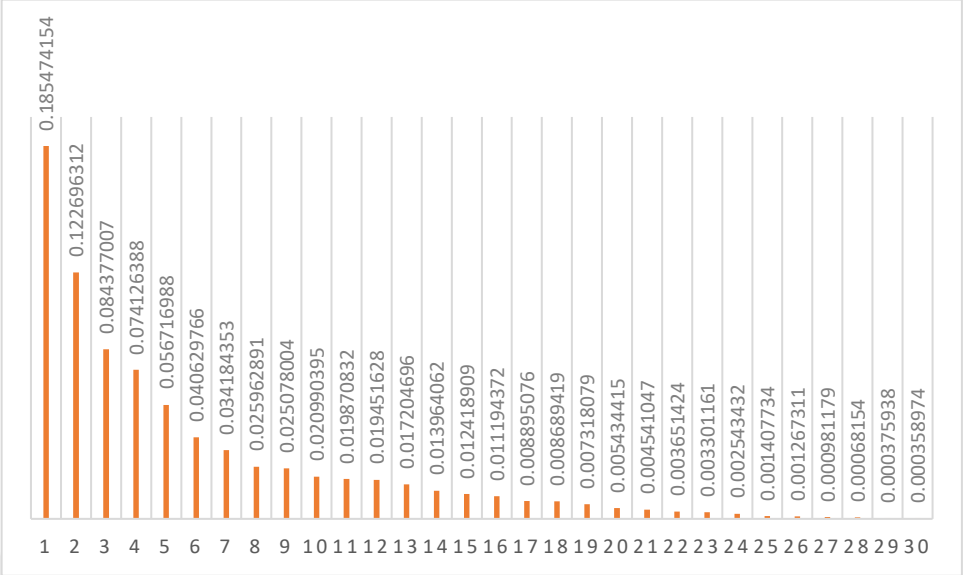


Data of R&D Investment / Sales presented in Figure 1 as seen above. Also, minimum, maximum, mean and standard deviation of R&D Investment / Sales presented in Table 14 below.

Table 14 *Descriptive Statistics of R&D Investment / Sales*

	N	Minimum	Maximum	Mean	Std. Deviation
IN1	30	,0003	,4481	,045668	,0945783
Valid N (listwise)	30				

Figure 2 *R&D Investment / Total Assets*

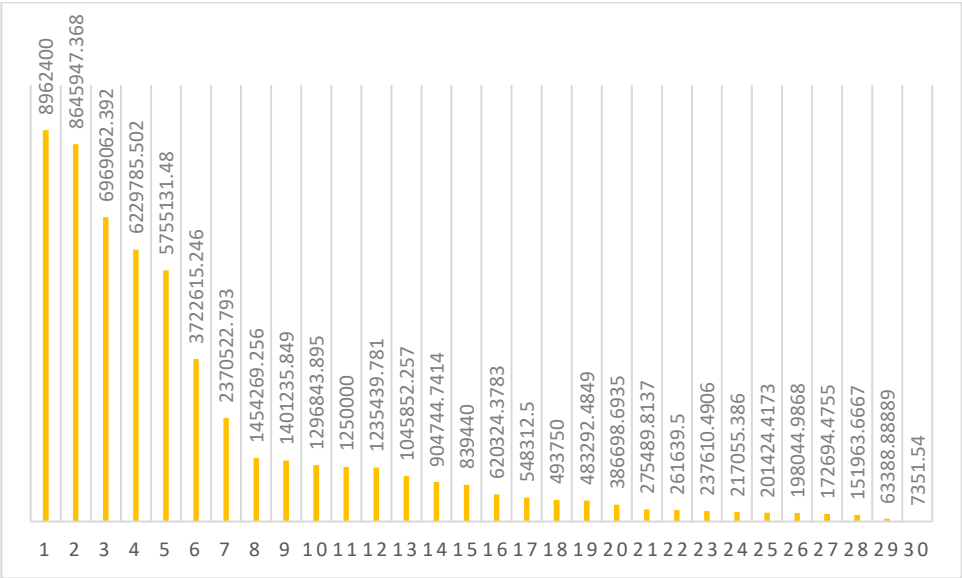


Data of R&D Investment / Total Assets presented in Figure 2 as seen above. Also, minimum, maximum, mean and standard deviation of R&D Investment / Total Assets presented in Table 15 below.

Table 15 *Descriptive Statistics of R&D Investment / Total Assets*

	N	Minimum	Maximum	Mean	Std. Deviation
IN2	30	,0004	,1855	,027126	,0413613
Valid N (listwise)	30				

Figure 3 *R&D Investment / R&D Projects*

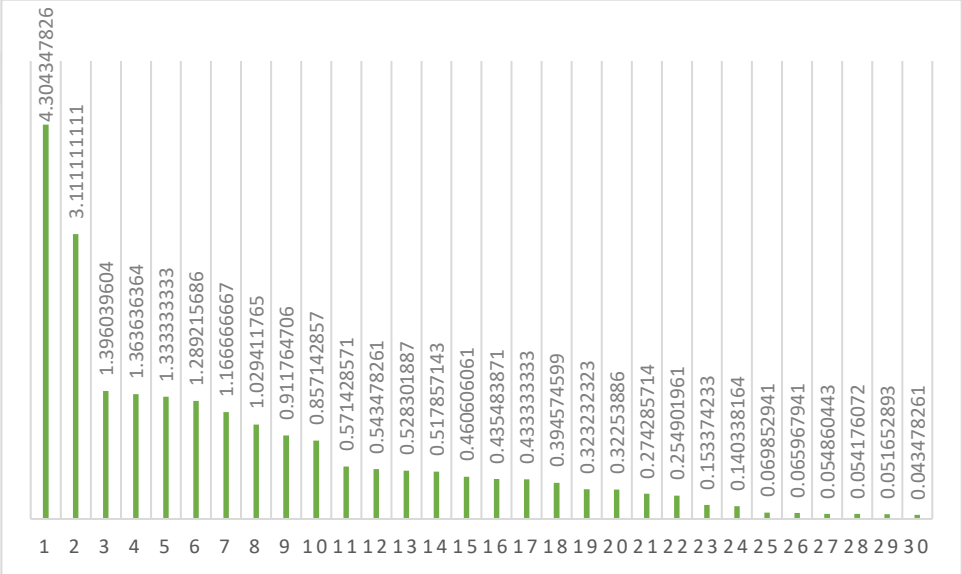


Data of R&D Investment / R&D Projects presented in Figure 3 as seen above. Also, minimum, maximum, mean and standard deviation of R&D Investment / R&D Projects presented in Table 16 below.

Table 16 *Descriptive Statistics of R&D Investment / R&D Projects*

	N	Minimum	Maximum	Mean	Std. Deviation
IN3	30	7351,5400	8962400,0000	1880077,726086	2640377,1036912
Valid N (listwise)	30				

Figure 4 *R&D Projects / R&D Employees*

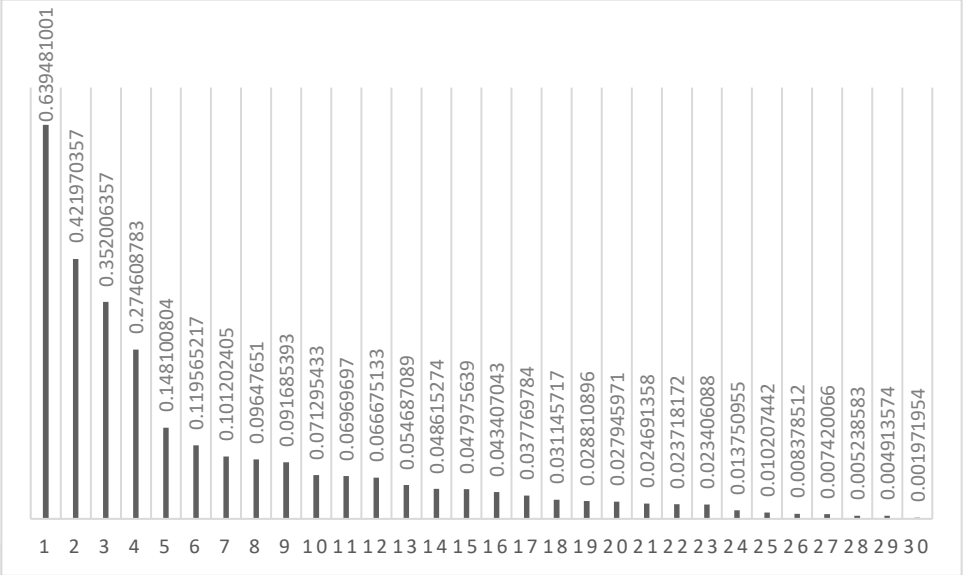


Data of R&D Projects / R&D Employees presented in Figure 4 as seen above. Also, minimum, maximum, mean and standard deviation of R&D Projects / R&D Employees presented in Table 17 below.

Table 17 *Descriptive Statistics of R&D Projects / R&D Employees*

	N	Minimum	Maximum	Mean	Std. Deviation
IN4	30	,0435	4,3043	,748546	,9276961
Valid N (listwise)	30				

Figure 5 *R&D Employees / Total Employees*



Data of R&D Employees / Total Employees presented in Figure 5 as seen above. Also, minimum, maximum, mean and standard deviation of R&D Employees / Total Employees presented in Table 18 below.

Table 18 *Descriptive Statistics of R&D Employees / Total Employees*

	N	Minimum	Maximum	Mean	Std. Deviation
IN5	30	,0020	,6395	,096561	,1439478
Valid N (listwise)	30				

6.2. Exploratory Factor Analysis (EFA)

6.2.1. KMO and Bartlett's Test

Table 19 *KMO and Bartlett's Test of Innovation Performance*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,702
Bartlett's Test of Sphericity	Approx. Chi-Square	111,648
	df	10
	Sig.	,000

The KMO and Bartlett's Test was implemented in the study to check the sampling adequacy of the research. Generally, Kaiser-Meyer-Olkin Measure of Sampling Adequacy more than 0,50 is acceptable and Bartlett's Test of Sphericity significance level should be P<.001.

Table 20 *KMO and Bartlett's Test of Financial Performance*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,585
Bartlett's Test of Sphericity	Approx. Chi-Square	81,429
	df	15
	Sig.	,000

Table 21 *KMO and Bartlett's Test of Firm Value*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,582
Bartlett's Test of Sphericity	Approx. Chi-Square	56,001
	df	3
	Sig.	,000

As results, all the sampling adequacy of KMO and Bartlett's Test are more than 0,50 and acceptable.

6.2.2. Total variance explained

Table 22 *Total Variance Explained of EFA*

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4,249	30,352	30,352	4,249	30,352	30,352	3,772
2	2,583	18,450	48,802	2,583	18,450	48,802	3,203
3	2,371	16,938	65,740	2,371	16,938	65,740	2,506
4	1,379	9,849	75,589				
5	1,017	7,264	82,853				
6	,798	5,701	88,555				
7	,532	3,802	92,357				
8	,396	2,830	95,187				
9	,238	1,700	96,887				
10	,222	1,583	98,470				
11	,115	,819	99,289				
12	,058	,411	99,701				
13	,028	,202	99,903				
14	,014	,097	100,000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance

Total variance explained extracted with principal component analysis method with three factors. Accordingly, cumulative percentage of Extraction Sums of Squared Loadings is 65,740 %, it means that three factor explains 65,740 % of total variance . So, the analysis results can be acceptable with this percent because in the social sciences %60 or higher percent are acceptable (Hair, Black, Babin, & Anderson, 2014). Because of factor number is three the cumulative percentage is lower, when it becomes four factors (innovation divided into two categories), it goes up to 80 %.

6.2.3. Pattern matrix of factors

Table 23 *Pattern Matrix of EFA*

	Component		
	INNOVATION PERFORMANCE	FINANCIAL PERFORMANCE	FIRM VALUE
R&D INVESTMENT / TOTAL ASSETS	,913		
R&D INVESTMENT / R&D PROJECTS	,707		
R&D INVESTMENT / SALES	,904		
R&D EMPLOYEES / TOTAL EMPLOYEES	,868		
R&D PROJECTS / R&D EMPLOYEES	,512		
OROA (OPERATING RETURN ON ASSETS)		,677	
FATO (FIXED ASSET TURNOVER)		,444	
GPM (GROSS PROFIT MARGIN)		,901	
OPM (OPERATING PROFIT MARGIN)		,900	
ROE (RETURN ON EQUITY)		,695	
TATO (TOTAL ASSET TURNOVER)		,583	
TOBIN'S Q			,893
PRICE / EARNINGS			,534
PRICE / BOOK			,919

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 11 iterations.

The pattern matrix has been extracted with principal component analysis method Oblimin with Kaiser normalization. According to the results, three factors have been loaded and coefficients less than 0.3 have not been loaded into the matrix.

6.2.4. Reliability test

In scientific research studies, reliability test is highly important. A Cronbach Alpha value of more than 0,7 or 0,6 is deemed to be generally acceptable. However, in this study, sample size is sort of low (N=30) for this test. So, according to (Taber, 2017) α value is acceptable (0.45–0.98).

Table 24 *Reliability Statistics for Factor 1*

Case Processing Summary

		N	%
Cases	Valid	30	100,0
	Excluded[a]	0	,0
	Total	30	100,0

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,624	,665	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
IN1	7,3333	13,747	,819	,948	,364
IN2	7,2000	12,924	,822	,950	,336
IN3	6,8000	14,579	,357	,346	,594
IN4	6,8000	26,303	-,335	,162	,861
IN5	7,2000	14,303	,671	,625	,426

The reliability test is implemented for the first factor, which is innovation performance. Here, the Cronbach's Alpha result is 0,624 which implies that the data is % 62,4 reliable for this research. It is in the range of acceptable. However, one interesting thing is if IN4(R&D projects/R&D employees) variable deleted the Cronbach's Alpha will increase to 0,861. Yet, as the result could still be acceptable, the variable will be used.

Table 25 *Reliability Statistics for Factor 2*

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,643	,761	6

Case Processing Summary

		N	%
Cases	Valid	30	100,0
	Excluded[a]	0	,0
	Total	30	100,0

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
FP1	-,0823	,617	,489	,635
FP2	-,0802	1,394	,038	,685
FP3	-,0784	1,278	,440	,612
FP4	-,0342	1,280	,591	,603
FP5	-,0354	,800	,620	,480
FP6	-,0087	1,153	,733	,549

The reliability test is implemented for the second factor, which is financial performance. Here, the Cronbach's Alpha result is 0,643 which is means the data % 64,3 reliable for this research. It is in the range of acceptable for small samples. However, one interesting thing is if FP2(Return on Equity) variable deleted the Cronbach's Alpha will increase to 0,685.

Table 26 *Reliability Statistics for Factor 3*

Case Processing Summary

		N	%
Cases	Valid	30	100,0
	Excluded[a]	0	,0
	Total	30	100,0

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,526	,801	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
FV1	2,0063	12,898	,712	,537
FV2	1,0082	3,917	,406	,517
FV3	1,4625	7,413	,492	,180

The reliability test is implemented for the third factor, which is firm value. Here, the Cronbach's Alpha result is 0,526 which is means the data % 52,6 reliable for this research. It is in the range of acceptable. However, if FV1(Tobin's Q) variable deleted the Cronbach's Alpha will increase to 0,537. Yet, as the result could still be acceptable, the variable will be used.

Table 27 *Total Output of EFA*

	Factor Loading	**Cronbach Alpha**	**% of Variance Explained**
Innovation Performance		,624	30,352
R&D Investment / Total Assets	,913		
R&D Investment / R&D Projects	,707		
R&D Investment / Sales	,904		
R&D Employees / Total Employees	,868		
R&D Projects / R&D Employees	,512		
Financial Performance		,643	18,450
OROA (Operating Return on Assets)	,677		
FATO (Fixed Asset Turnover)	,444		
GPM (Gross Profit Margin)	,901		
OPM (Operating Profit Margin)	,900		
ROE (Return on Equity)	,695		
TATO (Total Asset Turnover)	,583		
Firm Value		,526	16,938
Tobin's Q	,893		
Price / Earnings	,534		
Price / Book	,919		

6.3. Results of hypothesis testing

The hypothesis of the study has been analyzed in SPSS 22 software. Regression and correlation analysis have been conducted to test hypothesis. EVA and MVA variables were removed due to incompatible data in the analysis.

Data is standardized to Z value by subtracting the mean from each variable value and dividing the difference obtained by the standard deviation. Moreover, T value of variables have been calculated in order to use in regression analysis and hypothesis testing. Thus, the raw data were converted into Z data, and the difference in the unit of measure was eliminated. Then, by adjusting the T value, it was converted from the negative values

in the Z value to become a positive integer. Therefore, in the analysis results it can be seen that some variables have front label called “T” (example TIN1 means T value of IN1). Z value of variables calculated by SPSS 22. Z and T value formula of variables is presented in below .

Z Value = (Variable Value – Mean) / Standard Deviation

T Value = (Z Value * 10) + 50

6.3.1. Correlation Analysis Results

Table 28 *Correlation Analysis for Testing Hypothesis 1*

			FP1	FP2	FP3	FP4	FP5	FP6
Spearman's rho	IN1	Correlation Coefficient	,234	,087	**,432****	**,341***	,080	,029
		Sig. (1-tailed)	,106	,324	**,009**	**,033**	,337	,439
		N	30	30	30	30	30	30
	IN2	Correlation Coefficient	**,313***	,093	**,483****	**,447****	,170	,155
		Sig. (1-tailed)	**,046**	,313	**,003**	**,007**	,185	,207
		N	30	30	30	30	30	30
	IN3	Correlation Coefficient	,113	-,026	,146	,062	-,031	-,044
		Sig. (1-tailed)	,276	,445	,221	,372	,436	,409
		N	30	30	30	30	30	30
	IN4	Correlation Coefficient	-,075	-,131	-,031	,006	,095	,093
		Sig. (1-tailed)	,348	,244	,436	,488	,310	,313
		N	30	30	30	30	30	30
	IN5	Correlation Coefficient	**,401***	,035	**,337***	**,351***	,272	,221
		Sig. (1-tailed)	**,014**	,427	**,034**	**,029**	,073	,120
		N	30	30	30	30	30	30

According to Table 28 correlation results Table 29 listed significance and correlation levels of innovation performance and financial performance indicators.

Table 29 *Interpreting Correlation Coefficients of Innovation Performance and Financial Performance*

	Operating Return on Assets	**Return on Equity**	**Fixed Asset Turnover**	**Total Asset Turnover**	**Operating Profit Margin**	**Gross Profit Margin**
R&D Investment / Sales			A significant moderate positive relationship.	A significant moderate positive relationship.		
R&D Investment / Total Assets	A significant moderate positive relationship.		A significant moderate positive relationship.	A significant moderate positive relationship.		
R&D Investment / R&D Projects						
R&D Projects / R&D Employees						
R&D Employees / Total Employees	A significant moderate positive relationship.		A significant moderate positive relationship.	A significant moderate positive relationship.		

Correlation analysis results in order to test hypothesis 2 are listed below in the Table 30. In addition, Table 31 presents significance and correlations levels of innovation performance and firm value indicators.

Table 30 *Correlation Analysis for Testing Hypothesis 2*

			FV1	FV2	FV3
Spearman's rho	IN1	Correlation Coefficient	**,319***	-,096	,268
		Sig. (1-tailed)	**,043**	,306	,076
		N	30	30	30
	IN2	Correlation Coefficient	**,415***	-,138	**,317***
		Sig. (1-tailed)	**,011**	,233	**,044**
		N	30	30	30
	IN3	Correlation Coefficient	-,211	-,235	-,302
		Sig. (1-tailed)	,131	,106	,052
		N	30	30	30
	IN4	Correlation Coefficient	,074	,112	,131
		Sig. (1-tailed)	,349	,277	,246
		N	30	30	30
	IN5	Correlation Coefficient	,271	-,217	,192
		Sig. (1-tailed)	,074	,125	,155
		N	30	30	30

Table 31 *Interpreting Correlation Coefficients of Innovation Performance and Firm Value*

	Tobin's Q	**Price / Earnings**	**Price / Book**
R&D Investment / Sales	A significant moderate positive relationship.		
R&D Investment / Total Assets	A significant moderate positive relationship.		A significant moderate positive relationship.
R&D Investment / R&D Projects			
R&D Projects / R&D Employees			
R&D Employees / Total Employees			

Correlation analysis results in order to test hypothesis 3 are listed below in the Table 32. In addition, Table 33 presents that significance and correlation levels of financial performance and firm value indicators.

Table 32 *Correlation Analysis for Testing Hypothesis 3*

			FV1	FV2	FV3
Spearman's rho	FP1	Correlation Coefficient	,074	**-,391***	,091
		Sig. (1-tailed)	,349	**,016**	,315
		N	30	30	30
	FP2	Correlation Coefficient	,107	-,243	**,318***
		Sig. (1-tailed)	,287	,098	**,043**
		N	30	30	30
	FP3	Correlation Coefficient	,056	**-,473****	,065
		Sig. (1-tailed)	,384	**,004**	,366
		N	30	30	30
	FP4	Correlation Coefficient	,212	**-,461****	,295
		Sig. (1-tailed)	,130	**,005**	,057
		N	30	30	30
	FP5	Correlation Coefficient	,033	**-,546****	-,085
		Sig. (1-tailed)	,431	**,001**	,327
		N	30	30	30
	FP6	Correlation Coefficient	-,045	**-,551****	-,184
		Sig. (1-tailed)	,406	**,001**	,165
		N	30	30	30

Table 33 *Interpreting Correlation Coefficients of Financial Performance and Firm Value*

	Tobin's Q	**Price / Earnings**	**Price / Book**
Operating Return on Assets		A significant moderate negative relationship.	
Return on Equity			A significant moderate positive relationship.
Fixed Asset Turnover		A significant moderate negative relationship.	
Total Asset Turnover		A significant moderate negative relationship.	
Operating Profit Margin		A significant moderate negative relationship.	
Gross Profit Margin		A significant moderate negative relationship.	

6.3.2. Regression Analysis Results

Regression analysis has been implemented in order to test impact of independent variables to the dependent variables of firm value. In this study, forward selection regression analysis type has been chosen. Therefore, independent variables were added to the model considering that VIF (collinearity indicator) value must be lower than 3 and p value must be lower than 0,05. Due to the collinearity, multiple linear regression analysis could not be implemented between the variables of innovation and financial performance. In addition, Adjusted R Square values of the model was taken into consideration.

Table 34 *Regression Results of Dependent Variable FV1*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,603[a]	,364	,231	8,76807

a. Predictors: (Constant), TIN3, TFP2, TFP3, TIN5, TIN2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1054,903	5	210,981	2,744	,042[b]
	Residual	1845,097	24	76,879		
	Total	2900,000	29			

a. Dependent Variable: TFV1

b. Predictors: (Constant), TIN3, TFP2, TFP3, TIN5, TIN2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	36,324	12,682		2,864	,009	10,149	62,499		
	TIN3	-,096	,202	-,096	-,475	,639	-,513	,321	,648	1,542
	TFP2	,507	,176	,507	2,872	,008	,143	,871	,852	1,174
	TFP3	-,327	,208	-,327	-1,574	,129	-,755	,102	,615	1,625
	TIN5	-,546	,261	-,546	-2,094	,047	-1,084	-,008	,390	2,565
	TIN2	,736	,284	,736	2,593	,016	,150	1,321	,329	3,036

a. Dependent Variable: TFV1

According to the results of regression analysis of FV1, adjusted R square value was calculated as 0,231. Therefore, 23,1 % of variance of the dependent variable is explained by the independent variables. Furthermore, it is found that ROE (TFP2) and R&D Investment / Total Assets (TIN2) have a significantly positive impact on Tobin's Q (TFV1). However, R&D Employees / Total Employees (TIN5) has significant negative impact on Tobin's Q variable.

Table 35 *Regression Results of Dependent Variable FV2*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,597[a]	,357	,223	8,81547

a. Predictors: (Constant), TIN4, TFP2, TFP6, TIN1, TIN3

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1034,902	5	206,980	2,663	,047[b]
	Residual	1865,098	24	77,712		
	Total	2900,000	29			

a. Dependent Variable: TFV2

b. Predictors: (Constant), TIN4, TFP2, TFP6, TIN1, TIN3

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	66,174	21,685		3,052	,005	21,419	110,929		
	TFP2	,197	,169	,197	1,167	,255	-,152	,546	,939	1,065
	TFP6	-,552	,174	-,552	-3,169	,004	-,911	-,192	,884	1,131
	TIN1	,015	,190	,015	,077	,939	-,377	,406	,746	1,341
	TIN3	-,095	,209	-,095	-,453	,655	-,526	,337	,612	1,633
	TIN4	,115	,246	,092	,468	,644	-,392	,622	,701	1,427

a. Dependent Variable: TFV2

According to results of regression analysis of FV2, adjusted R square value calculated 0,223. Therefore, 22,3 % of variance of the dependent variable is explained by independent variables. Furthermore, it is found that gross profit margin (TFP6) has significant negative impact on Price to Earnings ratio (TFV2).

Table 36 *Regression Results of Dependent Variable FV3*

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,641[a]	,411	,288	8,43729

a. Predictors: (Constant), TFP3, TIN4, TFP1, TFP2, TIN2

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1191,492	5	238,298	3,347	,020[b]
	Residual	1708,508	24	71,188		
	Total	2900,000	29			

a. Dependent Variable: TFV3

b. Predictors: (Constant), TFP3, TIN4, TFP1, TFP2, TIN2

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95,0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	7,333	20,784		,353	,727	-35,564	50,230		
	TIN2	,276	,223	,276	1,237	,228	-,184	,736	,494	2,024
	TIN4	,314	,242	,250	1,297	,207	-,186	,815	,659	1,517
	TFP1	,178	,169	,178	1,051	,304	-,171	,527	,858	1,166
	TFP2	,700	,177	,700	3,948	,001	,334	1,067	,780	1,282
	TFP3	-,605	,240	-,605	-2,526	,019	-1,099	-,111	,428	2,338

a. Dependent Variable: TFV3

According to results of regression analysis of FV3, adjusted R square value calculated 0,288. Therefore, 28,8 % of variance of the dependent variable is explained by independent variables. Furthermore, it is found that ROE (TFP2) has significant positive impact on Price to Book ratio (TFV3). However, Fixed Asset Turnover (TFP3) has significant negative impact on Price to Book ratio.

6.2.3. Hypotheses Testing Results

Hypotheses of this study tested with correlation analysis. In order to implement suitable hypothesis testing in correlation analysis, means of T values of each factor have been calculated. Moreover, one-tailed Spearman correlation analysis has implemented. Formulas related with each factor are presented as follows.

Innovation Performance = (TIN1+TIN2+TIN3+TIN4+TIN5)/5

Financial Performance = (TFP1+TFP2+TFP3+TFP4+TFP5+TFP6)/6

Firm Value = (TFV1+TFV2+TFV3)/3

Table 37 *Hypothesis Testing: Correlation Analysis*

			Innovation Performance	Financial Performance	Firm Value
Spearman's rho	Innovation Performance	Correlation Coefficient	1,000	**,641****	,038
		Sig. (1-tailed)	.	**,000**	,421
		N	32	30	30
	Financial Performance	Correlation Coefficient	**,641****	1,000	-,121
		Sig. (1-tailed)	**,000**	.	,262
		N	30	30	30
	Firm Value	Correlation Coefficient	,038	-,121	1,000
		Sig. (1-tailed)	,421	,262	.
		N	30	30	30

**. Correlation is significant at the 0.01 level (1-tailed).

Table 38 *Results of Hypothesis Testing*

	Correlation Coefficient	**Sig. (One-Tailed)**	**Status**
H1	0,641	0,000	Supported
H2	0,038	0,421	Rejected
H3	-0,121	0,262	Rejected

7. CONCLUSION

This chapter concludes the research by summarizing the findings of research and making some recommendations for future research about the relationships of innovation, financial performance and firm value.

This study investigated the relationship between innovation performance and financial performance and firm value in Turkey by sampling 30 firms which are traded on BIST. 2018 innovation performance data of companies have been used. In order to observe the future effect of innovation performance on financial performance and firm value, the percentage differences of the variables (using 2019 data 2018 data) have been utilized to estimate financial performance and firm value. EFA, regression and correlation analysis were employed in the data analysis.

In this study a statistically significant positive relationship was found between innovation performance and financial performance. According to the findings, companies which invest more on research and development activities will have higher fixed and total assets turnover rates. Besides that, employing more personnel in R&D department has also same relationship with turnover ratios.

Although, there no significant relationship between innovation performance and firm value was found with correlation analysis, regression analysis results imply R&D investment/total assets have a significantly positive impact on Tobin's Q. However, R&D employees / total employees ratio has a significant negative impact on Tobin's Q ratio. Furthermore, R&D investments / total assets ratio have positive relationship with Price to Book ratio. Therefore, when the companies invest more on research and development, their stock price and firm value will increase accordingly.

In the study, no significant relationship has been found between financial performance and firm value. In spite of that, all financial performance determinants, except ROE ratio, have significant and negative relationship with Price to Earnings ratio. However, ROE ratio has significantly positive relationship with Price to Book ratio.

In the previous studies examining the relationship between innovation performance and financial performance, it has been observed that innovation performance of businesses has a positive effect on financial performance. The results obtained from this research (there is a statistically significant correlation between innovation performance and financial performance) are consistent with the results of the empirical studies on this

subject (Choi & Williams, 2013) (Deshpande, Farley, & Webster, 1993) (Tan & Wei, 2019) (Dunk, 2011) (Rhee, Park, & Lee, 2010) (Albeni & Doğan, 2015) (Kaygın, Yılmaz, & Kaygın, 2016).

To conclude, we can say if the businesses increase their R&D expenditures, Operating Return on Assets, Fixed Asset Turnover and Total Asset Turnover ratios may tend to increase relatively. Also, the Tobin's Q and Price/Book ratio is related with R&D expenditures of the companies. In this respect, the companies, which want to increase their financial performance and firm value, must focus on R&D expenditures. However, spending more money on R&D may not affect the financial performance or firm value alone. The important point here is the quality and efficiency of R&D activities resulting from R&D expenditures. Effective innovation projects will contribute to the performance and market value of companies.

7.1. Limitations of the Study and Suggestions for Future Research

The scope of work is limited to 30 businesses traded on the BIST due to data availability limitations. Therefore, findings and explanations obtained from the result of the model should be evaluated by considering the limitations of the study. Studies to be carried out with different and larger samples can lead to different results.

This study focused on the question of whether there is a relationship between innovation performance of the companies and financial performance and firm values. Since the financial performance and innovation performance of the businesses can be handled in a multidimensional scope, it will not be correct to explain them only with the factors used in this study. Therefore, it is thought that this research will contribute to the literature via guiding future studies to determine the effects of different innovation performance factors on financial performance and firm value. We recommend that future research studies utilize long term data. Different financial performance measures such as EVA and MVA may also be used as well as the financial performance measures used in this study. Also, we recommend future research studies could include the sustainability performance of companies and evaluate the impacts of sustainability together with innovation performance.

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APPENDICES

Appendix 1 *Component Matrix*[a]

	Component		
	1	2	3
IN1	,775	,387	
IN2	,807	,387	
IN3	,659		-,306
IN4		-,406	,371
IN5	,775	,306	
FP1	,465	-,347	,363
FP2		,525	,474
FP3	,738		
FP4	,601		,381
FP5	,496	-,502	,544
FP6	,558	-,450	,540
FV1		,633	,619
FV2	-,413	,608	
FV3		,617	,660

Extraction Method: Principal Component Analysis.

a. 3 components extracted.

Appendix 2 *Component Transformation Matrix*

Component	1	2	3
1	,808	,581	-,097
2	,454	-,510	,730
3	-,375	,634	,676

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Appendix 3 *Communalities*

	Initial	Extraction
IN1	1,000	,822
IN2	1,000	,855
IN3	1,000	,545
IN4	1,000	,341
IN5	1,000	,770
FP2	1,000	,468
FP3	1,000	,512
FP4	1,000	,575
FP5	1,000	,507
FP6	1,000	,794
FV1	1,000	,805
FV2	1,000	,799
FV3	1,000	,549

Extraction Method: Principal Component Analysis.

Appendix 4 *Structure Matrix*

	Component		
	1	2	3
IN1	,906		
IN2	,922		
IN3	,714		
IN4	-,454		
IN5	,875		
FP2		-,683	
FP3			,693
FP4	,614	-,525	
FP5	,382	-,620	
FP6		-,885	
FV1		-,897	
FV2			,892
FV3		,512	,553

Extraction Method: Principal Component Analysis.

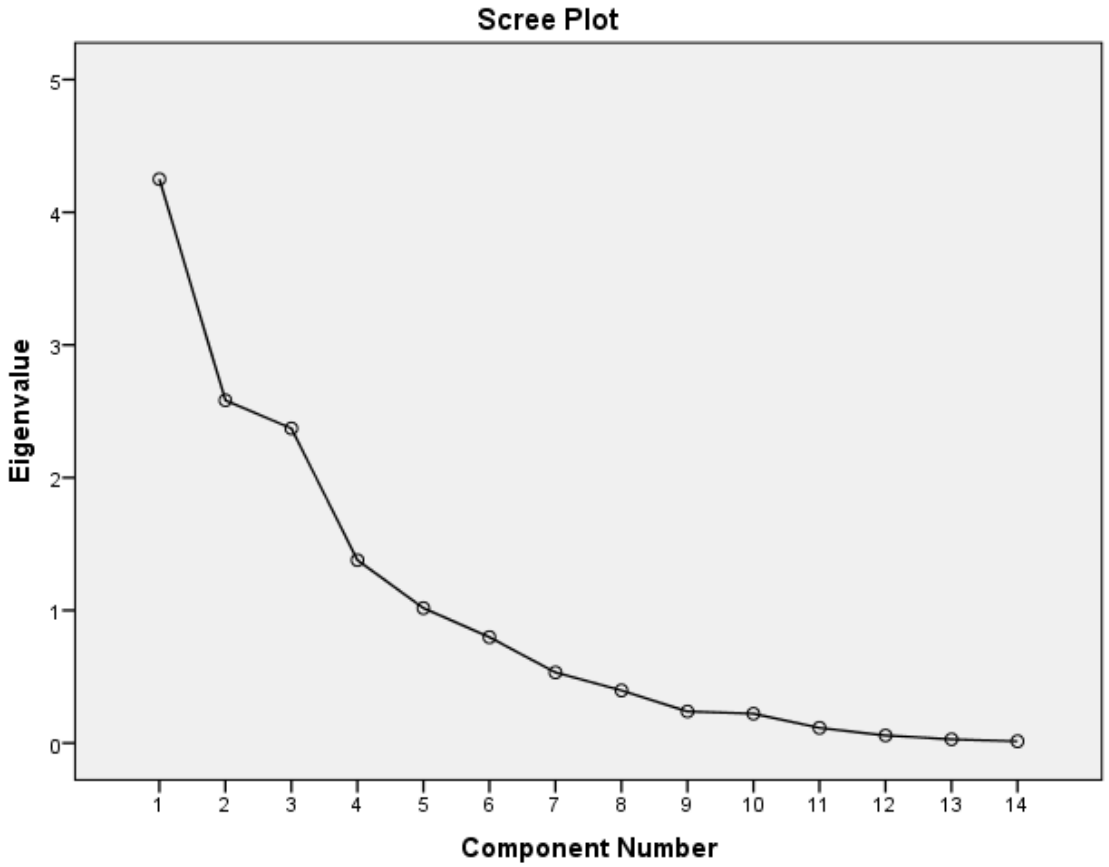
Rotation Method: Oblimin with Kaiser Normalization.

Appendix 5 *Component Correlation Matrix*

Component	1	2	3
1	1,000	-,159	,015
2	-,159	1,000	,043
3	,015	,043	1,000

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.

Appendix 6 *Factor Scree Plot*



Appendix 7 *Correlation Matrix*

		IN1	IN2	IN3	IN4	IN5	FP1	FP2	FP3	FP4	FP5	FP6	FV1	FV2	FV3
Correlation	IN1	1,000	,949	,475	-,255	,824	,070	,073	,530	,181	,092	,176	,041	-,136	-,070
	IN2	,949	1,000	,559	-,297	,768	,147	,041	,548	,294	,107	,185	,104	-,124	-,075
	IN3	,475	,559	1,000	-,451	,483	,192	-,082	,389	,365	,097	,136	-,117	-,220	-,193
	IN4	-,255	-,297	-,451	1,000	-,347	-,050	-,137	,172	,125	,181	,183	-,037	,003	-,040
	IN5	,824	,768	,483	-,347	1,000	,116	,146	,479	,265	,096	,211	-,110	-,210	-,108
	FP1	,070	,147	,192	-,050	,116	1,000	-,083	,284	,409	,501	,518	-,016	-,290	-,024
	FP2	,073	,041	-,082	-,137	,146	-,083	1,000	,279	,401	,002	,006	,374	,190	,494
	FP3	,530	,548	,389	,172	,479	,284	,279	1,000	,691	,280	,322	-,081	-,023	-,165
	FP4	,181	,294	,365	,125	,265	,409	,401	,691	1,000	,387	,311	-,003	-,077	-,056
	FP5	,092	,107	,097	,181	,096	,501	,002	,280	,387	1,000	,883	-,009	-,429	-,030
	FP6	,176	,185	,136	,183	,211	,518	,006	,322	,311	,883	1,000	,064	-,544	,049
	FV1	,041	,104	-,117	-,037	-,110	-,016	,374	-,081	-,003	-,009	,064	1,000	,395	,921
	FV2	-,136	-,124	-,220	,003	-,210	-,290	,190	-,023	-,077	-,429	-,544	,395	1,000	,402
	FV3	-,070	-,075	-,193	-,040	-,108	-,024	,494	-,165	-,056	-,030	,049	,921	,402	1,000
Sig. (1-tailed)	IN1		,000	,004	,087	,000	,356	,351	,001	,169	,314	,176	,415	,236	,357
	IN2	,000		,001	,055	,000	,218	,415	,001	,057	,287	,163	,292	,257	,346
	IN3	,004	,001		,006	,003	,155	,334	,017	,024	,304	,237	,269	,121	,153
	IN4	,087	,055	,006		,030	,396	,236	,182	,255	,169	,167	,422	,494	,416
	IN5	,000	,000	,003	,030		,271	,220	,004	,078	,307	,131	,282	,132	,285
	FP1	,356	,218	,155	,396	,271		,331	,064	,012	,002	,002	,467	,060	,450
	FP2	,351	,415	,334	,236	,220	,331		,068	,014	,496	,487	,021	,157	,003
	FP3	,001	,001	,017	,182	,004	,064	,068		,000	,067	,041	,334	,452	,191
	FP4	,169	,057	,024	,255	,078	,012	,014	,000		,017	,047	,495	,343	,385
	FP5	,314	,287	,304	,169	,307	,002	,496	,067	,017		,000	,481	,009	,437
	FP6	,176	,163	,237	,167	,131	,002	,487	,041	,047	,000		,368	,001	,399
	FV1	,415	,292	,269	,422	,282	,467	,021	,334	,495	,481	,368		,015	,000
	FV2	,236	,257	,121	,494	,132	,060	,157	,452	,343	,009	,001	,015		,014
	FV3	,357	,346	,153	,416	,285	,450	,003	,191	,385	,437	,399	,000	,014	

Appendix 8 *Reproduced Correlations*

		IN1	IN2	IN3	IN4	IN5	FP1	FP2	FP3	FP4	FP5	FP6	FV1	FV2	FV3
Reproduced Correlation	IN1	,822[a]	,837	,643	-,408	,792	,130	,163	,563	,357	,046	,115	-,014	-,109	-,102
	IN2	,837	,855[a]	,653	-,401	,807	,158	,183	,592	,390	,081	,153	,004	-,119	-,086
	IN3	,643	,653	,545[a]	-,296	,635	,149	-,003	,450	,277	,094	,143	-,186	-,220	-,262
	IN4	-,408	-,401	-,296	,341[a]	-,378	,184	-,059	-,121	,032	,308	,273	-,003	-,132	,036
	IN5	,792	,807	,635	-,378	,770[a]	,154	,115	,554	,355	,081	,146	-,072	-,159	-,160
	FP1	,130	,158	,149	,184	,154	,468[a]	,042	,371	,425	,602	,612	-,051	-,369	-,074
	FP2	,163	,183	-,003	-,059	,115	,042	,512[a]	,196	,237	,049	,082	,612	,317	,613
	FP3	,563	,592	,450	-,121	,554	,371	,196	,575[a]	,500	,409	,458	,055	-,242	-,008
	FP4	,357	,390	,277	,032	,355	,425	,237	,500	,507[a]	,515	,550	,151	-,225	,111
	FP5	,046	,081	,094	,308	,081	,602	,049	,409	,515	,794[a]	,796	-,041	-,460	-,057
	FP6	,115	,153	,143	,273	,146	,612	,082	,458	,550	,796	,805[a]	-,018	-,455	-,041
	FV1	-,014	,004	-,186	-,003	-,072	-,051	,612	,055	,151	-,041	-,018	,799[a]	,492	,826
	FV2	-,109	-,119	-,220	-,132	-,159	-,369	,317	-,242	-,225	-,460	-,455	,492	,549[a]	,525
	FV3	-,102	-,086	-,262	,036	-,160	-,074	,613	-,008	,111	-,057	-,041	,826	,525	,863[a]
Residual[b]	IN1		,113	-,168	,152	,032	-,059	-,090	-,033	-,176	,047	,060	,055	-,028	,033
	IN2	,113		-,094	,103	-,039	-,010	-,142	-,044	-,096	,026	,033	,100	-,005	,010
	IN3	-,168	-,094		-,155	-,152	,043	-,079	-,061	,088	,004	-,008	,069	,000	,068
	IN4	,152	,103	-,155		,031	-,234	-,078	,292	,094	-,127	-,090	-,034	,135	-,077
	IN5	,032	-,039	-,152	,031		-,038	,031	-,075	-,089	,015	,065	-,038	-,051	,052
	FP1	-,059	-,010	,043	-,234	-,038		-,125	-,087	-,016	-,101	-,093	,035	,080	,050
	FP2	-,090	-,142	-,079	-,078	,031	-,125		,083	,164	-,048	-,075	-,238	-,127	-,119
	FP3	-,033	-,044	-,061	,292	-,075	-,087	,083		,190	-,129	-,136	-,137	,219	-,157
	FP4	-,176	-,096	,088	,094	-,089	-,016	,164	,190		-,128	-,239	-,153	,148	-,167
	FP5	,047	,026	,004	-,127	,015	-,101	-,048	-,129	-,128		,087	,032	,031	,026
	FP6	,060	,033	-,008	-,090	,065	-,093	-,075	-,136	-,239	,087		,082	-,090	,090
	FV1	,055	,100	,069	-,034	-,038	,035	-,238	-,137	-,153	,032	,082		-,097	,095
	FV2	-,028	-,005	,000	,135	-,051	,080	-,127	,219	,148	,031	-,090	-,097		-,122
	FV3	,033	,010	,068	-,077	,052	,050	-,119	-,157	-,167	,026	,090	,095	-,122	

Extraction Method: Principal Component Analysis.

a. Reproduced communalities

b. Residuals are computed between observed and reproduced correlations. There are 62 (68,0%) nonredundant residuals with absolute values greater than 0.05.

Appendix 9 *EFA results of Innovation Performance*

Communalities

	Initial	Extraction
IN1	1,000	,848
IN2	1,000	,866
IN3	1,000	,510
IN4	1,000	,255
IN5	1,000	,780

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,258	65,165	65,165	3,258	65,165	65,165
2	,952	19,038	84,202			
3	,505	10,106	94,308			
4	,246	4,925	99,233			
5	,038	,767	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
IN1	,921
IN2	,931
IN3	,714
IN4	-,505
IN5	,883

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix 10 *EFA Results of Financial Performance*

Communalities

	Initial	Extraction
FP1	1,000	,483
FP2	1,000	,054
FP3	1,000	,454
FP4	1,000	,561
FP5	1,000	,671
FP6	1,000	,663

Extraction Method: Principal Component Analysis.

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,886	48,108	48,108	2,886	48,108	48,108
2	1,467	24,443	72,550			
3	,736	12,274	84,824			
4	,533	8,877	93,702			
5	,283	4,721	98,423			
6	,095	1,577	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
FP1	,695
FP2	
FP3	,674
FP4	,749
FP5	,819
FP6	,814

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Appendix 11 *EFA Results of Firm Value*

Communalities

	Initial	Extraction
FV1	1,000	,891
FV2	1,000	,402
FV3	1,000	,895

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,188	72,934	72,934	2,188	72,934	72,934
2	,733	24,420	97,353			
3	,079	2,647	100,000			

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component
	1
FV1	,944
FV2	,634
FV3	,946

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

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