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Public expenditures in framework of national innovation and R&D policies

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Abstract

National innovation and R&D activities are accepted as the key elements of economic development and growth and are the most important elements of achieving competitive advantage in international markets. The importance of these two concepts is increasing day by day in terms of economic units in both private and public sectors. Policies applied to these fields of activity in each country develop in a different way. Since the innovation and R&D studies, which are mostly carried out by the private sector compared to the public sector, develop in line with the financing capacity, the participation of the public in the relevant fields of activity with expenditure-oriented policy applications comes to the fore. The aim of this study is to examine the outlook and practices of policies for national innovation and R&D activities in OECD countries in terms of public expenditures, and to develop suggestions for these fields of activity in line with comparative analysis.

Keywords: R&D, Innovation, Public Expenditures, R&D Expenditure, OECD.

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Introduction

The revolution that began in the second half of the 18th century as a result of the development of production methods and processes, as well as the necessary energy sources for industry, such as steam, with the beginning of mechanization, caused large and radical changes in the country's economy with its developing production structures. In the 19th century, when these first post-revolutionary steam engines were replaced by products that run on electricity, oil and natural gas, in the second period, which began with the discovery of these fuels, the invention of vehicles such as cars and airplanes, the differentiation of the supply of goods and services and the development of the economy and industry, thanks to experimental developments, accelerated, and the period of the second industrial revolution began. On the other hand, the early 1960s provided a suitable environment for the third industrial revolution as a result of the slow incorporation of computers into everyday life and the rapid development of technology. This period heralded the transition to a robot-centered era, and thus increasing competition will make life easier. The period described as the fourth industrial revolution, originating in Germany, is still going through.

When the political history of economic approaches to innovation and R&D is analyzed, which sheds light on the period to which they relate, it is clear that many politicians directly or indirectly associate the nature of production with these areas of activity and, in this context, emphasize each resource in the focus of development and growth from a different perspective. In the information age in which we live, advances in science, industry and technology, as well as most of the advances made as a result of these developments, are now based on innovation and R&D, which are systematized at the national level. It is one of the main driving forces of entrepreneurial industrial dynamism, economic development and growth. These achievements are linked to the race to change supply and demand and the ability to conduct research and development and innovation, which is only a key element of participation in global competition. In fact, today's leading advanced economies are resilient thanks to the ability of their industries to commercialize new technology, innovation, and research and development. While the successes achieved growth and development, industrialized economies that cannot innovate and R&D are excluded from the market, and their failures can cause economic shocks such as economic stagnation.

With regard to countries, the strengthening of national innovation and research activities is possible with the active participation of many scientists, entrepreneurs and other

actors in research in this direction. Consequently, this can be achieved through effective supportive, regulatory and incentive policies implemented with public participation, which are necessary and complementary to research in these areas. In this regard, it is very important to analyze the national innovation and R&D results of communities such as the Organization for Economic Cooperation and Development, which includes developed and developing countries, and identify public policies that affect their success in this area.

The purpose of this study is to develop policy proposals for Azerbaijan and countries with similar political development in these areas, in accordance with a comparative analysis of national innovation and R&D policies in OECD countries in terms of public spending and results. obtained as a result of studying the prospects of the country.

Chapter 1. Conceptual framework for innovation and R&D

1.1. Innovation concept, innovation process and other related concepts

Today, innovations and research activities are factors that increase the competitiveness of countries in international markets by going beyond national borders with their socio-economic return to society. In terms of their characteristics, both in terms of types of innovations and in terms of research and development, in addition to the convenience and benefit for organizations, they make it possible to compare countries with their inputs / outputs in terms of indicators. In fact, economic units that apply nationally structured innovation and R&D strategies and programs can achieve significant gains such as profit, prestige and competition. In this regard, this part of the study builds a conceptual framework in terms of understanding the terms innovation and R&D, which are becoming more important, and discusses issues related to these concepts. The effect of globalization, which expresses the integration of world values in the context of culture, politics, socioeconomics and technology, in other words, the process of transformation into a common market, makes countries look in different areas today.

The concept of innovation began to be mentioned defined by many and became the subject of discussion. The concept of innovation was first used by Joseph Schumpeter (1939) and expressed that it includes a new organizational form, such as the creation of a new production function or a new product, as well as mergers, the opening of new markets. Paying attention to the fact that innovation is a special tool of entrepreneurship, P. Drucker (1996) defines it as an action that gives new opportunities the existing resources for creating wealth. On the other hand, considering the basic components of innovation, Taylor (2017) provides a composite (combined, general) definition as a creative process in which new or improved ideas are successfully developed and applied to achieve practical and valuable results (Taylor, 2017). Bareguet, Rowley and Sambrook (2009) define innovation as the activity of transforming ideas into updated / improved products, services or processes to achieve success, compete and differentiate in the markets of enterprises, organizations, or other economic units (Baregheh et al., 2009). The Oslo Handbook 2018 Oslo Handbook defines innovation as a new or improved product (product and service), process, or a combination of these offered by a business unit to potential users that is significantly improved (different) from the business's previous products or processes. In this definition, the term common unit is used to describe the entity responsible

for innovation and also refers to any institutional unit in any sector, including households and individual members (OECD, 2018).

The basic dynamic of the innovation process is the first and, perhaps, the most significant aspect in terms of innovation. The advantages of innovation, however, are not realized until the learning and dissemination processes are dynamic and cumulative. On the other hand, the knowledge, inventions, and innovations developed today are founded on those created in the past (Hall and Rosenberg, 2010). It refers to the exchange of innovations amongst entities within the sociological system, which happens when particular diffusion routes are used. The process of people creating and exchanging information with one another in order to attain mutual understanding is referred to as this communication. For instance, a customer could approach a change agent (innovator) with a need or problem, and innovation may be suggested as a potential solution. You can see that the interaction between the change agent and the client occurs across a number of cycles and is in fact a process of information exchange when seen in a larger perspective. The percentage of businesses adopting an innovation or the proportion of the total production estimated by the invention may both be used to quantify the pace of diffusion of that innovation. The pace of dissemination demonstrates that informal and interpersonal interactions are essential for problem-solving while using technology. Flexible communication is necessary since relevant information is complicated, consumers' demands are ever-changing, and information and needs are also ever-changing. Scarbrough (2003) focuses on interacting with the group inside and outside the organization in response to critical needs and changes in demand for integrating knowledge and action, the growing importance of networks, three major and related changes in the innovation process (Scarborough, 2003).

Stenberg saw in his survey that people think of innovation as innovative and associate innovation with something new, and he said that fifty percent of those associate innovation with problem solving and innovation. Creativity, new thinking, growth, leadership, profitability, knowledge, quality of life and solutions are the terms that come to minds of participants when they hear the concept of innovation. A smaller proportion of the population also associates innovation with change, technology and development (Stenberg, 2017). The existence of innovation can be driven not only by ideas in the environment (firm, company, etc.) in this innovative organization, but also by valuable ideas that exist both outside and inside companies. According to this paradigm, expressed by open innovation, it proposes to use innovation goals to accelerate internal innovation and expand markets for external use of innovation, to apply external ideas and external paths to internal ideas and ways to open the

market. Thus, the field of knowledge arising from the internal and external flow of companies, the existence and quality of these external ideas, changes the logic that leads to the formation of the central R&D bunkers of a closed innovation paradigm, which expresses the closeness to external ideas. In many industries, as in the entire software industry, innovative companies are experimenting with new business models that harness collective creativity through open innovation. The apparent success of some of these experiments stemmed from strategies that paralleled Schumpeter's creative destruction, that is, challenged the mainstream. Indeed, most of the tests focus on business models, value extraction and sustainability, which are potential common options for corporate impact and open initiatives (Chesbrough and Appleyard, 2007).

According to Franz et al. (2012), which define social innovation as innovation that is both beneficial to society and enhances the ability of society to act, opportunities for social innovation are largely determined by historical conditions. Moreover, social innovation, which is a kind of evolutionary change, dominant types of institutions and industries, is influenced by dominant technologies and the availability of free capital (Franz et al. 2012). The source of innovation associated with a new product, service or process can arise both within the company / institution and outside it, as indicated above. For example, the source of innovation may be the opinion of a sales force working in the marketing department within the company, or it may be shaped by an innovative idea in accordance with the needs, requests and preferences of a consumer outside the company. P. Drucker lists seven sources of innovative opportunities. These resources are:

- Unexpected success, failure or external external events,

- Disputes (between what should be as it really is),

- Innovation based on the needs of the process,

- Changes in industry or market structure,

- From demography (population changes),

- Changes in perception, temperament and feelings,

The first four resources, whether private or public service institution, are located in the organization's area of activity, industry or service sector, and in this regard, they can be seen primarily by people from that industry or service sector. The last three sources include changes outside the company or industry.

Innovation and technology are now crucial to the development of nations' economies. It's obvious that technology is the biggest engine for change—along with books, newspapers, and the telephone—and that technology, particularly the Internet, is fundamentally altering how business is conducted. It also modifies the fundamental strategies for social change, relentlessly advancing it in ways that have never been possible (Singh and Majumdar, 2015). It is become more and more difficult for scientists and technicians to keep up with advancements in their fields, much alone ignore unimportant ones, as the availability of knowledge is expanding quickly. In this sense, even while it makes it challenging to transmit knowledge between fields, specialization in more science and technology encourages multidisciplinary cooperation. In the loop between science and technology, research results in technical development, which creates knowledge that can be put to use, while technological progress speeds up research and innovation and creates better conditions for research. Science, innovation, and technology are all viewed in this perspective as being one and the same, and this network grows as a result of multidisciplinary collaboration. Focusing on the market coordination mechanisms that convert these various behavioral patterns into patterns of economic change is crucial since the major goal of innovation is to find new forms of behavior within the context of already-existing competitive interactions. On the other hand, ideas that do not succeed in the market or utterly fail are occasionally not a great loss. On the contrary, it is said that they will play a significant role in the advancement of the associated technology. Here, the term "technology development" (also known as "applied research" or "advanced engineering") refers to the process of doing research to learn new things, generally with the intention of transforming concepts into practical goals. In this perspective, innovation and technology are two crucial components that support one another in the advancement of science. Regardless of the ecosystem's structure, a number of variables affect how effectively businesses can develop and uphold a set of shared goals and objectives, as well as how well and how much inter-firm interdependencies are handled. As a consequence, while producing new or current resources, goods, and components, outcomes may represent performance, which might result in a variety of innovation. A new or enhanced product or service that is launched to the market and notably varies from the company's earlier products or services is referred to be innovative (OECD, 2018).

Automobiles, toys, household appliances, medical gadgets, and other products are some of the most prominent instances of product innovation in today's world. The examples of service innovation cover a wide spectrum of goods and services, from online learning to e-

commerce. In their 2017 study, Camp and Perry look at the distinctive and significant skills of innovation actors to promote improved services. While intermediaries should be able to concentrate on coordinating and integrating third party products and services, manufacturers need to strike the right balance between innovation in products and services. They should also develop strategies for delivering customer-oriented products and services through life services. This shows that customers may help their suppliers innovate by increasing demand, or by influencing supply through their purchasing procedures (Camp and Parry, 2017). The introduction of a considerably better new manufacturing process, distribution strategy, or support activity is referred to as process innovation. Process innovation should not be novel to the market; rather, it should be novel to the institution or division (business, organization, etc.) in question. Additionally, innovations might be created by other businesses in addition to being launched solely by the particular firm (Gault, 2013).

Process innovation is a crucial tool for boosting productivity because it sheds light on the numerous motivations for corporate innovation and helps businesses better understand the drivers of economic growth. Additionally, organizations may offer a competitive edge through process innovation; as a result, a deeper grasp of process innovation enables a better awareness of the instruments employed by businesses. Studying the many factors that encourage process innovation enables us to pinpoint the processes that foster the expansion of innovation in the private sector. Process innovation is a key component of government innovation strategy. Innovation happens in a market economy in the marketing of goods as well as their creation and production. Creating fresh marketing tools and strategies is known as marketing innovation. New forms and methods of transactions, including online ordering, are boosting the market reach of many businesses while reducing customer expenditure. In recent years, creative marketing strategies and technology have created new means of gathering consumer information. For instance, allowing for price flexibility at airports and enhancing management procedures to draw new routes might be crucial safeguards for current routes. Airports may concentrate on particular innovations for certain elements by knowing which sources of marketing innovation to employ for distinct sources of marketing effectiveness (Halpern, 2010).

Businesses may define growth plans with a competitive edge by being innovative, and these development strategies frequently entail entering new markets. Businesses do, however, have the option to diversify their operations into other new markets that they do not currently serve, such as the transition from the industrial to the consumer markets. However, when

marketing innovations are used, the ratio of total production to company investment rises, which results in higher productivity and higher profitability. These earnings can then be utilized as free money to make investments that foster more innovation (Ungerman et al., 2018).

Organizational or organizational innovation refers to introducing a new organizational method into a company's business practices (routines and procedures), updating the organization of the workplace (allocating responsibilities and decisions) or external (with other firms and institutions) relationships, or significant changes. The success of organizational innovation is attributed to the production of different / updated goods or services that provide value and benefit in the context of the organization, the tendency of the organization to develop different or improved goods or services, and the success in delivering those goods or services to the market. It also requires transformational leaders in the organization to acquire a vision that encourages creative ideas in their organizations, motivates their followers, increases their desire to work harder than expected, and drives them to innovate in their work. In radical innovation, since the main criterion is seen as a significant change in behavior due to a new product that consumers have begun to use, here it is essentially expressed as a collection of various goods, services or methods that are not yet subject to testing. In fact, this type of innovation, as the other name suggests, focuses on the effect of innovation as a radical, completely new, remarkable change. Effectively managing radical innovation is essential to the long-term success of companies. In this regard, the importance of developing and testing new applications that managers implementing radical projects can consistently use is emphasized.

In addition, the firm's ability to innovate may require managers to find ways to engage with customers in radical innovation. Therefore, it is believed that customers will not only be able to evaluate existing service offerings, but also contribute with more radical ideas for new services with the collaboration to be done (Engen and Holen, 2014).

Incremental innovation is expressed as small changes in any product that help improve performance, reduce costs and increase product demand, or easily lead to a different version of the system. Incremental innovation means making improvements to a specific solution, that is, improving what we are already doing (Norman and Verganti, 2014). Indeed, incremental (incremental) innovation strengthens the firm's resource base and current operating system. The firm makes extensive use of the existing formal organizational structure to coordinate additional innovation. Business model innovation refers to the development or modification of

an existing business model, or the creation of a different business model. While highlighting the status quo of the current business model, the focus is on adjustments and increased innovation within the established business model. In addition, an innovative business model moves away from the status quo and focuses on opportunities in the external environment. According to Schneider and Spieth (2013), who point out that there is a very important difference between business model development and innovation, adjusting business models that have been developed or created to address deficiencies requires focusing on the current situation and possible changes in business models. On the other hand, business model innovation requires its focus on discovering and potentially exploiting opportunities that arise in the environment in which it finds itself (Schneider and Shpit, 2013).

Each company's business model serves two crucial purposes, such as producing and retaining value, in its own unique way. The first describes a series of steps that will result in the delivery of a new good or service, from locating raw materials to ensuring that customers are satisfied in a way that assures the overall value provided by all the steps. In this case, the company won't compete with other businesses engaged in the activity if there isn't any net value generation. The business model's second purpose is to try to get value from certain operational and development processes. In actuality, a business cannot sustain an activity for an extended period of time if it cannot benefit from it.

Innovation indicators include statistical data on innovation, the circumstances in which it happens, the effects of innovation on innovative enterprises and the economy, and more. Research on innovation uses these metrics to track innovation through time and compare innovation across nations, regions, and sectors (OECD, 2018). Although they are taken into account individually in certain studies, innovation indicators share indicators with R&D and can only throw light on a portion of the innovation process. While innovation and R&D are distinct ideas, they are still connected. The methodology of the European Innovation Scoreboard (EIS) 2019 edition differs from that of the 2018 edition in that there are four primary categories of indicators and 10 aspects of innovation taken into account, for a total of 27 different indicators. However, innovation is frequently measured using performance metrics from R&D, patents, education, researchers, and cutting-edge technology (European Commission, 2019).

As a result of combining knowledge from people, the sociocultural environment, or society and using it to develop new processes, systems, and applications within software,

research activities include all activities that involve research conducted with content that accepts creativity on a systematic basis (Legislation). R&D activity is one of the most significant indications of innovation activity in this context since it is considered to be one of the elements that contributes to the value of the innovation process. The 2018 Oslo Guidelines state that although basic research cannot be utilized for practical reasons to follow some breakthroughs throughout the observation period, it may be used to increase a firm's pool of knowledge. However, all forms of R&D conducted or funded by commercial organizations are referred to as these companies' creative activities (OECD, 2018). In reality, internal research and development (R&D) capacities of organizations have often been considered as key variables in defining these capabilities since the capacity of companies to generate and exploit technical knowledge is an important part of competitiveness in many industries. On the other hand, when we look at the literature, the majority of viewpoints claim that R&D expenditure, which is a sign of innovation, is particularly crucial for emerging nations. Furthermore, it is stressed that investments made in R&D activities of emerging nations, depending on the size of their economies, and, more crucially, the return on investment, are crucial.

The promotion of R&D and the disclosure of discoveries so that others may utilize and further research findings are at the core of the patent system. The capacity of rival businesses to copy or create patented ideas contributes to the patent system's success in attaining these objectives. A large portion of patent literature makes the assumption that copying protected items is either expensive or poses no risk to the inventor. Patent data are widely utilized to assess and gauge innovation because they offer extensive and timely information regarding creative pursuits. Despite the fact that R&D expenditure is sometimes used as a stand-in for innovation charges, the outcomes might be assessed utilizing patent information (Dang and Motohashi, 2015). Therefore, a patent, which is a sign of invention, not only demonstrates the presence of innovation but also the legal protection of an individual's or organization's intellectual property rights, namely the rights of the inventor. In the eighteenth century, invention in nations without patent law was examined, and afterwards the impact of patent law on innovation, through exhibits and awards ceremonies at which a global jury presented prizes for the most inventive displays. In truth, invention is the foundation of the continually changing national and international patent laws that have existed since the middle of the 19th century and continue to do so now (Moser, 2013).

WIPO serves as an example of a global forum on services, policy, information, and collaboration in the field of intellectual property, in addition to national and international patent

laws intended to safeguard intellectual property rights (IP). WIPO wants to take the lead in creating a fair and effective global IP system that encourages invention and creativity for the good of all (WIPO, 2019). In countries with more multinational corporations (global research centers) or more dynamic and collaborative firms (global initiatives, etc.), the transition from nanotechnology research to technology applications is more likely, according to the impact of international cooperation in patent applications (WIPO, etc.) on corporate commercialization (Shapira et al., 2011). Like a patent, a utility model has the ability to support R&D-based innovation and safeguard any ensuing monopoly rights. However, a utility model and a patent differ in certain ways based on specific criteria. The primary difference between certain goods, items, and innovations is that a patent protects the right, but a utility model does not. Furthermore, patent rights are seen as superior than utility model rights in terms of both the breadth and the period of protection since a patent offers 20 years of protection while a utility model only offers 10 years. The term "patent families" refers to groups of related patents (or applications) that share one or more priority applications. One type of patent application is the triad (triple) family of patents, which consists of many filings with the European Patent Office (EPO) and the Japan Patent Office (JPO), each of which has one or more priority filings with the United States Patent and Trademark Office (USPTO). Since only patents applied for in the same countries are included in the family and the effects of home advantage and geography are removed, triple patent families enhance the statistical comparability of patent-based scores internationally. Family patents are very valuable economically since they need additional expenditures. The requirement for a talented, educated, and well-trained workforce is one of the variables impacting the development, growth, and competition of a country in the national and worldwide markets in addition to having a healthy economy overall. On the other hand, with the development of the science and technological infrastructure, the expansion of advancements in these fields is often assured by the training of skilled individuals who have attended higher educational institutions. When separating the innovation dimension of nations, educational factors like the amount of scientists, engineers, and university graduates in a nation are crucial indicators. When a business launches a new item, service, manufacturing method, or organizational shift, new employee skills are frequently needed. Another reason why businesses are more profitable is because they make investments in hiring employees with advanced degrees. In actuality, there are requirements for job nowadays that need a person to have strong skills and highly educated qualifications in addition to the expectation that they have experience. As a result, a key aspect in creativity is the educated human factor. Experts in project management who comprehend, develop, or create new projects, products, processes,

techniques, and systems are represented by researchers. This metric is determined by the ratio of researchers to employees, which is 1000. (OECD, 2019).

Important researchers in terms of R&D may be given the authority to oversee or implement initiatives in a particular field as well as manage high-profile public projects. Scientists can be utilized as a measurement instrument, for instance, to carry out more study on the efficacy of innovation and enhance innovation in their capacity as researchers. Thus, the number of researchers serves as another crucial marker of innovation since innovation is a process that integrates current knowledge with new approaches, where the researcher is given responsibility. The country exporting these products and services has a competitive advantage due to the technological advancement of such commodities and services. In reality, technical innovation and R&D drive industrial and economic development, as well as the consequences of generating diverse products through technology in international commerce. This is why technological advancements are clearly important for economic development.

In fact, according to Heckscher Ohlin's theory of trade, the economic structures of countries are likely to change, and changes in the endowment of factors such as technological development will cause changes in the structure of trade. In this context, the increase in the export of advanced technologies ensures the rapid development and growth of world trade. For example, technological developments are creating new finished products, consumer and industrial products, and new product market sectors. The export earnings of a country with advanced communications technology and a large proportion of its exports with advanced technology are expected to increase. In addition, high-tech exports are helping to further improve the efficiency of international transport, overcome low trade barriers and boost global trade (Ghani, 2009). The contribution of high-tech exports to national growth and productivity can directly increase output as it is accepted as a contribution to the production process of an advanced technology importing country as well as an exporting country. Imports from developed countries not only have a positive effect on domestic innovation. At the same time, high quality capital goods are used, which leads to domestic production and therefore to GDP growth. Therefore, thanks to the export of advanced technologies, which is an important indicator of innovativeness, and the export of technologies of an innovative country, the diffusion of innovations is questionable.

1.2. R&D concepts and their relationship with technology

R&D activities require different types of research with specific objectives. In the context of a country, the fields of science, industry and technology develop as a result of research carried out in accordance with research activities. In addition to development, R&D, which is important for raising the country's economy to high positions, often lays the foundation for the formation of innovative activities and contributes to the development of science, industry and technology. The term R&D covers basic research, applied research and development and development in Frascati (2002). Basic research refers to empirical or theoretical research aimed primarily at gaining new knowledge of the underlying phenomena and observed facts, without considering any particular application or use. Applied research consists of original research activities to obtain different / updated information in accordance with defined functional goals or objectives. On the other hand, experimental development means a systematic business, based on existing knowledge gained from research and practical experience, to produce different / new products, materials or devices, create new / different methods, processes and services, or significantly improve / regulate that, what has already been installed or produced. In fact, R&D appears as regular research conducted to obtain new materials, products and vehicles, as well as to obtain new information for the development of science and technology, which is especially important in a competitive environment of economic entities (private / public enterprises, companies, etc.). Every day there are products with knowledge, and getting the right information becomes an inevitable necessity in order to keep up with the speed and intensity of change. In addition to building real teams, virtual teams create an environment for increased innovation in research and development and ensure the dissemination of information across companies by connecting time and place. Globalization and new waves of world trends in the economy, services and trade, as well as advances in the field of telecommunication technologies open the way for the formation and operation of virtual teams.

When studying the literature, it is often difficult to distinguish between R&D and innovation, and the most common assumption is that R&D, as the main contribution to innovation, leads to new products and processes (Harris and Moffat, 2011). According to another point of view, it is argued that, firstly, this (R&D) is not a direct contribution of open innovation, but a contribution that increases the efficiency of the release of innovations. Therefore, companies invest in research and development to develop innovative processes and products that can contribute to their productivity and demonstrate economic performance. It is

believed that the technical innovation potential of any firm depends on its environment, which includes economic, social and political factors, the state of technology development and information about technology. Barriers to the flow of people and knowledge, social and market needs between the firm and its environment limit its knowledge of new and existing technologies and government programs, incentives and rules, as well as the innovation potential seen by the firm. In fact, the point reached in technology today also increases the importance of the functionality of virtual teams, which are largely technology-based and are usually created to bridge geographic or temporal divisions. Using modern computer technology, virtual teams support a wide range of activities and forms of work supported by technology that transcend time and space to perform one or more research and organizational tasks.

The degree to which an organization matches the perceived potential for innovation depends on its attributes, including its resources, people, communication, and decision-making frameworks. Because the unintentional reuse of talent that needs to be refreshed lengthens the time it takes to catch up to rivals in addition to the time caused by mismatch, the worse the R&D outcomes are the more prone an organization is to competence traps. Even if the discrepancy can be swiftly fixed, competency traps can limit the efficacy of R&D since the company is unable to decide which capabilities should be upgraded (Sosa, 2013). The administrative and technical actions associated to the adoption of broad corporate choices intended to gain a competitive advantage make up an enterprise's business strategy. When evaluating prospects, businesses must establish a consistent set of goods and clients.

Therefore, maintaining a competitive edge only requires R&D and innovation strategies; the equipment must be able to keep up with changing market conditions and customer demands. The R&D and innovation strategies that an organization must employ in order to outperform its rivals, stay one step ahead of the competition, and gain a competitive edge will change depending on the circumstances, requirements, and opportunities that exist. By creating new or updated goods or manufacturing processes ahead of rivals and releasing them onto the market in accordance with an aggressive strategy based on R&D and innovation tactics, it seeks to acquire technical and market leadership. On the other side, defense-oriented strategy aims to keep up with technological advancements while maintaining competition. As a result, this method enables businesses to differentiate themselves, avoid high risks, learn from the mistakes of the early adopters, and capitalize on markets they established but were unable to fully exploit.

Based on their active participation and recent product releases, the firms are concentrating on being the first customer company and gaining additional customers through their research and development. A more conservative strategy that focuses on generating value through gradual exchange is preferred by market readers, who regularly monitor the markets and want to keep an eye on growing exchange preferences and accelerating markets. On the other hand, technology drivers prioritize a high-tech approach to innovation, give less consideration to direct customer involvement in the process, and go in the direction of their technological capabilities. They also invest more money in research and technology to promote disruptive innovation or incremental change (Ramadani and Gerguri, 2010).

A strategy based on the granting of a second degree patent, for instance, may decide not to make any improvements to its goods if there is no obvious demand from the user or the primary company. Instead, it may opt to imitate an innovative firm that is effectively managed at cheap production costs. Additionally, a firm can offer innovation with methods for taking advantage of chances or learning about specific technical advancements, about staff members who have access to this information, or about the industry in which this information is used. The architecture in question relates to a set of choices made on the institutional and geographic organization of R&D. The formal and informal directions of R&D are defined by processes. Project management systems, project management (including the form of senior management reviews), the order and flow of crucial project activities, the scheduling of reviews, and the metrics and indicators used to track projects are all possibilities that fall under this area. The list of specialists, their technical education and training, work styles, career routes, firing procedures, etc. are examples of the human aspect in this situation. It demonstrates how the selection of human resources, like human resources, has a big impact on how productive R&D is. Portfolio, on the other hand, refers to the criteria for evaluating, prioritizing, and choosing projects as well as the planned distribution of resources for various R&D project types.

The enterprise benefits from the R&D program's functionality within the context of the organization and the subsequent implementation of R&D projects in a specific fashion. While a successful R&D program has various components for each organization, it typically follows a three-step process. A short- to medium-term R&D program that employs a defensive strategy to preserve and sustain the efficacy of current goods or product lines is included in the first phase. The second stage consists of a stage that aims to find the required sophisticated technology or product, apply it, and get rid of flaws and inconsistencies. The long-term research project that will be used to compete in the direction of an aggressive approach is referred to as

the final phase. Since R&D initiatives are a crucial component of corporate renewal, they have a significant impact on a company's market performance. If R&D projects are not carefully chosen and institutionalized, this can result in resource wastage and unfavorable commercial effects.

As a result, picking an R&D project is a crucial issue for many firms. The literature study identifies three key areas that are connected to the choice of R&D initiatives. These include the necessity of coordinating selection criteria with institutional plans, accounting for the qualitative advantages and hazards of potential initiatives, and integrating the demands and preferences of many stakeholders. Due to the complexity of the decision-making process involved in choosing a research and development (R&D) project, disagreements and perceptional uncertainty frequently prevent coordination and consensus. As a result, mistakes in investment and R&D strategy are frequent. Additionally, it is difficult yet crucial for an R&D project to define the first selection of different stakeholders and compare them in the analytical decision-making framework. Firms must invest in the proper project in line with tools that may help them decide the optimum allocation of resources since research and development is a crucial component of strategic management for organizations.

For many businesses to continue operating, particularly those that compete for market-driven innovation, strong R&D programming is essential. Therefore, by participating in the market, it boosts its competitiveness and extends its life at a cheap cost. This is done by selecting an appropriate, consistent, and lucrative R&D project that satisfies the demands of the market. The administration of the division as well as its physical location are both factors in how research operations are organized inside a firm, business, or division. As a result, the organization is working to structure and organize the R&D activities of individuals who have come together to accomplish the objectives set forth in the R&D activities, both in relation to management and other departments, as well as all of these individuals or institutions, organizations, or organizations. R&D management, on the other hand, refers to identifying issues and managing the search for answers in research and development that is done for a specified reason. These roles are crucial for luring, nurturing, and keeping scientific talent since the functional parts of R&D contain some functional focus, such as manufacturing, human resources, marketing, and finance. The production and commercialization of innovations fall within the purview of innovation management, which is characterized as a mix of technology management and research and development management (external, internal creation and preservation of technological knowledge). It covers a range of tasks including fundamental

research, development, technology development, idea development, new product creation, process development, prototyping, management of the research and development portfolio, and technology transfer.

In reality, both in the commercial sector and in research today, emphasis is placed on how important it is for production, organization, and management approaches needed for R&D. It is well acknowledged that the key to obtaining high inventive efficiency is proper administration of an organization's technologies and research and development efforts (Prajogo and Sohal, 2006). Interviews with R&D managers can also offer a useful manual for setting up R&D operations in many firms where the organizational structure is weak and unproductive. For comparison with other nations and to measure the advancement of science, innovation, and technology, a number of indicators are utilized. Similar to innovation, expenditures on R&D activities, the number of R&D employees, the number of patents, and the number of scholarly publications make up the main indicators used to quantify R&D activities and R&D flows. Since these indicators may be used to gauge performance in terms of quantity and quality, they can be used to monitor innovation as well as R&D efforts. According to the theoretical model, businesses make investments in physical capital and R&D that might affect the trajectory of productivity in the future. The return on investment in R&D, and consequently the return on export, improves with investment in R&D due to its effects on future productivity and participation in the export market. R&D personnel in a statistical unit are those who are fully involved in the R&D of that unit or provide direct R&D services, such as R&D managers, technicians and office staff. The responsibilities of R&D personnel are listed below:

- Conduct scientific and technical research for an R&D project (creating an experiment or research, creating a prototype, etc.),

- Planning and management of R&D projects,

- Preparation of interim and final reports on R&D projects,

- Provision of internal services for R&D projects (for example, special calculations or working with library and documentation),

- Providing support in the management of financial and personnel aspects of R&D projects. Using a high level of R&D personnel in terms of the quantity and quality of the organization or economic unit increases the efficiency of R&D activities and brings success and competitive advantage.

Patent, which is also an indicator of R&D, is an intellectual property right associated with inventions in a technical field. A patent can be granted by a patent office to a firm, individual, or government agency. A patent application must meet certain requirements, that is, the invention must be new, be creative and have industrial applicability (OECD, 2018). In essence, a patent is a normative set or document that guarantees a monetary value for knowledge, experience and experience obtained as a result of complex research and innovation activities. In this regard, in addition to the competitive advantage of the enterprise-patent holder, its value in the market also increases. Thus, the number of patents owned by a country serves as an indicator used to measure innovation and R&D activity in that country. Published scientific publications are another indicator of R&D. This indicator is one of the important analysis tools used to determine the position of countries in the world in terms of scientific fields of activity, to compare countries or universities in terms of their scientific qualities, and to measure the academic performance of scientists. In addition, the number of publications published in international scientific journals, the number of publications in scientific journals viewed by scientific indices, and the number of citations of publications are among the criteria that distinguish international publication activity.

In this regard, the indicator data of the country's scientific publications also allow a conclusion on the size of the R&D areas and activities carried out in that country. Scientific publications, which are indicators of R&D, can sometimes be an important criterion in establishing the basis for scientific, industrial, innovation and technology policies of countries. In fact, the number of articles published in scientific journals included in the Science Citation Index is taken as an indicator of R&D in country comparisons in order to assess the development in these areas, to determine the performance and the level of national technological ability. On the other hand, scientific publications also contribute to the development of science, industry and technology, as they include the academic research of scientists, as well as the analysis, assessment, criticism and interpretation of this research. Consequently, the data from these indicators, by their very nature, can be a guiding factor in the policies that policymakers will pursue in their business areas.

1.3. Innovation and systems approach

Firms, through their innovation activities, often establish relationships with each other and with other types of organizations. In view of these aspects, innovative firms are not seen as isolated and distinct decision-making units. Firms' behavior is also determined by

institutions that restrict or encourage innovation, such as laws, health codes, cultural norms, social rules, and technical standards. The systems approach offers better theorizing and integration of institutions, rules and culture into technological analysis. In this respect, innovation is not a stand-alone activity, but embedded in the wider society, so this approach not only contributes to the creation of institutions, rules and culture with innovation, but also allows technological inventions to be commercialized (Godin, 2009). If it is desired to define, understand, explain and influence innovation processes, it is necessary to consider all the important factors that shape and influence innovation. Indeed, innovation systems are designed to do this in a variety of ways. In addition, attempts to understand the structure and dynamics of these systems form the basis of modern thinking about innovation processes. Only general arguments for the effectiveness of innovation systems can be presented here, illustrating the use of the approach in research and policy, which has proven to be useful when compared with other approaches. In this context, the systematization of innovation allows different organizations operating in different institutional contexts to interact in a specific order, which is important for innovation processes and efficiency. In addition, the actors involved in innovation serve to create the elements of systems and use knowledge for economic purposes. Having the resources to develop their innovative potential, economic units differentiate in their production and enter new markets or increase their existing market share, thus achieving competitiveness at a high and sustainable level of their activities.

In reality, an economic unit's updating or differentiating its products in terms of goods, services, and technological advancements demonstrates that it is working to satisfy market demands and customer wants while also aiming to preserve and strengthen its market position. To increase the Block economy's capacity for innovation, take advantage of opportunities to be flexible and opportunistic, have a human capital profile in science and technology, collaborate with international clients, use technology to disseminate information, and respond to information about technology. Other significant openings for innovation in the private sector include the application of information technology and process reform. Outsourcing to the private sector is a kind of alternative public sector service delivery that enables the company to concentrate on its primary objective (Borins, 2001).

Both divisions have the opportunity to innovate in this area in terms of quality and organization. Economic units may prioritize their market, manufacturing, and technology goals and execute the proper action plan if they have a comprehensive awareness of the precise nature of innovation in those units. Sustainable economies participate in primary innovation,

particularly to the extent that nations have an incentive to develop in goods for which they have a competitive advantage. Therefore, innovation not only helps the economy as a whole but also significantly boosts the nation's exports while giving it a competitive edge abroad. In reality, both the public and private sectors need to be active in innovation for nations to stay up with global trends and change. New goods and materials, new processes, new services, and new organizational forms are some of the preferred possibilities for firms to compete with one another and fulfill consumer wants since change and value acquisition are intrinsic to organizational existence. The institutional mandates that govern markets, on the other hand, are based on laws, rules, and regulations that are intended to promote free competition between buyers and sellers. Furthermore, since failure results in a company's expulsion from the market, competition gives businesses a crystal-clear and indisputable incentive to innovate (Hartley et al. 2013).

While change and value acquisition are viewed as alternatives to organizational architecture in this setting, innovation becomes essential when it comes to competitiveness. Monopoly market innovation moves slowly. The longer the monopolist delays, the longer it takes for customers to pay for the services provided by the newer models since the older versions continue to work. However, the benefits for customers are increased by the launch of new models since they can utilize a superior product. The exercise of actual monopolistic power, on the other hand, can result in substantial current-period earnings from innovation that allow the monopolist to recruit more competent staff and offer internal finance, which encourages swift response to events and lessens the firm's reliance on outside funding.

In reality, this scenario can take on varying levels of development depending on the market activity of the monopolies, the growth of their R&D activities, their capacity to fulfill requirements and demand, their ability to effectively defend against competition, and how they utilize their monopolistic power. The presence of an impersonal and frequently distinct set of prices at which individual investors can purchase or sell any quantity without altering those prices characterizes a classic competitive equilibrium. This is said to be caused by the fact that there are several dealers present. The trader's preferences and production capacity must meet certain requirements set out by the classical competitive equilibrium analysis in order for prices that guarantee the Pareto optimal to exist. Strategic interdependence and cooperation between oligopolists are what essentially set oligopolies apart from monopolies and atomistic competition. Because the actions of one corporation might have enormous repercussions for any other firm, such businesses have an incentive to develop and compete. If price competition

occurs and earnings decline, lower prices are readily compensated. A successful advertiser or inventor, however, benefits from competition (for instance, a change in model) in advertising, product quality, or product design as a result of innovation. While Romer and Schumpeter's growth models contend that monopoly power is not always necessary for innovation, they also contend that enterprises innovate in order to seize the profitable possibilities that come with monopoly power. In fact, Tischler and Milstein (2009) contend that a monopoly is more likely than an oligopoly that produces the same number of items to lower the range of products it produces at the beginning of the game.

Vivarelli (2007), who examines the effects of innovation on the labor market, asserts that new goods and services produced as a consequence of innovation spur more production, open up new markets, and create jobs as a result of increased demand. Process innovation can therefore lead to the creation of new employment in the capital industries that manufacture various technologies. On the other hand, because they streamline the manufacturing or service process, certain technical advancements might have a detrimental impact on the labor market in specific industries. In the production department of a company functioning in any industry, for instance, the demand for humans declines and, as a result, the number of employees also lowers when equipment, tools, or technologies that may replace personnel are developed. The production and usage of digital data are continually changing due to technological advancements in content generation, communications, analytic tools, and infrastructure. On the other side, the advent of the open source software community, the widespread usage of social media, and particularly the expanding accessibility of open source data have resulted in a radical shift towards online behaviors like crowdsourcing and co-creation.

Industry 5.0, a data-driven innovation in Japan, is fueled by the confluence of a number of phenomena, including the production and use of massive amounts of data, the escalating movement of social and commercial activities online, and the falling costs of data collecting, storage, and processing. These massive databases are increasingly important to the ecosystem of research, technology, and innovation because they boost productivity, stimulate the growth of new businesses, and provide societal and competitive advantages (Fukuda, 2020). In fact, Industry 5.0 goods and services that communicate with both people and robots let people satisfy their natural want to express themselves. These individualized goods or services are frequently referred to as having a human touch. Despite the fact that Industry 5.0 originated in Japan, it is believed that the structures and technologies created here will surely assist to alleviating societal issues around the world (Fukuyama, 2018). In light of the fact that the public and

private sectors will need to collaborate to establish the ideal environment for growth, Industry 5.0 places a strong emphasis on labor market structure in addition to entrepreneurship, competition, the development of talent and skills, safety and regulation, and other related topics. data transfer These initiatives may boost the advantages of data-driven innovation, promote its performance, and promote its growth in Industry 5.0. (Fukuda, 2020).

Industry 5.0, which denotes a change from a product-driven to a customer-driven strategy, makes interactions between producers and customers easier in this situation. As it includes a wide variety of activities including online platforms and marketplaces, communication services, Internet search services, social media and creative content sources, it also gathers data through these interactions and develops and maximizes total value for its members. The primary driver of innovation in the private sector is to boost profits, or at the very least maintain current earnings, in order to advance in a more cutthroat global market.

As a result, innovation is regarded as the secret to private business success since it aids in cost reduction, product improvement, and market expansion. The size of businesses and how much funding they devote to innovation varies greatly in the private sector. Since a result, fast globalization is altering how new ideas for innovation are developed as it brings different forms of socioeconomic activity across national boundaries. Since innovative ideas come from a variety of sources and greatly enhance competitive advantage, this elevates the private sector's significance and position in terms of innovation to a new level. To meet the different demands, wants, and ambitions of people and communities in the twenty-first century, as well as to prevent growing price pressures and boost the effectiveness of public services, high levels of innovation are required at the national and local levels. Successful innovation is a strategy for enhancing the effectiveness of public administration and services by better addressing needs, resolving issues, and optimizing the use of resources and technology.

In contrast to the private sector, the public sector adopts policies that are intended to benefit the entire society as a whole rather than to make a profit. On the other hand, the public sector, which is acknowledged as a provider of services in a society, could have a structure that is far more inventive and dynamic than is often believed. The operating procedures of many public institutions are actually changing as a result of new active labor market policies, engagement in R&D, formation of preventive health and climate change policies, new digital services, and organizational changes.

Even innovations that are motivated by a policy mandate, like the political choice to adopt web-based tax return forms, rely on government managers to decide how the solution is created and put into practice. Therefore, under these types of management, managers and all other public sector employees may play a significant part in the creation and adoption of innovations. Additionally, the drive for innovation among leaders at all levels is crucial to the development of the public sector's innovation as well as their own and their employees' personal and professional growth (Arundel et al., 2019).

However, innovation carries significant risks, such as failure due to its nature, rejection by producers or users of a product or service, or long-term volatility. In addition, innovation developed by civil servants working in government is often owned by the government, and the rate of successful public sector innovation is limited because government agencies do not have enough venture capitalists for their statutory public administration innovation funding allocations. In many countries, governments and businesses are working together to create institutions that foster private sector innovation, especially in areas such as information technology. In this context, the lack of risk, the inability to create an additional budget for civil servants beyond their basic salary, and the fear of failure make the public sector more hesitant about innovative initiatives than the private sector. Given the excellent innovation potential of the private sector beyond production, policy should focus on the privatization of some public services, and all types of incentives and support should be used in cooperation, thereby increasing productivity and employment.

In essence, co-innovation gives the government the opportunity to shift the focus of implementation and diffusion to the most talented participant, thereby strengthening the elements of implementation and dissemination of the innovation cycle, as well as the resources (local expertise, funds, etc.) brought in by the collaborating partners increase the quantity and quality of innovation. On the other hand, government institutions are important users of new innovations, which determine whether they will develop and what form they will take. Usage plays an important role, especially for government procurement, and the public sector can be a key partner in the development of custom generators. Public sector organizations also play an active role in the development of new technologies and often provide the additional services and infrastructure needed to efficiently use private sector goods and services. In this context, the public sector is an important part of innovation as it is both a user and a developer of innovation, directly or indirectly. The concept of an innovation system is based on the idea that innovation does not arise as isolated, discrete phenomena, but also as a result of the interaction

of many institutions or actors / instruments. A set of actors and interactions has some special properties that persist over time, and in most cases this set requires action as a whole. The structure of an innovation ecosystem should not be linear, but should include interconnected systems and ways that help maintain and formulate evidence-based functional policies. Consequently, an innovation system can be created at many levels of abstraction and detail, from a single technological project to the level of an enterprise, industrial sector, national, regional and even global level.

Technological innovation includes innovation in industrial arts, engineering, applied sciences and pure sciences. The technological innovation in question can be a new technology, or it can be developed, improved or achieved at a high level. Examples include innovations in the electronics, aerospace, pharmaceutical and information industries. The Technological Innovation Systems (TIS) approach refers to the stage of building a system for new technologies. TIS consists of a network of actors involved in the launch of a new technology. In addition, TIS includes all the components that influence the innovation process (development, diffusion and use of new technologies) for an emerging technology, not just the components dedicated to that particular technology. TIS can be analyzed in terms of its structural components (actors, networks and institutions) and functions (Bergek et al. 2008).

On the other hand, the framework provides entrepreneurs with valuable insights into the processes essential to the successful development and implementation of innovative sustainable technologies. The national innovation system consists of participants or actors located within national boundaries, their activities and interactions, as well as the socio-economic environment that develops outside these actors or participants, which determines the innovative efficiency of the system. Thus, it is defined as the national policy and programs of governments, the laws of the nation, the presence of a common language and common culture, an internal and external system that can significantly influence the development of technological progress. In other words, national differences and boundaries tend, in part or on purpose, to define national systems of innovation, or, moreover, general ideas about national societies and cultures tend to unify national systems. National innovation systems require not only combining ideas from vastly different areas of analysis, such as economic policy, economic interdependence, and radical economic change, but also new combinations of such elements in the system. In addition, the system is based on the ideas that new technologies will foster the development of new products, markets based on scientific endeavors, and that

success in innovation comes from long-term relationships and close interactions with agents from outside the company.

Chapter 2. National innovation and R&D policies

2.1. Approaches of economic schools to national innovation and R&D policies

National innovation and R&D are important not only to increase wealth (to increase the wealth of nations in the narrow sense), but also to get people to do things that have never been done before. On the other hand, since it allows you to change the quality of life in general, it can be the source of not only the same product / service, but also a previously non-existent product / service model. Indeed, although Adam Smith's main goal in The Wealth of Nations is to explain the uneven growth of wealth in different countries. Its focus on trade promotion and protection, shipping finance, mail and cargo trade, shipbuilding and marine energy policies, with the maritime sector mainly related to manufacturing, indicates a policy shift. Thus, current policy debates in these areas are by no means new. Changing forms of political organization and regional boundaries inevitably changes the nature of the debate. The use of a national innovation approach assumes that innovation activities are often analyzed in a broader sense. Rather than focusing solely on the number of innovative products and processes implemented in a country, the determinants of innovation need to be considered alongside commercial firms and government actors (such as learning processes, incentive mechanisms, or the availability of a skilled workforce).

Therefore, a systems approach to innovation is based on concepts of non-linear and multidisciplinary innovation processes, and the focus is on the interaction between organizations and institutions, as well as interaction at the organizational level. An innovation policy is a set of measures taken by the government to influence innovation processes by changing or controlling the institutions and behavior of target groups, and the results of this policy consist of a set of results achieved by participants and institutions through negotiations (Lee, 2013). In addition, since R&D, which is an important part of science, includes relationships in the national innovation system, this policy also serves R&D. The national innovation system is driven by the growing need for public-private partnerships in research, technology and development, which puts innovation policy in a broader socio-economic context. On the other hand, the network quality of innovation systems is enhanced by improving the interaction between the target research system and industry (Smits and Kuhlmann, 2004).

The national innovation system is made up of networks of markets, non-market organizations, local, regional, and other industrial clusters that affect the direction and rate of diffusion of innovation and technology in a nation. The formation of the system, which largely reflects the relative strength of national innovation systems to foreign investors, is influenced by national characteristics, frameworks, conditions, interactions between various actors and the functioning of the system, their interfaces, a variety of policy steps, and R&D. The approaches taken by economics schools to national innovation and R&D often cover topics like production growth and efficiency, production equipment and techniques, labor division, capital, and public policy, and how they ought to be. On the other hand, many economics schools generate ideas about the topics they cover and offer suggestions on how to build and grow the economy. He emphasizes topics like economic expansion, productive capacity, and cost-effective manufacturing. Economic growth, in this regard, mostly assesses improvements that take place or are seen in quantitative terms, rather than in quality. On the other hand, the main objectives of economics schools often center on attaining full employment growth.

Because each school of economics advocated a distinct set of policies to attain its aims and objectives, new growth theories and policies as well as the formation of new schools of economics were made possible by the social and economic outcomes. In order for a nation to experience economic progress, its policies and ideas must not only be followed, but also kept up to date with changes in the global economy. Indeed, implementing innovation and R&D policies that are suitable to each nation's social and economic structure is necessary for innovation and the capacity to participate in global economic marketplaces. Supply politics in general is at the core of traditional economic theory. The classics held that there should be relatively little economic interference since the state is opposed to such ideals and places considerable value on individuality, initiative, and new thinking as means of insuring output.

However, instead of becoming a manager or a leader during the era of classical economics, the entrepreneur adopted a role that just accepts funds and is thus not particularly active. John Bob Say claimed in The Law of Origin that each proposal would generate its own demand while pointing out that the products of manufacturing would finally meet certain requirements. In truth, Say preferred production above consumption and said that the market is where the commodities and services that need to be generated are traded. Therefore, according to traditional economists who support supply-side economic development, the origins of economic growth are buried in the value produced by industries like manufacturing, commerce, and agriculture. In reality, they contend that the presence of a market economy, a

strong cultural and social milieu, effective political governance, and technological advancements all make it possible to create the conditions essential for economic progress. Adam Smith, one of the most significant representatives of the classical school of economics, highlighted all the benefits of the division of labor. As a result, new disciplines have emerged and activities are carried out by specialized knowledge bodies, resulting in products containing an increasing number of technologies.

Growth of the economy is reliant on the accumulating of labor and capital. Smith defined economic growth in this context as the increase in wealth and wealth of nations. According to him, a division of labor is necessary for the economy and the size of the market in exchange-based production activities, and under the condition of effective labor, the division of labor results in a growth in the wealth of countries. As a result, Smith highlighted how building infrastructure for R&D is essential to today's wider social division of labor. He asserts that modern civilization is defined by ongoing innovation, which leads to the development of new products and technology (Kurz, 2008).

One of the British classics, Thomas Robert Malthus, spoke about the beneficial effects of technical advancements on the economy and covered how innovation affects prices. In reality, the technical advancements that follow boost the economy by lowering the cost of the goods and services produced. Since it adversely affects the components of production necessary for output, such as investment, David Ricardo suggested that the tax on fixed assets should be eliminated and production should be enhanced. Contrarily, according to Ricardo's theory of comparative advantage, an increase in output as a result of a technical advancement causes economic development, and economic growth offers a nation a comparative advantage over other nations by increasing the amount of international commerce. In actuality, Ricardo's strategy for technical advancement focuses on the employment of machines and diverse production methods, and Ricardo examined the effects of these methods on distribution. According to him, the ratio of fixed capital to working capital rises as a result of technological improvement, which reduces the need for labor. In addition, Ricardo suggested that mandated imports be inexpensive even while he supported encouraging domestic agricultural output to prevent capital accumulation from being hampered by diminishing productivity. The industrial revolution and its aftereffects are among the most significant factors that contributed to the development of neoclassical economic theory as a reaction to classical economic philosophy. The emergence of neoclassical economic theory, on the other hand, was fueled by a shift in how capital and trade were perceived, their expansion across national boundaries, or on the

path to globalization, technological advancements, and the application of these advancements across all sectors of production.

Neoclassical (Solow) growth theory in this sense involves capital accumulation and productivity. According to the hypothesis, income grows by the same amount for each individual as fixed capital increases. According to the neoclassicists, innovation can be backed by research and development and applied to the marketplace. On the other side, the idea defined technical growth as a gain in productivity, or the ability to produce the same amount of things at a lower cost. According to Alfred Marshall, businesses seeking more effective, economical manufacturing or reduced production costs will require innovative production techniques. He said that attaining these objectives as well as economic and development growth depend heavily on education.

Marshall, who also had aspirations of establishing an industrial zone or manufacturing city, thought that this education would promote better communication of technical and scientific knowledge. According to him, this results in the employment of high-performance machinery, a rise in specialization, and a consequent shift in the quantity and caliber of businesses and industries. John Keynes claimed that economies with an equilibrium underemployment structure may remove balance of payments imbalances through the production of national income and its proper use in this respect. Keynes was an opponent of neoclassical economics.

Technology, a crucial component of research, development, and invention, explains how a person investigates nature, the production process he utilizes to maintain his way of life, and how social ties are formed, along with the concepts and ways of thinking that emerge from these relationships. Hornborg (2011) asserts that Marxist discourse often adheres to the notion of describing technical things as the products of human creativity that rely on their inherent qualities and change through time.

In fact, the discourse made the case that capitalism structures support scientific advancement and that vested interests and ideologies restrict the nature of technological development. In his first book, Capital (1867), Marx explored the advantages of technology and made the case that it is the secret to rapid productivity development. Marx really held the view that governments may accomplish economic growth by decreasing the degree of government spending and by minimizing the expenses associated with businesses bringing technical improvement and innovation. One of the most crucial components of the Marxist

theory of capitalist development is capital accumulation. Therefore, a change in technology and production, as well as the continuation of this development, are necessary for capital accumulation. Marx asserted that technical innovation in capital goods plays a significant part in the capitalist economic model and that the bourgeoisie's quality of life would deteriorate if they did not continuously introduce revolutionary improvements to the means of production.

Industrial change as a result of technological invention and innovation, along with the development of mechanization, will provide producers with the opportunity to increase production. In addition, he said, production is carried out with less cost and labor through new inventions and developed production methods. In this regard, innovations and inventions that result from R&D are expected to contribute to economic growth through increased savings. Economic evolution, generated by the theory of internal change, is based on the relationship between the origin of life, the structure and depth of nature, human existence and the natural world in Charles Darwin's The Origin of Species, published in 1859 by the scientific world (Potts, 2003). Changes in the underlying cognitive structure that have taken place throughout history clarify evolutionary thinking. In fact, the focus of evolutionist theory has been an attempt to understand the processes of economic change. According to evolutionist theory, economic growth is influenced by the current economic environment. Therefore, the correct definition of the factors influencing the processes of economic development shows that an appropriate economic policy will be implemented. The evolutionary economic thought of Thorstein B. Veblen, one of the evolutionary economic thinkers, is based on institutions. Instinctive behavior influences thought patterns, he said, and that influence creates technological developments and institutional change. Indeed, institutional changes lead to lower investment requirements and increased returns. Veblen, who wanted to create an evolutionary model similar to Darwinian but far from teleology in order to overcome the duality of individual structure as a whole, recognized that people are purposeful actors. But he argued that institutional or cultural evolution should be viewed as causal processes as unintended, that is, unintended consequences.

According to Pott (2003), who studies evolutionary economics, the human mind is, among other things, creative and entrepreneurial. Therefore, when opportunities and incentives are provided, people's basic instinct is to socially coordinate and reintegrate difficult experiences to develop better ways of doing things. Joseph A. Schumpeter viewed the neoclassical equilibrium theory as an elegant example of the power of counterbalancing forces in economics, which abstracts away from the qualitative changes that can occur. Since these

stabilizing forces, in his opinion, are real and powerful, they transfer the economy to a stable state in the absence of qualitative changes (innovations). However, in the real world, such a stable state has not been achieved, since this balance is constantly being disturbed by innovations. Therefore, Schumpeter argued that a different approach, more dynamic and historical, is needed to study such processes of qualitative changes over time, and he intended to develop it (Fagerberg, 2003). Since the early work of Schumpeter, the concepts of entrepreneurship and innovation are closely related. Ascribing important qualities and responsibilities to the entrepreneur, Schumpeter noted the galleries of creative destruction that entrepreneurs unleash by introducing radically different products, services and processes, thereby challenging industry officials maintaining the status quo.

Schumpeter saw technological progress as the result of an endless cycle of innovative firms emerging, the commercial introduction of new products or processes, the shifting of existing challenges, and the subsequent emergence of a new generation of innovative firms. He also believed that technological progress was associated with the industrial research laboratories of large firms with static market power. He argued that such firms would use their economic profits to fund risky large-scale R&D activities that would both allow better exits in a dynamic sense and would allow firms to maintain their positions in a static commodity market (Martin and Scott, 2000).

The concept of innovation played a more important role in economics than Schumpeter's concept of invention. However, Schumpeter created the theory of maximizing credit and profit until he defined innovation as the main function of the entrepreneur and made the innovator and the innovation process one of the three elements. He also repeatedly emphasized the difference between innovation and invention and invention. Moreover, Schumpeter not only rejected the idea that innovation is directly related to invention, but also argued that the social process that produces innovation is distinctly different from the social process that produces innovation, economically and sociologically.

In The Theory of Economic Development (1934), Schumpeter examined the typical European industrial structure of the late 19th century, which was characterized by many small firms. According to him, the model (pattern) of innovation is characterized by the ease of technological entry into the industry and the large role that new firms play in innovation. In an expansionary innovation model, new entrepreneurs enter the industry with new ideas, products, or processes, creating new ventures that challenge established firms, thereby permanently

disrupting existing production, organization, and distribution routes and erasing half the rents associated with previous innovations. As long as economic growth continues, the competitive advantage of established companies that have achieved success and established a position in the market may decline in technology.

On the other hand, in the model of deepening innovation, companies that have a certain position in the market and have established themselves against the background of other companies continue to innovate using their technological knowledge and experience, as well as their ability to innovative thinking. In fact, resident companies either maintain their existence and competitiveness by participating in innovative activities such as new or improved production, production technologies or production processes using their existing capacities (capital, technology, etc.), or they risk gain or lose less. On the other hand, new companies looking to enter the market must have the competence to attract customers with an improved service, business model, or marketing technique. Otherwise, neither the existing firm will be able to continue its existence for a long time, nor the new entrepreneur will be able to enter the market. Therefore, for innovation in the market, all kinds of existence are necessary. After the death of Schumpeter, many of Schumpeter's central ideas about innovation, industrial development and dynamic competition were marginalized by mainstream economic research. In terms of transformation and industrial dynamics, attention was drawn to the relationship between innovation and firm size, on the one hand, and innovation and market structure, on the other. With the advent of game theory, firms' attention shifted to R&D and licensing strategies (Malerba, 2006).

2.2. Factors affecting national innovation and R&D policies

A growing body of research on policy-oriented innovation systems indicates that it has become a prime target for policymakers around the world, especially in industrialized countries. Significant advances in science, industry and technology after World War II served as a benchmark for managing the significant negative impacts of the socio-technical system of modern economic growth, of which countries have contributed to the reorganization of their existing political structures in these areas, and of which they are a part. Ensuring innovation and economic progress in innovation and R&D at both the firm and system levels requires the removal of barriers such as existing financial, technical knowledge and skills, and technological mismatches.

The process of locating the sources of this ongoing crisis, the procedure of eliminating bottlenecks, closing structural flaws, eliminating the absence of complementary cooperative relationships, or straightforward technological and organizational flaws all have an impact on the capacity of firms within themselves. Investigating the reasons may help policymakers pinpoint the issues that need their attention. The potential of efforts in these fields may thus be increased by understanding the variables impacting national policy in the fields of innovation and R&D as well as the country's economic orientation. The most significant and innovative advancement in economics of education today is the notion that human capital may be included in the concept of physical capital, which includes automobiles, machinery, and other production equipment. Human capital is formed from the talents and abilities that enable it to operate in novel ways, just like physical capital is created by transforming resources to build instruments that support manufacturing.

For instance, SMEs' capacity to get novel business offerings in their markets based on novel concepts and novel technology rely on their R&D operations, and securing this lucrative opportunity depends on the accessibility of enough human resources (Rammer and Spilkamp, 2006). Modern economic growth is mostly driven by human capital, which increases knowledge, experience, and skills. In actuality, human capital serves as the foundation for both increasing output and technical advancement. The Lucas and Romer Growth Models show that the function of knowledge-based human capital is to promote the adoption of foreign technologies rather than to be drawn into production as a distinct factor of production in and of itself, but rather to contribute to the development of suitable domestic technologies.

In the end, the emphasis is on converting information into better educated, more productive individuals, and this is a component of Lucas' growth theory's notion of human capital. In light of this, human capital places a strong emphasis on the R&D sector's productivity as well as cognitive ability, institutional settings, and a number of other possible effects on the creation, use, and diffusion of information (Storper and Scott, 2009). Human capital, which is the knowledge and skills that people bring to an organization or organization, therefore improves a country's capacity to develop its own innovation and R&D activities as well as its capacity to adopt technologies developed in other countries, helping it to catch up with its economic level.

The majority of studies in the pertinent literature largely agree that institutional, social, cultural, and cultural aspects as well as differences in entrepreneurial activity might affect how

R&D and innovation are measured between nations. Internal factors that influence innovation in the private sector include innovation strategy, an innovation culture that permeates the entire company, organizational size, the proportion of highly educated employees, human resource management and related employee competencies, company resources, managers' perspectives on innovation, goal-setting, and financial considerations. Social values, education, the degree of economic freedom, and institutional quality all play a part in the sociological, economic, and institutional atmosphere of the society in which entrepreneurs operate. A good social environment encourages innovation, R&D, and entrepreneurship through speeding economic growth and employment creation (Castano et al., 2015). Today, we must acknowledge that national culture affects business entrepreneurship, which in turn affects R&D and innovation. In fact, Hofstede's work, which demonstrates how culture develops in many ways and how this influences cultural values at the individual or societal level across national cultures, is the point of convergence of studies that consider the cultural realities of entrepreneurship and innovation.

When an agent's ranking of preferences in relation to options in a set of choices depends on the behavior of other agents, this is known as a societal preference interaction. For instance, it may be based on customer preferences, or the agent might be reliant on the activities of other agencies when placing an order based on the possibilities in the selection set. So, interactions of preferences coming from either producers or consumers can direct both innovation and R&D. In reality, because innovation and research both result in the creation of something new, the interaction of preferences will unavoidably affect this activity. Institutional and new technology interaction spans not just commercial institutions but also research institutions, lobbying groups, governmental organizations, and other entities. These groups either work together directly, cooperatively, or separately, or they engage in some kind of conflict. Each of these parties' activities has an impact on how certain companies, technology, or inventions evolve.

In this setting, effective commercialization frequently results in the simultaneous or parallel institutional influence of numerous institutions / organizations on the creation and spread of inventions. The entrepreneurial paradigm was first proposed by Schumpeter in the 1930s as a theoretical connection between entrepreneurs and innovation. Entrepreneurship is viewed as creative action and invention and is one of the primary elements of innovation. As a result, conducting focused study in an economic unit and developing a foundation for fresh ideas requires the needed level of entrepreneurial aptitude (Zhao, 2005). However, it is crucial from a socioeconomic perspective that the company model has the ability to provide high-

quality economic value for the nation while simultaneously being cognizant of its social responsibilities. On the other hand, because entrepreneurship research, a crucial component of innovation, also directs R&D, the continuation of coordinated operations supports the economy of the nation's long-term expansion. The acceptance and development of several ideas can be influenced by entrepreneurship research, which supports innovation in a variety of fields. In reality, the contemporary entrepreneur, who contributes significantly to R&D and innovation, boosts the economy of the nation by generating new products and services, improving manufacturing techniques, establishing organizations, expanding into new markets, and locating resources. Entrepreneurial activity, which plays a significant role in assuring the nation's growth both economically and socially, effectively serves as the engine in this situation. Therefore, entrepreneurship is a crucial component of a free market or competitive economy.

The significance of technical development in the commercially competitive environment and economic transformation is well acknowledged. All economic theories—whether Marxist, Keynesian, neoclassical, Schumpeterian, or others—adopt the premise that greater productivity depends on the development of new goods using cutting-edge production techniques and their active spread across the economy. The new economic growth model highlights the notion that commodities and services, as well as the cognitive domain, should be differentiable in this approach. This model, also known as a research strategy, emphasizes the significance of raising the necessary investment in these areas since the nation's research and innovation activities are considered as a distinct field of study. Since knowledge is created throughout the socioeconomic structure, particularly as a product (learning by doing) or consumption (learning by doing), progress in the current economic setting is primarily a result of the improved mental productivity of all organizational leadership.

On the other hand, the model emphasizes the significance of research and development (R&D) and knowledge creation, as well as how much R&D is involved in the economy and how useful it is for analyzing long-term growth. SMEs, in particular, conduct significant ongoing R&D operations in markets where technology evolves quickly, product life cycles are incredibly short, and invention is at the forefront since R&D and innovation now play a significant role in economic development (Rammer and Spilkamp, 2006). International data indicate that a country's national competitiveness is significantly higher than that of other countries in this context if its R&D intensity is high.

It is true that new ideas can displace old ones, or that creative destruction might encourage spending on further research and development to serve as the foundation for some of the innovators' ideas that are not wholly original. A macroeconomic environment that is stable supports macroeconomic policy and growth. When real interest rates are adequate, fiscal policy is steady and stable, real exchange rates are competitive and predictable, and the balance of payments position is viewed as doable, the macroeconomic structure being discussed can be said to be stable. This definition includes a criteria that policy variables are at levels that are conducive to growth in addition to the stability of macroeconomic policy variables.

In this regard, businesses are less likely to act in a socially responsible manner if, for instance, inflation is high, productivity development is slow, consumer confidence is low, and, in short, businesses are more likely to generate low profits or when there is economic uncertainty. In order to avoid lowering financial performance, managers often behave in their own best interests. The current state of the economy, governmental initiatives, the expansion of the industry's market, the cost of particular resources used in production, the industry's age, relationships between suppliers and other businesses, information hubs, the utilization of financial resources or support mechanisms, collaborations with academic and scientific research institutions, and national innovation and R&D are all relevant factors in this context. This can affect operations and policies D. Managed company owners can sell their companies as a whole or in parts to grow, create prestige, or split, merge, and sometimes change. It is also possible that other owners may be more effective in controlling and that even one person with the appropriate management skills and sufficient personal fortune may decide to buy a firm. Therefore, companies that resort to such differentiation methods may be constrained by money, or rather capital markets. In this regard, all kinds of economic variables can guide innovation, R&D and policy from the decisions of the company manager to the national dimension.

2.3. Actors involved in national innovation and R&D activities

The national innovation approach assumes that innovation and research activities are usually analyzed in a broader sense. Rather than focusing solely on the amount of innovation implemented in a country, it includes interactions between business firms and government actors, as well as determinants of innovation and actors (institutions or organizations) such as learning processes, incentive mechanisms, or the availability of a skilled workforce (Balzat and Hanush, 2004). There is a clear division of work and responsibility between the participants in the national innovation model and R&D. In fact, whether it is a simple R&D activity or an

innovative work, it needs an organization or structure to transform itself or scientific discoveries and technologies into innovations that will support sustainable long-term economic growth. In this respect, the main drivers are the public, firms, companies and enterprises, universities and research institutes, intermediary institutions, university-industry-public cooperation, the national innovation system and important actors involved in research activities. The dramatic change in the approach to public administration that prevailed in the period after the 1980s. Required national and local politicians to adopt an anti-innovation approach to social and regulatory service delivery, develop radically new policy frameworks, and enlist the support of citizens and their parties to adopt these legislative innovations and enhance their central role.

Countries can benefit from accumulated knowledge elsewhere if they develop technological competence to find suitable technologies and to select, absorb and adapt imported technologies. Therefore, policies that benefit from global R&D are important, as well as policies that encourage their own R&D activities. In addition, policies that encourage national R&D and dissemination of knowledge in countries can be seen as global R&D and can be more effective (complementary) in nature. Since the public sphere is the stage on which the drama of public life emerges, it includes all the social, cultural, legal and, most importantly, the economic activity of the state within national borders and at the international level. In this regard, the public has the right to direct the entire stream of social change and development, as well as its main activities and goals by its political decisions. In national innovation and R&D activities, the public is expected to guide organizations in finding, developing and implementing ideas inside and outside the organization, and to enable individuals and others within the organization to take a form of innovation that harnesses innovative values (Bommert, 2010). In fact, the success of modern and efficient public services that will meet needs, solve problems and develop more efficient ways to use resources and technologies is based on a high level of R&D and national innovation. At this stage, the public institution plays an important role in financing costs, operating and managing activities, both in supporting innovation and research activities within the institution, and in continuing these activities in other private sector institutions. There is a broad consensus that the public can and should play an active role in research funding, on the basis that new scientific discoveries will be translated into reality through R&D by both the public and private sectors (Shot and Steinmüller, 2018). On the other hand, since current financial resources and economic conditions can affect the management of public expenditure, the policy and management of a public institution in this

direction requires strategic planning, which is also considered an innovation activity. In this context, public budgeting is largely electoral, and since the results-based budgeting system to be adopted is results-oriented rather than contribution-oriented, the information on results and data used in budgeting is imposed on government officials, especially program managers, accountability for the quality of service, cost-effectiveness and efficiency of the program (Young, 2003). In fact, results-based budgeting, based on strategic planning, requires the technological infrastructure and training research to create a results-based information system. In addition, the preparation of the dataset based on the analysis of performance indicators, the availability of qualified and cultured public personnel, the implementation of a salary policy suitable for the system, ensuring sufficient flexibility in the use of allocations in terms of. Before government agencies and ensuring systemic coordination only through the central unit affect the success of budget execution. Thus, it is expected that the public, which is the main driving force in innovation and R&D activities. Will create a comprehensive, planned and strategic government budget that will not only participate in these activities, but also increase innovation and R&D activities in the private sector. The public sector is obliged to fund scientific research in order to ensure the openness of science and to regulate the scientific behavior of the scientific community. It is also important that the public sector provides and regulates a tool to refer to experts in the scientific community so that they can identify, assess and solve problems arising from the application of science (Shot and Steinmüller, 2018).

In this context, since policy includes all the aggregate actions of government institutions that influence processes in these areas, policy instruments consist of management practices that involve the use or deliberate limitation of government methods in one way or another to achieve policy objectives. The choice of policy instruments is part of policy formulation, and the instruments themselves form part of the actual implementation of the policy. This dual nature of instruments shows that it is important to look at how they are selected and the practice involved in policy implementation (Borras and Edquist, 2013). A country's policymakers are expected to organize their science policy to include and serve R&D, innovation and technology policies. While R&D and innovation differ in the literature, especially in terms of commercialization, there is significant overlap between policies in these areas. The public sector, which seeks to increase its national innovation and research activities and gain a high competitive advantage in the international arena, can provide these areas of activity with the existing basic policy instruments.

In fact, the general instruments of public policy in the field of innovation and R&D mainly consists of intellectual property, R&D support, education and training, public procurement and all related activities. Intellectual property law provides a significant advantage over antitrust law when deciding whether to allow or deny open access. Because it only works as a control over private behavior, and not as a positive regulation regime with obligations of access. On the other hand, the main challenge in developing a suitable open access regime for information platforms is to create a structure that simultaneously takes into account the need to provide incentives for investment and allows access when needed to foster competition and innovation (Weiser, 2003). Firms with a strong commitment to innovation and R&D need a set of innovative capabilities that support innovation in order to specialize in their fields, their ability to harness those opportunities, the resources they can use to innovate, and incentive structures that reward innovation. In this context, R&D support is the most appropriate policy instrument to use. Tax incentives and direct government funding represent the main government financial support for encouraging R&D and innovation in companies (Borras and Edquist, 2013). A government agency not only promotes national innovation and R&D by protecting intellectual property rights and providing incentives and financial resources. In addition, it is expected that the educational and teaching environment will be designed in such a way as to ensure the acquisition of knowledge and skills of the present and the future, and this process will be linked to the requirements of society and the economy (Stone, 2017).

Public procurement means that a public entity buys a product, good or service that can be called a system, or a combination of these.Public procurement for innovation occurs when a public authority is instructed (through a new product) to perform certain functions within a reasonable time frame. It can take various forms, such as strategic, direct catalytic, and finally commercial pre-commercial government procurement. The fulfillment of its mission in general public procurement and market stimulation in strategic public procurement occurs when demand is stimulated for certain technologies, products or services to support private buyers. Direct buying occurs when goods or services are for public use only, whereas catalytic buying occurs when the government participates in or initiates a tender, but the acquired innovation is ultimately used exclusively by the end user. On the other hand, the main idea of public pre-commercial public procurement is to target innovative products and services that require additional research and development (Edler and Georgiou, 2007).

On the other hand, government technology procurement is being used as a policy innovation tool in the defense materials sector in many countries. The development of traditional infrastructure is seen in some countries as an extremely powerful tool for influencing the speed and direction of innovation in the civilian sphere. Given the sectoral diversity of technological resources and opportunities that affect innovation and R&D performance, innovation analysis should, in principle, be tested by sector. In addition, standard sectoral classification categories are considered more appropriate to account for sectoral diversity in public procurement, given the unique nature of the public services market and the greater weighting of certain service sectors. In fact, open public procurement policies aimed at encouraging and developing innovation are mainly applied in the field of public procurement in the field of technology and R&D. Accordingly, the main theoretical arguments for innovation in public procurement reflect historical success stories (e.g. Internet, various military solutions), and the likelihood of higher success rates for innovation in public procurement is increased (Lember et al., 2014). It is also important to note that organizations providing goods and services to the public sector often serve both the public and private sector markets. For this reason, the public sector can have a direct / indirect relatively large or small impact on innovation. In this context, public procurement, which has significant influence among policy instruments, can be the cornerstone of a mix of coordinated and technology- or industry-specific policies.

While some consumers emphasize that they want the products they buy to have certain socially responsible characteristics (product innovation), others value the knowledge that the products they buy are produced in a socially responsible manner (process innovation). Firms using a differentiation strategy typically use more than one differentiation method. For example, a consumer firm may engage in activities that distinguish its products by creating unique fragrances, using high-quality interiors, supporting the local community, and promoting diversity in the workplace. In addition, CEOs prefer to pursue product differentiation while pursuing the goal of satisfying personal interests. On the other hand, companies are influenced by the innovation of companies belonging to different sectors, they collaborate with other companies and interact with the information infrastructure. In this context, given that they differ according to labor markets, finance and intellectual processes, innovation and the economic performance of innovation are among the units that play the most important role in the national innovation system.

The basic understanding of companies seeking to differentiate themselves by innovation and to make this principle part of their corporate strategy within the current resources and conditions is based on the idea of achieving a more efficient and prestigious position by reducing costs and introducing new products and services. As such, companies resort to R&D and innovation to protect their standard of living, which is important to the organization, for example, for economic growth, job creation, survival and competitive advantage. Although the main functions of organizations are product supply and marketing with mechanization after the industrial revolution, the importance of differentiating the market through research and development is increasing day by day as their fields of activity expand. In fact, businesses are an organization that is economically and technically important to their goals. The method and exchange of knowledge and wisdom have been the reason for the existence of universities since their inception in Europe in the Middle Ages. Research universities have long recognized the creation of human capital as part of their mission. Human capital development is integral to the process of creating new knowledge while developing one's own intellectual and technical skills as teachers, students and researchers, and also occurs through activities such as distance education, production expansion and public education programs.

While this is indirect in some areas, the impact of university research is important. In fact, according to companies in most sectors, university research and science is effective in the creative endeavors of most industries, and especially applied sciences and engineering fields also contribute to R&D and innovation. Universities are an important unit of the system in terms of their functions. Responsibility for the maintenance of activities such as the production of scientific knowledge, education and training of scientists and researchers. At the same time, in addition to training activities, it also includes functions such as training R&D personnel through national innovation systems, engaging in R&D activities, and encouraging companies to produce technology and create innovation through university-industry collaboration. Other research institutions outside the university provide information for innovative companies in generating and developing new ideas throughout the innovation process. Scientists in research institutions devote a significant portion of their time to observing new developments in their disciplines and research results. Thus, these institutions represent an important conduit for the dissemination of scientific knowledge in the business sector, as they are sometimes the main source for private companies looking for ideas for innovations or needing help to develop them.

An organization or institution that acts as an intermediary or broker in any aspect of the innovation process between two or more parties, with organizations that have been identified as mediating in the innovation process. Such brokerage services include assistance in providing information on potential employees and arranging a transaction between two or more parties. Mediating institutions can also act as mediating or mediating bodies or organizations that are already collaborating and helping to find advice, funding and support for the innovative results of such collaboration. According to Bessie and Chauvin (2013), the economic activity of intermediaries consists of services associated with their participation in the construction, maintenance or expansion of a market. Intermediaries can also be viewed as professional intermediaries who intervene between supply and demand and are viewed as third parties whose actions have some effect on the economic or symbolic value of a product or organization. However, it was noted that intermediaries, in addition to their obvious specific functions (providing sales, matching, consulting and valuation services), are actors who participate in valuation activities to shape the market.

Watkins et al. (2015) focus on innovative intermediaries that foster R&D partnerships and include various sources of risk financing such as consulting firms, technology transfer offices, and venture capital. In addition, the importance of the role that institutional structures can play in the transfer and dissemination of knowledge and knowledge within the national innovation system was emphasized. Intermediary institutions can help build innovation networks. For this reason, their presence is essential in the processes of entrepreneurship and innovation. In the case of private innovation, demand formulation, networking and innovation management services re-establish the interaction and coordination of innovation systems. In addition, the competencies required for innovation can raise awareness through knowledge acquisition and R&D based on market demand, help remove some emerging constraints, help build capacity, and thus can become a new innovation policy tool for policymakers.

Collaboration includes activities in which two or more parties work together, and each of them contributes resources, such as intellectual property, knowledge, money, personnel, or equipment, to achieve a common goal that brings mutual benefit. In this respect, collaboration provides an opportunity for participants to exchange and exchange information and benefit from each other's experiences, knowledge and experiences. In addition, working together helps all partners to achieve tangible results faster and more reliably, helping to connect knowledge with business experience and adapt it to market needs (Halvorsen et al., 2005). Given the circular and interactive nature of the innovation process and the growing technological

complexity in many sectors, firms need to maintain relationships with other institutions and organizations to innovate. Indeed, the importance of collaborating with research centers is not only to view them as a source of any kind of innovative ideas, but also because they offer companies a way to access research funding by participating in government-funded programs.

The triple helix theory argues that interaction between university, industry and the public is key to improving the conditions for innovation in a knowledge-based society. The theory is based on the productive principle of a knowledge-based economy, with industry as the center of production, the university as a source of new knowledge and technologies, and the public as a source of contractual relations that guarantee stable interactions and exchange. The triple helix, arrangements and networks between institutional domains provide a source of innovation policy at the national and international levels. Thus, innovation is sometimes broader than anything that happens in one corporate area, for example, the behavior of enterprises when planning and implementing changes to develop new products from other firms in the cluster or from another industry. It promotes innovative strategies based on the deliberate development of academic industry relations through science, technology and innovation policies. In creating the conditions for innovation, collaboration between university, industry and the public seeks to build on available resources, create niches for technological innovation, and secure a place in the division of labor in the global economy. Indeed, cooperation provides the advantage of access to external technologies and government support, while allowing the sharing of costs and risks, and the use of synergies from complementarities between partners. This allows for better control and tracking of technology transfer and the internalization of side effects, while the natural reciprocity relationship between complementary parties enhances efficiency.

Joint proposals for innovation are based on the assumption that the active participation of a wide range of actors with innovative tangible or tangible assets (knowledge, creativity, money and other assets) will increase the quantity and quality of innovation (Bommert, 2010). In this context, technoparks are the best example of such structuring in increasing national innovation and R&D. In addition, applications called innovation centers, technopolises or science, research and technology parks are composed of technopark-like structures. Depending on the scientific and technical policy of the country in which they are created, the university base, industry and geographic structure and the level of technology development, they differ in the way they are implemented.

2.4. Policies to increase the performance of national innovation and R&D

Learning processes in national innovation and R&D policies, based on the experiences of countries themselves and on the experiences of other countries in organizing national innovation systems, are considered to be an important contribution to innovation policy development. This awareness requires an international comparison of innovation power and institutional frameworks, especially mechanisms to stimulate innovation (Balzat and Hanush, 2004). On the other hand, in addition to experience, building a national innovation system in countries and promoting R&D and efficiency gains in these areas requires intensive policies. Since creating an innovation strategy and identifying those to be implemented is a complex process that requires detailed information, it is important to be careful when defining and implementing effective strategies. For example, they require consideration of marketing or manufacturing initiatives, investment in R&D, support of appropriate business infrastructures, taking into account existing innovation opportunities, analysis of innovation processes and possible restructuring (Hitmar et al., 2014). In fact, the effort to develop a proposition that creates the highest value for customers means understanding and anticipating their needs in order to develop innovations that can be best adapted to their current and future expectations. In addition, since actors involved in R&D and innovation, especially firms and companies, differ in the degree of flexibility and ability to respond to user requests, the extent to which they differ between certain markets and users is a factor in determining their innovation strategies. The preferences and abilities of actors in the production and diffusion of different types of innovations also lead to different innovation strategies. Fundamental changes in the political, social and economic climate and changing stakeholder relationships are forcing organizations to develop sustainable R&D and innovation strategies and implement incentive policies that should be in place. Cabrilo et al. (2014) propose an approach that identifies gaps in human capital, which is the main resource for a more comprehensive assessment of the effectiveness of innovation, and adapts it to innovation to design innovation strategies. Since a national innovation strategy must take into account that one size does not fit all sectors, identifying human capital gaps in different sectors of the economy aims to obtain more reliable information on innovation resources and to fine-tune the national innovation strategy based on the specific characteristics of a country's industry.

System-based knowledge and innovation policies require adequate structures and processes within the political system and, most importantly, the ability to coordinate different policy actions in the area of knowledge and innovation management. Since reducing

communication uncertainty about information flow and policy coordination can reduce resistance to innovation, decision-makers should make the necessary efforts to facilitate innovation policy implementation. In addition, the creation of functional communication channels for the transfer of information influencing innovation is one of the main structural features of organizations involved in the implementation of innovation. Ensuring the flow of information and coordination is important in terms of accelerating R&D research, increasing efficiency and achieving goals, and innovation. In this direction, improving each component of the knowledge management structure has a positive effect on both R&D and innovation. For innovation to take place, managers must first have better and more diversified knowledge of the internal and external forces affecting the company, and the free flow and coordination of information within the organization must be ensured. The better the dissemination of knowledge, the more opportunities for innovation, as more people at organizational levels and departments gain access to new information that interacts with the information already available. In fact, the system may not work as we would like, because there are no knowledgeable participants in R&D and innovation, there are no connections, or the boundaries of the system are drawn in the wrong place. Gaining the ability to understand and position the flow of information can require massive investments in education, gathering disparate information, coordinating information exchange, and the preliminary research and development that is shaping the growth of science and technology. Attention to these issues provides the main rationale for policy innovation systems. The country's collaborative innovation infrastructure consists of a set of cross-investment and policies that support innovation across the economy. A collaborative innovation infrastructure builds on an existing pool of scientists and engineers, while a strong collaborative innovation infrastructure builds on excellence in fundamental research. This, in turn, develops a basic understanding, and understanding lies at the heart of human resources for R&D and very new commercial technologies for which public funding is mandatory in almost all countries.

Overall, a strong co-innovation infrastructure requires a range of national investments and policy decisions that can take decades. Based on the reformulation of the structure of systemic failures in terms of actors and rules, failures, an emphasis is placed on infrastructure and high-quality scientific, innovative and technological infrastructure, especially in the field of information innovation, as well as on issues related to physical infrastructure related to innovation and R&D. In this respect, policymakers' decisions based on a shared infrastructure of innovation and R&D are influenced by a very strong infrastructure of human capital, not

just physical and technical infrastructure. The integrity of the system often depends on a set of physical infrastructures related to energy, communications and scientific technology, or information infrastructures such as universities, state-supported technical institutions, regulators, libraries and databases, and even government ministries. These infrastructures, in turn, include technical standards, risk management rules, health and safety standards, etc. operate within an institutional framework that emphasizes regulation. The regulatory system includes not only formal rules but also the general legal system concerning contracts, employment and intellectual property rights (patent and copyright) in which firms operate.

Given that corporate acquisitions affect the overall performance of R&D, they also affect the innovation system. There is a strong case for the fact that regulations shape innovation and economic performance. The need to monitor and evaluate regulatory effectiveness and the necessary changes to regulatory systems ensure that the public is acting in the right direction (Smith, 2000). On the other hand, the rationale for focusing on regional innovation systems stems from factors that national innovation systems theory has identified as important, such as institutional structure, inter-firm character, learning ability, R&D intensity, and significant differences in innovation. activity between regions. This requires policies that increase the ability of regions to absorb investment for innovation. Funding constraints can prevent particularly small and technology-based entrepreneurial organizations from pursuing economically viable innovation projects. On the other hand, the funding needed for innovation or R&D can be obtained from internal sources in the organizational structure, external sources, or both. Entrepreneurs try to capitalize on the resources of the private sector or public financial institutions, which are external financial resources, to finance their activities. To apply for public funding, an entrepreneur must bear a flat fee, while private funding does not include any application costs. However, entrepreneurs are required to pay the market rate for these funds. Moreover, compared to the public sector, private sector financiers can have an unlimited supply of financial capital (Takalo and Tanayama, 2010). Unlike capital investment, access to external finance for investment in R&D can be more limited for a variety of reasons that exacerbate imperfect capital markets. Information asymmetry in relation to the value of investments, on the one hand, and the intangibility of the created assets, on the other, affects the conditions for financing investments in R&D. On the other hand, government equity financing is very important for young firms, as most of these firms rely on government capital as a marginal source of funding. If external capital requires a premium on value, these firms will face mandatory financial constraints, and fluctuations in both internal cash flow and

external public equity funding can significantly affect their R&D. In addition, investment returns and how they are structured (for example, debt and equity) can have a significant impact on what is financed and how financiers can shape R&D and innovation (Kerr and Nanda, 2015).

Much of the investment in R&D consists of project and other costs, as well as payments to highly skilled technologists who often require firm-specific knowledge and training. Faced with high costs, a firm that is uncertain about the sustainability of a positive financial supply change may retain some of its new equity funding to support the initial R&D increase and have resources in the future. On the other hand, a company facing diminishing financial resources may phase out its R&D and innovation activities. Therefore, it is important to obtain the necessary financial resources. In fact, R&D spending enables the production of new knowledge and the development of creative ideas for products, processes and services that drive economic growth. Even if the vast majority of R&D projects do not produce tangible results, these failures contribute to the accumulation of knowledge necessary to stimulate the innovation process. Since innovation and R&D are perceived as a social process, shaped by the institutional structures in which they are involved, although the increase in the effectiveness of an actor in an organization is largely due to technological progress, investment in physical capital and the growth of human capital, these factors are deeply shaped by institutions.

Thus, actors involved in national innovation and R&D can improve their performance in line with their corporate innovation strategies, leveraging information processing capabilities, physical and human capital, and political preferences. Modern approaches to the innovation system are mainly focused on the production side, where innovation emerges. In this context, since technology is a very important element for performing these functions in modern society, the production, distribution and use of technology as sub-functions are important for the system.

On the other hand, technology is becoming more and more important as corporate activities also include some research and development activities related to product customization. The need to keep track of new technological developments and the ability to produce entirely new technologies and products is due to both the increased cost of R&D and the increased flexibility of the technology. In fact, in addition to the availability of existing resources, technology is an important element in improving the efficiency of institutional structures involved in innovation and research. Establishing a mission and local strategies for all institutional structures shaping national innovation and R&D policies, strengthening their

assigned roles, revising existing rules and introducing new rules when necessary, and conducting R&D and innovation activities that will contribute to all areas, rather than in a specific area It is important to improve the institutional effectiveness of the national innovation system and R&D.

Chapter 3. Comparing Azerbaijan to OECD countries

3.1. National innovation and R&D policies of Azerbaijan - OECD countries

The Organization for Economic Co-operation and Development (OECD), established in 1961 on the basis of the Paris Convention signed on December 14, 1960, is one of the international organizations working to improve lives and improve policies. The OECD, headquartered in Paris, France, consists of member countries with advanced and emerging demographic governance structures. The institution seeks to improve the social welfare and economic level of member countries, help member countries solve their problems in a short time, guide them and contribute to the sustainable spread of economic growth. As a global forum and knowledge hub focused on developing better policies for better lives, it brings together countries and a range of partners from around the world to explore innovative ideas and best practices across the entire policy spectrum (OECD, 2020). According to the OECD, national innovation policy aims to compensate for market failures, which ensures optimal investment in R&D and innovation. Because technology risk is so high, market mechanisms provide a level of investment in research that is well below the socially optimal level. This justifies significant government intervention in funding basic research and some aspects of innovation. Indeed, the national innovation system explains the role of the actors who contribute to the end result of skill creation and commercialization, and the relationships that should unite them. In this case, in principle, the first action of the government is primarily to facilitate exchange between groups of actors and increase their ability to communicate and absorb information (Paic and Viros, 2019). In most OECD countries, the governance structure of universities includes a council as the main decision-making body responsible for setting priorities. In fact, in 25 (68%) of the 37 member countries, the private sector participates in the administrative boards of universities. This participation reinforces the institutions' commitment to partnering with industry and supporting knowledge transfer. In most cases, business representatives represent large firms, but in some countries, such as Iceland and Ireland, there are also representatives of small and medium-sized enterprises (SMEs). Industry representation on university councils is a recent development in some countries. In France, for example, the representation of jobs, trade unions and local actors on the councils of universities and public research institutes was introduced in 2013 by the Higher Education and Research Act. University reforms in Portugal in 2007 ensured representation of external stakeholders on university governing boards (OECD, 2019). The Swedish innovation agency VINNOVA and

Finnish innovation policymakers with a national innovation systems approach use the triple helix metaphor. This means that government bodies, universities, other research institutions and industries are in close cooperation on the innovation system. Also in Finland, major funding programs are designed to cover firms of all sizes, universities, research institutions and related public sector institutions, i.e. to take full advantage of the triple helix approach.

Institutions that set national or regional benchmarks for evaluating the effectiveness of education, research and innovation in OECD countries are becoming increasingly important for the systematic assessment and monitoring of universities and public research institutions. 19 out of 37 OECD countries (51%) have such agencies. The National Agency for the Evaluation of Universities and Research Institutions, created in Italy in 2006, is the best example of such an institution (OECD, 2019).

After World War II, the belief that organized R&D can spur economic growth and promote economic prosperity has led to the creation of many new government institutions supporting civil science and engineering and has given impetus to the development of civil R&D departments. The Cold War era has led to a further expansion of military as well as research programs by government agencies other than defense, and models have been created for government-funded research and development to be carried out by private sector contractors. Thus, there has been a significant increase in the scale of government financial commitments for R&D, accompanying the institutional expansion of the production of scientific and technical knowledge in the public sector. While research and development is mainly carried out by nongovernmental organizations, various taxation and subsidy measures have been introduced to encourage private companies to undertake R&D projects at their own expense.

Looking at the historical development of national innovation and R&D policies, one can see that the construction of modern science systems in industrialized countries took place literally in the 1950s. In some countries, government laboratories and universities sometimes take scattered measures to mitigate identified weaknesses in the innovation process, including, for example, the creation of the National Research and Development Corporation (1949) in the United Kingdom to help promote and disseminate inventions. Among others, France has established sectoral technical centers to provide industry with technical research, assistance and information, and Germany has established a Fraunhofer applied research and development system (World Bank, 2010).

Since scientific ideology after 1950 supported the idea that technology naturally arose out of science, it did not require governments to do anything other than build a good scientific base. Market ideology, on the other hand, indicated that innovation occurs naturally in good business environments, and governments should focus on this issue only to ensure an open competitive environment and in addition to funding public goods such as basic research. that the private sector cannot do. finance. While these two perspectives acted in coalition to bolster their interests, governments felt the need to take special measures to encourage innovation. These efforts were fueled by World War II initiatives and the active participation of governments in the development of defense technologies. Government efforts in the 1960s and 1970s were largely inspired by the linear model of innovation and the idea that science and research should focus on technological and industrial applications (World Bank, 2010).

During this period, the newly formed OECD directed the development of national science policy through the Office of Science Affairs. From its inception in 1961 to the emergence of the literature on national innovation systems, the OECD has produced many policy documents. Most of these included a systems approach that emphasized the institutional and contextual aspects of R&D. According to the OECD, R&D consists of four sectors or components: government, university, industry and non-profit organization, economic and international environment (Godin, 2009).

Established in 1993 by the OECD Committee on Science and Technology Policy, the OECD Innovation and Technology Policy Working Group promotes sustainable and inclusive knowledge-based economic growth through increased productivity and provides evidence-based policy advice for STI. In fact, the institution aims to strengthen public research institutions and their contribution to innovation and economic performance, and encourage the creation of companies based on science and technology. (OECD, 2020)

In the 2000s, the practice of creating institutions to boost national innovation and research activities in OECD countries came to the fore. For example, enterprises and scientific departments; The National Center for Research and Development, administered by the Ministry of Science and Higher Education of Poland, was established to serve innovation and therefore competitiveness, as well as to support the planning and implementation of modern solutions and technologies in the economic field.

In addition, in 2009, a group of European ambulance services, academic health research organizations, hospitals and other healthcare organizations formed a consortium called the

European Smart Ambulance Provider Platform. Each member organization of the consortium brings specific expertise to the project in areas such as ambulance manufacturing, advanced emergency services, project management or public health innovation. Many OECD countries are participating in this project, including Denmark and the Netherlands. (European Commission, 2020)

In 2014, the Dutch government launched a new science development strategy, the National Research Programme. In order to maximize support for different social groups, one of the main pillars of the development process was public participation using digital tools. Here the participants are invited to ask the scientist a question. In 2015, the EU-funded CIMULACT project, which involves more than 1,000 citizens from 30 countries, as well as various participants, began to redefine the European research and innovation agenda to make society more relevant and accountable. The project encourages participants to formulate their vision of a desirable sustainable future; discussion and development with other participants, recommendations for future research and innovation policies and issues. (OECD, 2018).

Publicly funded R&D programs are expected to enable the participation of academia and industry from other countries and ensure targeted collaboration between the most appropriate partners. Nanotechnologies, which are one of the important achievements of national innovation and R&D, require interdepartmental and/or international cooperation to realize their full potential. The European Union's Horizon 2020 (2014-2020) global cooperation initiative, which has three components in the context of R&D and innovation, scientific excellence, industrial competitiveness and leadership, and addressing social challenges, is an example. this approach. Global centers of excellence in AI research (such as those at Stanford, Carnegie Mellon, and MIT) have sprung from public support, often associated with US Department of Defense funding. However, recent advances in AI have supported the growth of private AI research and development. For example, earnings reports showed that Google, Amazon, Apple, Facebook, and Microsoft spent a total of $60 billion on research and development in 2017, including a significant share in AI. In comparison, the US government's total R&D in non-defense manufacturing and technology was about $760 million in 2017 (OECD, 2018).

Since governments play an important role in technology development, they often create a favorable climate for innovation by directly supporting technology development or, more indirectly, through various incentives or legislation. The innovation climate is largely

determined by general macroeconomic, business and governance conditions, as each society must find ways and tools for innovation that suit its own needs and capabilities. Despite the nature of these conditions in low- and middle-income countries, a well-designed and well-executed innovation policy can be an effective tool to trigger change and development within a country's overall framework conditions. These countries can achieve significant economic and social progress by applying knowledge and technology available worldwide and adapting it to local conditions. Sources of foreign knowledge and technology include trading activities such as the import of equipment and goods, multinational companies, and talented diasporas (World Bank, 2010).

Supporting innovation in business enterprises, including SMEs, has been a policy priority in OECD countries for decades. The emphasis on SMEs is based on the understanding that such enterprises face certain barriers to R&D and innovation, many of which can be traced back to market failures. Accordingly, most governments in the OECD region run a large number of R&D and innovation support programs with companies. In addition, governments, especially universities and public research institutes, are developing programs and policy instruments to improve innovation outcomes by specifically supporting R&D collaboration, knowledge and technology transfer, or, in a multifaceted and more interactive perspective, encouraging co-creation. involving actors from other parts of the innovation system. The policy focus is changing, given the extent and volume of public support for R&D and innovation available, as well as the growing needs of the business sector in response to global competition and technological change (Hutschenreiter et al., 2019).

Many support instruments are being used to enhance national innovation and R&D in OECD countries. As in Azerbaijan, both public research institutions and private sector activities in OECD countries are publicly funded through financial or non-financial incentives. In addition, organizations such as the National Center for Scientific Research in France serve the needs of public research, and some of them produce fundamental knowledge that firms can use in their own applied research. Thus, policy makers provide direct or indirect financial support to the research budget of private sector institutions as well as their own institutions. On the other hand, most OECD countries, unlike Azerbaijan, allow full write-offs of existing R&D expenditures, which means deducting depreciation charges from taxable income. In addition, some countries allow accelerated amortization of investments in machinery, equipment and buildings intended for R&D.

OECD countries tend to use both indirect and direct financial support, reflecting their complementarity. Direct measures have a direct impact on the policy of a rigid level of innovation activity. Through indirect measures, policy makers support any innovative activity that falls under the rules of the program, without participating in the selection of innovative projects for support. These measures tend to rely more on the development of pre-existing individual firm plans rather than direct measures, and their application is often broad and not sector-specific.

Many OECD countries are striving to improve the level of business innovation policy at the system level. Most governments today use a large number of programs and tools that support R&D and innovation in the private sector. Individual tools used to support research can produce more and better results if they are well coordinated and linked. A critical element in this context is the coordination of programs by appointing dedicated agencies to implement individual programs and associated toolkits through more effective management. For countries that offer tax incentives for R&D and innovation, the appropriate design of these financial instruments and their direct interaction with public support programs and instruments is an important area for political attention.

The OECD countries, which carry out very important activities in the field of science, industry and technology, have begun to focus on expanding this research, drawing attention to the importance of research and development and innovative research, which has been developing rapidly since the middle of the 20th century. In fact, depending on the socio-economic structure of each OECD country, governments use various incentive practices to increase innovation, R&D and entrepreneurial activity in this direction, support the private sector, and hence economic growth and development.

Many actors (such as business, government) have different rationalities and different goals in the transition to a circular economy, which means reversibility. At the heart of the OECD's work on innovation and R&D in the circular economy in cities and regions are incentives and frameworks to engage stakeholders in the design and implementation of inclusive policies, motivate common goals, create synergies at the right scale, and minimize future social obligations. , Conditioning is important. In this regard, the active participation of all stakeholders requires specific and specific communication strategies and effective incentive policies (OECD, 2020).

In OECD countries, the use of incentives favored by policy makers in national innovation and R&D policies varies from country to country in both quality and quantity. However, as in Azerbaijan, the support elements included in incentive applications tend to have the same goals and objectives, and therefore contain similar structures and themes. In this regard, the scope of stimulus application in OECD countries is treated as tax and other non-tax support, as shown in Table 1.

Table 1. Elements of general support for an incentive system implemented in OECD countries

Tax Incentives	Employment	Financial Supports	Investment Related Supports	Other Supports
Tax Exemptions VAT Refund Tax Permit Tax Discounts R&D Tax Deduction (Including Deduction) Reduced Tax Rate	Support SSI Discount Income Tax Withholding Supports	Financial Supports Cash Aids loans	Infrastructure/Land Concessions Accelerated Depreciation on R&D Assets	Patent Related Incentives Other Incentives

Source: Behera & Sethi, 2022

Since the elements of the general support system of incentives used in OECD countries are listed in Figure 1, politicians in countries resort to financial support for plans, programs and projects in the field of innovation and R&D through direct measures as an instrument of public financial policy and indirect measures as part of the volume of tax expenditures. On the other hand, in order to boost innovation and R&D activities, some OECD countries, unlike Azerbaijan, provide government support in the form of accelerated depreciation and tax incentives for investment-related R&D assets, such as tax holidays and tax permits. The way in which all types of innovation research and R&D are supported in OECD countries differs depending on the element of incentive support that each country prefers due to its socio-economic structure. In fact, countries resort to ancillary elements of tax and non-tax incentives,

which they use to support various kinds of plans, programs or projects to increase national innovation and R&D.

According to a report by Deloitte (2018), a German policy that does not prioritize elements of tax support in promoting national innovation and R&D, but emphasizes research in these areas and allocates more grants to programs and projects of small and medium-sized businesses in this direction. whether to provide tax support or not. As a matter of fact, after 2020, politicians are expected to reform the tax laws in these areas of activity and present an encouraging proposal (Deloitte, 2018).

In addition, as in Germany, there are countries that use elements of non-tax support to encourage the growth of national innovation and R&D in other OECD countries. The practice of patent term differentiation, which is an incentive for increased innovation and R&D activities and favored in recent years by many OECD countries, is gaining in importance. In fact, a patent application to be determined by the government can improve public welfare as well as increase national innovation and R&D activities. The most appropriate patent filing scheme in this direction would be for the government to provide firms with an incentive agreed-upon list of options for patent durations and associated lump-sum patent fees. For example, giving firms with high R&D and innovation potential the option to choose longer patent terms gives those firms an incentive to invest more resources in R&D. Any single patent term may provide too much incentive for firms with low R&D and innovation productivity and little for high productivity firms.

Tax and non-tax support has become an important tool to encourage research in these areas in OECD countries, which place great importance on national innovation and R&D. In this direction, some governments create incentives for investment in R&D in the economy by treating eligible spending on R&D, especially by firms, as preferential taxes. In addition, in most OECD countries, large-scale budgets are allocated to spending on non-tax support elements to achieve high performance in these areas of activity.

The rise in living standards from the industrial revolution to the present has a lot to do with innovation. In fact, innovation is a key factor in overcoming global challenges such as climate change and sustainable development, as well as an important factor in determining the effectiveness of innovation, competitiveness and national progress. In this context, entrepreneurship, which transforms scientific and technological developments into more productive economic activities, and innovative approaches to the creation and delivery of goods

and services, as well as the application of advances in technology and market structures and regulatory frameworks that allow the expansion of more productive activities leads to economic growth.

Because innovation outcomes provide a rich database of detailed indicators and insights into the inputs and outputs of countries' innovation and research activities, they guide innovation-oriented growth policies, especially in developing countries. In fact, innovation activities inspire people, especially the new generation of entrepreneurs in the economic unit and those involved in innovation activities. In addition, innovation performance is critical to the effectiveness of the plans and programs that will be created, developed and implemented later.

New York-headquartered Cornell University, the European Institute of Business Administration, a European business university in France, and the World Intellectual Property Organization (WIPO) have jointly published the Global Innovation Index since 2007. The KIE project was initiated by Professor Datta to determine how to find metrics and approaches that better reflect the wealth of innovation in society and go beyond traditional innovation metrics.

In addition to being the leading reference tool for measuring the innovation performance of an economy, it is a valuable benchmarking tool that can facilitate dialogue between the public and private sectors and allows policymakers, business leaders and other stakeholders to assess innovation progress annually. In addition to measuring the effectiveness of innovation, innovation indices provide countries with some clues to implement sustainable innovation (Global Innovation Index 2020).

In fact, as the detailed results of the innovation input and output sub-indices are published, these data also allow inferences about the development and sustainability of public-private initiatives in national innovation and research activities, as well as cross-country comparison. KIE reports innovation capacity indicators and results, including an annual ranking of countries (approximately 140 countries) in terms of innovation capacity and success.

Despite all this, if we look at the global innovation ranking of top 10 countries, we can see that Azerbaijan is ranked 80th which is 2 steps better than 2020.

Table 2. Global Innovation Index for 2020-2021

Country	Score		Rank	
	2020	2021	2020	2021
Switzerland	66.08	65.5	1	1
Sweden	62.47	63.1	2	2

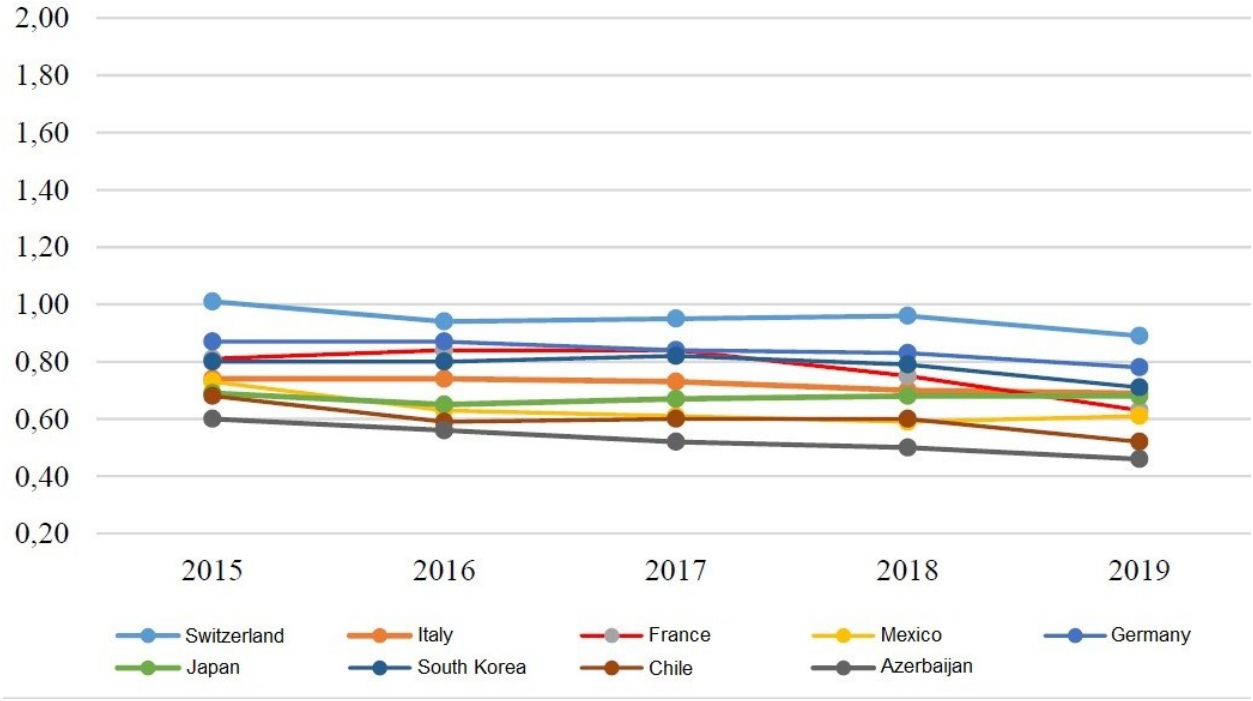
United States of America	60.56	61.3	3	3
United Kingdom	59.78	59.8	4	4
Netherlands	58.76	58.6	5	6
Denmark	57.53	57.3	6	9
Finland	57.02	58.4	7	7
Singapore	56.61	57.8	8	8
Germany	56.55	57.3	9	10
Azerbaijan	27.23	28.4	82	80

Source: Global Innovation Index 2021: Which are the most innovative countries? (wipo.int)

Compared to 2020, Azerbaijan has achieved success in the growth of institutions, and these successes are reflected in such categories as Human Capital and Science, Business Development, Technology and Knowledge Economy. Thus, in the ranking of innovations, the rating of Azerbaijan has improved by two steps compared to the previous year. In order to develop innovative entrepreneurship, the state must pay great attention to the development of high professional skills.

Since the level of innovation productivity of a country is calculated as the ratio of the score of the output sub-index to the score of the input sub-index; Since the indicator is higher, this indicates a high level of effectiveness of all efforts and activities to study innovation for the country. In other words, this ratio shows what innovation gain this or that country received for its resources. Accordingly, the overall course of the innovation productivity indicators of some OECD countries and Azerbaijan in the classification of the global innovation index (2019) for 2015-2019 is shown in diagram 3.

Figure 1. Trends in innovation productivity indicators in selected OECD countries and Azerbaijan (2015-2019)



Source: Mohnen, 2019

The Innovation Contribution sub-index evolves in relation to institutions, human capital, R&D, infrastructure, market and business development, which cover the elements of the national economy that support innovation. Indeed, human capital assets owned by public or private sector institutions in a country, research and development activities, infrastructure systems established, and the level of market and commercial development represent any necessary resources and efforts that contribute to innovation. Thus, the Innovation Contribution Index makes it possible to compare each country, identifying it with other countries, and on the other hand, it creates a large potential set of contributions for developing countries that are absent or are looking for solutions to their problems.

All types of work carried out in line with national innovation and research activities, of course, require a source of funding. At this point, when considering countries as a source of financial income, GDP levels come to the fore. In fact, plans, programs and projects that will create and implement policies in the country for these areas of activity are undoubtedly developing under the influence of GDP per capita in the country.

Since a country's high performance in national innovation and R&D increases national income, it also increases economic and social welfare. In this context, the main factors

determining the effectiveness of innovation and R&D are the number of production personnel, employment in knowledge-intensive sectors, high-tech exports and the number of patents. Products with high innovation potential, competitiveness and high profitability, contributing to economic development and increasing market share, include high-tech products.

The high-tech export indicator, which is often used in the EU, measures the technological competitiveness of countries, that is, their ability to commercialize the results of R&D and innovation in international markets. It also reflects the specialization of the product by country. The creation, use and commercialization of new technologies are important for the country's competitiveness in the modern economy.

The phenomenon of globalization makes it imperative for countries to interact with other economies in international markets and takes the commercial activities that are done today into another dimension. In parallel with this, the changing social order not only introduces important changes in the role of society in the national economy, but also adds new ones. In fact, national innovation and R&D, which is rapidly growing in importance today, are key elements in participating in international competition. While the private sector, which is the building block of the participants in this activity, comes to the fore with its work areas, it is important to develop the necessary modern policies that are appropriate for the era, with policy implementation initiatives, a support and incentive system that will increase the activity of politicians in the public sector and expand these areas.

To expand national innovation and R&D activities, in addition to the allocation of financial resources from the public to the private sector, another important issue is how and where financial resources are used by policy makers in terms of quantity and quality. In this regard, since implementation affects business development in terms of countries, national innovation and R&D efficiency, new policies can be developed by adopting model countries with positive results in other countries.

The main purpose of the development and implementation of innovations is to gain superiority in competitive strategy. World experience shows that investment in innovation leads to rapid development of the economy and improvement of living standards. At the same time, the development of innovative fields is sometimes observed with harm. For example, funds allocated to basic science are non-refundable. Currently, nanotechnology has not produced the expected results. Therefore, the effectiveness of innovation-oriented investments should be taken into account (Azizova, 2012).

The issue of commercialization of innovations and innovative processes is particularly important in the current market economy. The search for investors for the commercialization of advanced innovation projects is often considered a labor-intensive and sometimes unfulfilled endeavor. However, the state, which is highly effective in driving the economy towards innovative development trends, is not yet well developed for the mechanisms of legal, organizational and economic interaction of science, production and market.

In the modern world, techniques and technologies are changing relatively quickly. In such cases, it is necessary to adapt products and processes to local conditions and improve productivity and costs. Many of these changes take place in workplaces, not research labs. The overall impact of small changes in the product and processes in the country's economy may in many cases be greater than the new technology. In this respect, adapting existing technologies to local conditions can be as productive as innovations. Developing countries should focus their efforts on scientific research and experience building. Meanwhile, the government should assume mediation functions as a means of acquiring, mastering, adapting and developing technology obtained from abroad and assisting these efforts.

It is very important to implement measures aimed at establishing new enterprises at the qualitative level of modern industrial enterprises based on local raw materials, as indicated in the concept of long-term development of Azerbaijan. By 2020, the country is making plans for steel, oil and gas processing and petrochemical complexes, fertilizer, shipbuilding and cement plants, aluminum industry development, primary aluminum production, technological development, establishment of the chain, increasing the export potential of this sector. At the same time, the formation of industrial cities infrastructure in economic zones will allow state investment policy to focus on non-oil refinery industry development. The Decision on the Establishment of the Sumgait Chemical Industrial Park and the Implementation of the Decree on the Establishment of the Balakhani Industrial Park in Baku on December 28, 2011, Implementation of Systematic Measures are regulated in order to create favorable conditions for the development of innovative and high-tech competitive production in the country. However, it should be noted that in most regions of the country, the potential of scientific organizations is not sufficiently exploited. One of the main reasons for this is that scientific study products are not always competitive products. The violation of the existing relations of scientific organizations with enterprises has led to the separation of science and production almost everywhere. There is a need to develop a regional innovation strategy to address all existing disadvantages and expand regional innovation activities. The successful implementation of the oil strategy has created the necessary resources to finance the

development of economic zones. In this context, the State Program for the Socio-economic Development of the Regions of the Republic of Azerbaijan between 2009-2013 was approved by the Decree of the President of the Azerbaijan Republic dated April 14, 2009, in order to continue activities in the field of development of the regions. The purpose of this program is to accelerate the development of the non-oil sector in the country, diversify the economy, ensure balanced regional and socio-economic development and further improve the living standards of the population. To achieve the goals set in the State Program, the following tasks are envisaged:

- To ensure the rapid development of the non-oil sector by effectively using the natural and labor potential of the country;
- Continuing measures to improve infrastructure provision;
- To take purposeful measures to improve the business environment and accelerate the development of entrepreneurship;
- continued investment in the development of the economy;
- Promotion of the product for export;

The state establishes priorities in the field of innovation, the goals and principles of its policy. At this point, it is necessary to distinguish between scientific-technical and innovation policy. In the first case, the state pursues the goal of creating and using innovations that pay for new scientific knowledge, and in the second, for individual and public needs. State innovation policy is an important part of the socio-economic policy, which shows the forms of activity of states in the fields of science and technology, their direction, the goals of state bodies, the attitude of the state to innovation activity. This policy is a set of measures that increase the effectiveness of innovation to ensure the socio-economic development of the country and the full satisfaction of public needs.

3.2. Comparison of R&D expenditures in Azerbaijan – OECD countries

While capital stocks increase as countries develop based on investment and productivity, priority is given to efficiency in the production stages. On the other hand, in an innovative economy, innovations come to the fore and have the qualities of a development tool. In this regard, activities that will promote innovation and technological development should be prominent at the point of economic growth in countries such as Azerbaijan, which are in the stage of an economy based on productivity and investment.

Schumpeter's models of endogenous growth based on national innovation and R&D have important implications for developing countries. First, they introduce non-profit entrepreneurial activities that stimulate technological development and product launches. This indicates that there will be improvements for growth in policies and institutions that contribute to another factor. They also describe R&D spending that could stimulate the development of local technologies and lead to faster growth in developing countries. In addition, these models may allow technology spending in developed countries to have a positive impact on developing countries through the flow of goods and ideas, implying that policies that promote flows will generally promote growth. Thus, technologies developed by OECD countries contribute to increased productivity and production, as well as to the development of innovation and R&D in developing countries, to the extent that they are suitable for local needs. Indeed, this shows that R&D spillovers increase with trade, highlighting the positive impact of trade on the efficiency with which human capital generates new knowledge.

Today it can be seen that national innovation and R&D is given great importance in most countries, and policies are being implemented in this direction. In this regard, R&D spending is at the forefront of the main determinants of economic growth models in which information is incorporated. Spending on innovation and R&D in a country, contributing to economic development, ensures a high quality of life and is an important indicator of innovation in terms of meeting various market needs and achieving competitiveness with competing countries.

OECD countries, most of which have developed economies, attach great importance to national innovation and R&D, and their policies in this direction are being improved every year. In fact, since every research in this direction represents an expense, it involves the private sector, government spending, and spending on higher education in these countries. Expenditures on R&D, which are widely used when comparing countries in studies conducted in the relevant literature, are an important tool of analysis, as they show the extent of countries' activities in these areas.

Of course, in recent years, Azerbaijan has achieved many successes in the field of ICT, and it would be appropriate to link these successes with intellectual, business and intellectual development.Technological innovation expenditures in the industry amounted to 53.3 million dollars in 2010. Manat formed.

This figure decreased more than six times in 2015 compared to 2010. Although technological innovation costs increased by 1.5 times in 2018 compared to 2017, a downward trend has been observed in recent years. Calculations show that in the period 2015-2018, the

share of product innovations in the total amount of technological innovation in the industry was 90%.

Analyzing the distribution of investment in innovation in the sector and the types of activities in the Azerbaijan industry can give an idea about the nature of the current innovation processes. The first thing that is clear from the data is that the share of investment in innovations in domestic investment in fixed capital is very low.

Table 3. Expenditures on Technological Innovations in Industry by Innovation Types (Thousand Manats)

	2015	2016	2017	2018
All Industry	8139	31589	9326	13877
Product Innovation	7 952	30904	5975	11899
Process Innovation	187.3	684,6	3351	1978
Mining Industry	4.8	692,9	778	8197
Product Innovation	4.8	692,9	778	8052
Process Innovation	-	-	-	145
Manufacturing Industry	8 128	29319	8083	4066
Product Innovation	941	28634	5196	3847
Process Innovation	187.3	684,6	2887	219

Source: State Statistical Comittee of Azerbaijan Republic

Thus, in 2016, domestic investments in the sector amounted to 3.24 billion manats and the manufacturing industry - 848 million manats. In 2016, innovation investments were made mainly in the manufacturing industry (93.1% of investments), with an investment of 20.7 million manats. Innovation investments in 2016 relate to the beverage, oil refining and computer equipment industries.

Table 4. Innovation Expenditures in Industry and Processing (in Million Manats)

Country	Score		Rank	
	2020	2021	2020	2021
Switzerland	66.08	65.5	1	1
Sweden	62.47	63.1	2	2
United States of America	60.56	61.3	3	3

United Kingdom	59.78	59.8	4	4
Netherlands	58.76	58.6	5	6
Denmark	57.53	57.3	6	9
Finland	57.02	58.4	7	7
Singapore	56.61	57.8	8	8
Germany	56.55	57.3	9	10
Azerbaijan	27.23	28.4	82	80

Source: State Statistical Comittee of Azerbaijan Republic; Research and development (R&D) - Gross domestic spending on R&D - OECD Data

In the context of market relations, difficulties have arisen in Azerbaijan regarding the prospects for the development of science. These difficulties include the lack of a legislative framework for the development of science, the funding of science, the increase in the natural age of scientific personnel, the sharp decline in the prestige of science and pedagogical activities, and so on. Today, the funding of science is one of the most serious problems and is important in maintaining the scientific potential of the country. This problem also makes it difficult for Azerbaijan to enter the world arena as a developed country. Today, Azerbaijan is among the developing countries, but in the conditions of modern market economy, adaptation to the global information space, the sustainability of this development requires the development of scientific potential. Because, first of all, the development of science creates a favorable opportunity to change the structure of the formation of the gross national product.

Table 5. Financing of R&D in Azerbaijan

	2015	2016	2017	2018
Total expenditure, mln manats	88,9	92,1	109,8	122,0
Share in GDP	0.2	0.3	0.4	0.4
Share in budget expenditure	0,8	0,8	0,7	0,6

Source: State Statistical Comittee of Azerbaijan Republic

The figures in the table confirm that there is a problem in financing the country's research sector, but the issue cannot be solved by increasing budget allocations. The study of foreign experience has shown that the private sector plays a crucial role in funding research,

and the share of this sector in funding is more than 70%. In this regard, it is necessary to pay attention to the structure of funding for research in the country, and the indicators in the table below provide the necessary insights into this issue.

It is clear that in this structure of funding, the overall program-targeted organization of research has a very limited scope, but at the same time it should be noted that the high share of the state budget in funding does not directly reflect the low level of program-targeted organization of research. Because a significant part of the budget allocations can be spent in principle on the basis of the program-targeted organization of research work. However, it is known that the vast majority of science allocations from the state budget are spent on the basis of administrative-organizational methods, and the share of the newly established Science Development Fund is still limited to 7 million manat per year.

Thus, in fact, it is obvious that the program-targeted organization of research as a whole is not yet widely used, but this aspect is more pronounced in the division of research funding into sectors. Therefore, let's consider the distribution of research funding by sectors.

It should be noted that even these indicators do not provide detailed information on the program-targeted organization of such research as a whole, and the increase in the share of the higher education sector in funding in recent years does not confirm the expansion of program-targeted organization of research as a whole.

Because it is a mistake to perceive the program-targeted organization of research as a whole only as the financing of individual projects. The program-oriented organization of R&D as a whole envisages the implementation of projects aimed directly at innovation processes or the study of issues that are very important in terms of socio-political, spiritual and cultural interests of the country.

3.3 Overview of Innovation ecosystem in Azerbaijan and evaluation of innovation strategies

There is still a lack of coordination and consistency in Azerbaijan's innovation strategy, which results in the policy's being dispersed among a wide variety of legal and strategic documents and entities. As a consequence of this, the President of the Republic of Azerbaijan issued a decree on January 10, 2019, charging the Presidential Administration with the responsibility of formulating a national innovation strategy as well as an associated action plan in order to address the resulting policy gaps. A national Innovation Strategy for Azerbaijan is

now being drafted by the Boston Consulting Group (BCG), which was recruited for the project; however, the process is not yet at its conclusion (Babayev & Hajiyev, 2019).

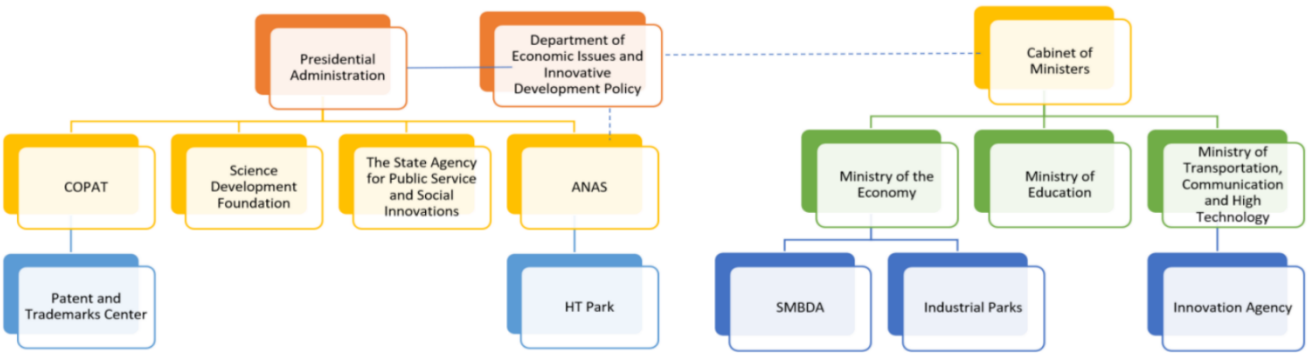
In the National Strategy for the Development of Information Society during 2014-2020, which was approved by a presidential decree on April 2, 2014, the primary goal of STI is defined as strengthening competitive and export-oriented high-tech industry and establishing an innovation system, both of which will ensure the development and application of knowledge-intensive and high-tech products. The National Strategy for the Development of Information Society was approved on April 2, 2014. Among the many goals, one of the clauses relates to the encouragement of creative company ventures and the establishment of technology parks, business incubators, and innovation organizations (Huseynova et al., 2019).

On September 20, 2016, the president of Azerbaijan signed a decree for the approval of the state program on the implementation of the National Strategy for Information Society Development in Azerbaijan for the period of 2016-2020. This was done to ensure that the strategy would be put into action as intended. This program lays out the specific goals that must be accomplished and assigns responsibility for achieving those goals to a variety of government agencies. These agencies are tasked with the organization of educational and promotional activities among small and medium sized businesses (SMEs), on the expansion of the application of information and communications technology (ICT) solutions; the development of innovative entrepreneurship in the field of ICT; and support for the creation and implementation of science-intensive and high-tech products.

Following the implementation of decree No. 881 on the 10th of January 2019, titled "On Coordination of the Field of Innovative Development in Azerbaijan," there has been an increase in the level of coordination within the realm of innovations. In accordance with this decree, the representatives of central executive bodies like the Azerbaijan National Academy of Sciences along with a variety of public legal entities, state-owned legal entities, and higher state-run educational institutions are required to appoint a responsible coordinating person for issues relating to innovative development. Compiling and submitting semi-annual reports on creative advancements in their respective state organizations should be the responsibility of the person responsible for coordination. The Department of Economic Issues and Innovative Development Policy of the Presidential Administration of the Republic of Azerbaijan will be taking the lead in accumulating and evaluating the country-wide data that is produced as a

consequence of this study. The governance structure of the major state bodies involved in STI is outlined in Table 6 (Babayev & Hajiyev, 2019).

Figure 2. Major state bodies involved in STI



Source: Ibraghimov, 2022

According to the Decree of the President of the Republic of Azerbaijan dated 22 February 2019 entitled On ensuring the activities of the Innovation Agency under the Ministry of Transport, Communications, and High Technologies of the Republic of Azerbaijan, the central executive authorities, state-owned legal entities, and public legal entities are required to seek agreement regarding drafts of normative legal acts related to innovation activity before submitting them to the norm-setting body (Arzuman, 2021).

When it comes to the formulation of policy recommendations, particularly for state development projects, international consulting companies are receiving an increasing number of requests for assistance. For example, the strategic roadmaps for the expansion of the economy and the general plan for the development of the capital city of Azerbaijan both profited from the incorporation of information gained from foreign sources. In 2019, the President of the Republic of Azerbaijan's Administration's Department of Economic Issues and Innovative Development Policy collaborated with the Boston Consulting Group to hire a team of consultants to develop an innovation strategy for Azerbaijan. These consultants came from the Boston Consulting Group. Plans for the preparation of drafts of state programs and of normative legal acts are approved and published in the manner that is prescribed for acts of the norm-making bodies that approve them, as is mentioned in the Law on Normative Acts, which provides a general framework for the publicizing the planning activities in the preparation of draft normative legal acts. This law also mentions that the plans for the preparation of drafts of normative legal acts are approved and published in the manner that is prescribed for acts. The

main prerequisites for public engagement in the design of STI policy are laid out in detail by the legislation in Azerbaijan. However, the same law does not establish a requirement for norm-making bodies to publish drafts of their decisions or specifications for how detailed the published information should be, including any timeframes that have been decided upon. It only mandates that approved plans for the preparation of draft state programs and normative legal acts be forwarded to the relevant authorities for information (Hasanov & Akbulaev, 2020).

New amendments to Azerbaijan's tax law come into effect on January 1 in order to give monetary benefits for small and medium-sized organizations (SMEs). For instance, a tax break was granted for small creative businesses for a period of three years following the date of certification. However, the system for issuing these Startup Certificates is still being developed, and no certificates have been granted as of yet. The certifications will be issued by the interministerial committee that was established under the direction of SMBDA (The Small and Medium Business Development Agency). Two additional new concepts have been introduced as a result of the amendments made to the tax code. These new concepts are the SME cluster company, which is a legal entity that has been granted a special certificate of eligibility, and the SME cluster members, who are also legal entities or individuals who have been granted a special certificate and have entered into a contract with a cluster company. In May of 2019, the criteria for recognizing SME Clusters were legislated, and according to Azerbaijani legislation, a cluster is best characterized as a value-chain model that is constructed by SMEs around a single anchor business. According to the criteria, a SME cluster company is a commercially registered legal entity that enters into business agreements with at least ten micro, small, and medium-sized enterprises that are not related to one another as part of a SME cluster project and obtains at least fifty percent of its raw materials from regional producers who are also members of the cluster. In addition, the SME cluster company must have a commercially registered legal entity (Akhundova, 2020).

Participants in SME Clusters can receive particular tax benefits for themselves and their businesses according to the tax legislation. These privileges are applicable to a SME Cluster company for up to seven years from the date of its registration in the SME Cluster Register and provide exemption from income, land, and property tax. Additionally, any imported technical or technological manufacturing and/or processing equipment will be exempt from VAT for the same period of time, depending on the applicable confirming certificate provided by the SMBDA. Individuals who fall under the category of micro-entrepreneurs will be exempt from

the taxes listed above beginning in 2019 on 75% of the revenue that is attributable to their entrepreneurial activity. This is in addition to the exemptions already specified.

In addition, those who resided in high-tech and industrial parks were given favorable tax and customs treatment under the new regulations. As of the 21st of December, 2012, according to the tax code, residents who live in industrial or technology parks created by the state are now eligible for exemptions from income, property, and land taxes as well as from the value-added tax (VAT) on imported machinery and technical equipment. Additionally, these residents are exempt from the VAT on imported machinery and technical equipment. These tax breaks were only good for a period of seven years before to 2019, but as of the 29th of November in that year, they are now good for a period of ten years. In accordance with the statute that governs customs tariffs in Azerbaijan, residents of industrial or technology parks that were created by the state are exempt from paying customs charges on the import of technological equipment and gadgets for a period of seven years beginning on January 19, 2016, beginning with the first year of their exemption. A tight working relationship with the Ministry of Transport, Communications, and High Technologies is required for the creation of the plans. The government offers small and medium-sized businesses (SMEs) a variety of financial opportunities through its Entrepreneurship Development Fund, while the Innovation Agency and SMBDA are seeking to develop their own funding opportunities (Akhundova, 2020)..

The National Fund for Entrepreneurship Support was replaced in 2018 by a public organization known as the Entrepreneurship Development Fund, which was established under the Ministry of the Economy with the objectives of enhancing the support system for the development of entrepreneurship, establishing new production and processing businesses based on cutting-edge technologies in non-oil sectors, securing the financing of export operations, and accelerating investments in the real sectors of the economy. The National Fund for Entrepreneurship Support had been in existence since 2011. The annual interest rates on concessional loans that are given by the Entrepreneurship Development Fund have seen a reduction from 6% to 5% in order to make the loans more appealing to businesses and to make them more feasible for them to use. These loans may be obtained along with a plethora of other credit options ranging from little to medium to huge amounts. The fund's services are provided through the local banking sector because its predecessor organization was criticized for having onerous requirements that restricted access to finance for newly founded firms by requiring guarantors and significant amounts of collateral. In other words, these requirements restricted

access to financing for newly founded businesses. The State Fund for Development of Information Technologies, which is managed by the Ministry of Communication and High Technologies of the Republic of Azerbaijan, provided financial assistance to innovative small and medium-sized enterprises (SMEs) throughout the period of 2012–2018. The fund's activities were entirely funded from the state budget, and the fund itself was administered by the Ministry of Communication and High Technologies (Hajıyeva, 2018).

The following is a list of the most notable methods out of the various ones utilized by the ICT Fund (which has since been merged with the Innovation Agency) in order to aid cutting-edge ICT initiatives:

- Concessional loans, which are loans with interest rates no more than 5% that are provided by institutions that have been granted permission to do so (small, medium, and large loans).

The majority of grants were awarded to small and medium-sized enterprises (SMEs) for the development of new software products, e-services, and infrastructure innovations. There were three different sized grants available, namely small, medium, and large. Each funded project had a maximum period of thirty-six months, and it went through a three-stage review process that included evaluations from the fund's own specialists as well as evaluations from outside experts and the board of directors of the fund.

The ICT Fund's Supervisory Board consisted of seven individuals, four of them were appointed to represent government institutions, while the remaining three were appointed to represent civil society (3 members). It is remarkable that there is no representation from the business sector. Between the years of 2014 and 2018, there were a total of six grant competitions, and the winners' prizes were distributed to 117 different companies. The winning applicants were granted access to the incubation facility that is located within the High Technology Park. This facility is managed by the Ministry of Transport, Communications, and High Technologies. Representatives of the innovation ecosystem have expressed their optimism that the new method proposed by the Innovation Agency for the distribution of grants and loans will address the gaps and deficiencies that exist in the operability of the ICT Fund. In particular, they are concerned about the limited approach that primarily focuses on the IT industry. The organization of startup competitions, in this sense, serves as one of the potential funding sources for innovative businesses still in the concept stage.

Research and development in Azerbaijan receives inadequate funding because it only represents for 0.2% of the country's GDP. This percentage is much lower than the OECD

average of 2.5%. Only around 0.03% of Azerbaijan's GDP is set aside for applied research, and the country's severe lack of financial resources to fund research and development has a negative impact on any innovation-driven economic advancement that may occur. It is anticipated that the national innovation strategy would contribute partially to the solution of this problem by introducing new financial schemes and legislative mechanisms to support applied research.

Table 6. Financing of Research and development and science

	2012	2013	2014	2015	2016	2017	2018	2019
expenditures for science from state budget, million manat	116.7	117.0	124.2	113.2	110.2	109.8	117.8	122.3
in percent to GDP	0.21	0.2	0.21	0.21	0.18	0.16	0.15	0.15
in percent to state budget expenditures budget expenditures	0.67	0.61	0.66	0.64	0.62	0.62	0.52	0.50

Source: State Statistical Comittee of Azerbaijan Republic

Table 7. Gross expenditures for R%D

	2012	2013	2014	2015	2016	2017	2018	2019
Gross expenditures for research and development works - total, thsd manat	120 264.0	125 987.8	128 647.4	123 230.4	129 289.8	132 340.0	150 532.1	171 067.6
including:								
domestic expenditures for research and development works	117 347.1	121 968.0	123 804.4	120 943.6	124 721.3	129 871.8	147 468.3	163 890.4
of which:								
current domestic expenditures for research and development works	113 807.4	116 976.3	118 465.9	118 643.3	120 782.3	127 997.0	144 997.9	161 299.9
capital expences for research and development works	3 539.7	4 991.7	5 338.1	2 300.3	3 939.0	1 874.8	2 470.4	2 590.5
external expenditures	2 916.9	4 019.8	4 843.4	2 286.8	4 568.5	2 468.2	3 063.8	7 177.2

for research and development works								

Source: State Statistical Comittee of Azerbaijan Republic

The presidential decree that is titled On the formation and running of the industrial estates is responsible for regulating the activities that take place within the industrial zones. Industrial sites are multi-sectoral, specialized manufacturing compounds that offer advantageous conditions to small and medium-sized enterprises (SMEs). Applicants for industrial estates are selected based on the likelihood that they will interact with the other inhabitants of the complex. Industrial parks are specialized industrial complexes catering to multinational corporations that specialize in a certain industry. Industrial park tenants are eligible for the following benefits: exemption from corporate and income taxes for a period of seven years following registration; exemption from land taxes for a period of seven years; exemption from real estate taxes for a period of seven years; and exemption from value-added tax for a period of seven years on imported production-related machinery, facilities, and goods. One of the primary goals of the industrial parks, which are overseen by the Ministry of Economy, is the expansion of scientific study and technological know-how as a whole. Small and medium-sized businesses (SMEs) make up the vast majority of residents in industrial estates. Although SMEs are ineligible for the financial incentives offered to residents of industrial parks, they may still reap the benefits of programs that are specifically designed to meet their requirements. The Azerbaijan Investment Company (AIC), which was founded by the Ministry of Economy and provides opportunities for co-investment, is in charge of maintaining the industrial parks in the country. There are now three parks that are reserved solely for innovative small and medium-sized enterprises (SMEs). One of these parks is the High-Tech Park of ANAS, which reportedly has housed eight firms since it debuted in 2017. The Innovation Agency welcomed its first four residents in July 2020, splitting them between the two parks it maintains, one in the city of Pirallahi and the other in the city of Mingechevir. Residents of these three parks are eligible to receive free business support services, tax exemptions from the 18% VAT on imported infrastructural and technical items and services, as well as tax exemptions on earnings, for the first seven years of their park residency. In addition, residents are exempt from taxation on their earnings.

In the year 2014, the Baku Business Training Center, which operates under the supervision of the Ministry of Economy, established the first business incubator in the

Azerbaijani region of Guba Khachmaz that is supported financially by the state. This incubator is now a component of SMBDA. Since then, there has been a consistent rise in the number of incubation facilities that are run by both the government and the commercial sector. For example, the SMBDA now operates two business incubators in the local Azerbaijan region, and one of its key performance indicators (KPIs) is the development of plans to construct five additional incubators in the near future. The first private Barama Innovation & Entrepreneurship Center was established in 2009 with the assistance of Azercell Telecom LLC and PASHA Bank. However, the Innovation Agency has been in charge of managing this incubator since since it was established in 2018. Incubator centers are also operated by public and private universities in Azerbaijan. Some examples include the ISE startup Club at UNEC, the ADA University Innovation Lab, the Techno Park of the Baku Engineering University, the Techno Park of the West Caspian University, the Eazi Startup Center at the Azerbaijan State Oil and Industry University, and others (ADAIL). An example of effective collaboration between the public sector and the commercial sector is provided by the INNOLAND facility, which brings together a number of participants in the creative ecosystem of the country, among them the Next Step Incubator. Additional private firm incubators include the Social Innovation Lab (SIL), BBF, Youth Inc., Idrak Technology, the Innova Startup Factory, and the Lotfi Zadeh Technology Center. These business incubators offer a wide range of services to their clients, including help tailored to a particular sector. As there is currently no explicit regulation governing the activities of business incubators, these organizations frequently operate either as for-profit corporations or as nonprofit organizations. This is due to the fact that there is no explicit regulation governing the activities of business incubators. Both the certification of business incubators and the evaluation of the services that they provide will be made possible thanks to the work that is now being done by the Innovation Agency to develop the standards and model regulations that will apply to these organizations (Rahmanov et al., 2018).

Conclusion

Innovation, which has become a system in the national context, has further enhanced the importance of research and development, which has been a part of life since the dawn of mankind, and these two activities have become an integral part of the socio-economic relations that complement each other. In fact, the increasing importance of these activities, which are key factors in achieving competitive advantage, has led to an increase in investment, which is a necessary cost for these activities, and therefore R&D spending, which is an important indicator, in OECD countries, especially in countries developed economies, as in the rest of the world. In this context, the growing importance of activities has forced policy makers, especially in developing countries, to adopt some cost-oriented rules and practices to encourage and encourage the private sector to engage in this activity. This study, which concerns Azerbaijan and OECD countries, made a historical analysis of national innovation and R&D policies in countries, and it was seen that most of the important policy initiatives for these areas of activity began to develop in the OECD. countries after World War II. In Azerbaijan, it was found that this phenomenon began to develop slowly after privatization in the 1990s and has intensified over the past five years. In addition, the tendency of politicians towards elements of incentive support to expand these areas of activity in general in OECD countries has developed mainly for the provision of non-tax support, such as loans and grants, and tax support in Azerbaijan.

Along with the increase in private sector R&D spending in OECD countries since the 2000s, there has been a trade-off between public sector R&D spending and higher education. This can be explained by the creation by the public of research institutes as regulators and stewards, the promotion of R&D-supported research activities by the private sector and universities, and the role played by the commercialization of research results by the private sector. In fact, as a result of market-oriented investment planning through public spending on R&D, the private sector did more R&D; the direction of patenting and innovation activities were gaining momentum. In OECD countries that can achieve high levels of innovation and productivity, investment in information and communication technology has been integrated with new business strategies, processes and organizational structures and increased the share of high-tech products in exports by increasing labor productivity.

Developed and sound economy, good infrastructure and efficient and stable policy for national innovation and R&D, private sector R&D in the leading country Switzerland, Japan,

South Korea and Germany, which demonstrate high innovation performance and come to the fore in public procurement. This provided an increase in the overall cost/investment rate of Ge. In these countries, which mostly apply to non-tax incentives, public R&D spending in terms of implementation and funding remains higher than the OECD average. Prepared support plans, programs and projects were comprehensively organized in terms of quantity and quality, mainly aimed at encouraging small and medium-sized enterprises. In addition, long-term lending opportunities and large grants are among the policy instruments frequently used in these countries. In fact, public R&D spending in these countries has been high in high value-added investment areas such as manufacturing and technology, and R&D employment in the public sector has gradually increased. Since education and employment, which are the main elements of human capital, are of great importance, important reforms have been carried out in these areas. In Azerbaijan, which has the lowest national innovation score among OECD countries, it is not possible to speak of a strong, stable and sustainable innovation and R&D policy, despite an increase in policy initiatives over the past five years. Direct support for expanding national innovation and R&D remains weak in terms of quantity and quality sufficient to encourage the private sector to do so. The lack of available resources in the country was seen as the biggest obstacle to doing so. On the other hand, the inability to effectively use the insufficient resources allocated in the field of science and technology, especially for the development of the national innovation and research culture, the lack of a harmonious education system regarding these activities, the inadequacy of the university-industry-public cooperation leads to the fact that the indicators input and output innovation in the country and, consequently, productivity become low.

The fact that the higher education sector stands out as the segment that most influences the national innovation and research activities, with its function of conducting basic research, is due to the fact that it is the field of production of the information used. This situation highlights the positive externalities of R&D cooperation. Therefore, innovation and R&D policies that are compatible with social, economic and environmental concerns should be developed through the establishment of cooperation between the private, public and higher education sectors. In addition, scientific and technical partnerships established between the public and private sectors and universities contribute to the success of countries in adapting to social and global changes. In fact, the effective role of intermediary institutions in these areas of activity should be further strengthened.

Today, it is international commercial relations that are formed depending on the level of efficiency and achievements of the parties in national innovation and research activities. These areas of activity that require government intervention can be expanded with supportive stimulus policies based primarily on public spending, especially for developing countries. However, it is important that public spending to be made in this direction be directed towards high-impact/value-added activities, especially industrial production and technology. In addition, the fact that the policy framework to be put in place to enhance national innovation and R&D is encouraging, stable, efficient, and especially sustainable encourages actors involved in activities to invest more in this research. These policies, which ensure public participation in national innovation and R&D and complement the private sector, can take the country to a different place, promoting development and growth in an increasingly competitive environment.

Reference list

1. Akhundova, N. (2020). Current Situation And Prospects Of Development In The Sphere Of Financing Of Small And Medium Business Entities In The Republic Of Azerbaijan. Economic and Social Development: Book of Proceedings, 3, 174-183.
2. Arundel, A., Bloch, C., and Ferguson, B. (2019). Advancing Innovation in the Public Sector: Aligning Innovation Measurement with Policy Goals. Research Policy. pp. 789-798.
3. Arzuman, H. (2021). Problems Of The Development Of State-Business Cooperation In Azerbaijan. Economic and Social Development: Book of Proceedings, 500-508.
4. Babayev, B., & Hajiyev, N. (2019). Building an innovation ecosystem in Azerbaijan-on the basis of the study of israeli practice. Economic and Social Development: Book of Proceedings, 312-319.
5. Balzat, M., and Hanusch, H. (2004). Recent Trends in The Research on National Innovation Systems. Journal of Evolutionary Economics. Volume 14, pp. 197-210.
6. Baregheh, A., Rowley, J., and Sambrook, S. (2009). Towards a Multidisciplinary Definition of Innovation. UK: Management Decision
7. Behera, P., & Sethi, N. (2022). Nexus between environment regulation, FDI, and green technology innovation in OECD countries. Environmental Science and Pollution Research, 1-14.
8. Bergek, A., Staffan, J., Bo, C., Sven, L. and Annika, R. (2008). Analyzing The Functional Dynamics of Technological Innovation Systems: A Scheme of Analysis. Research Policy. Volume 37, Issue 3, pp. 407-429
9. Bessy, C., and Chauvin, P.-M. (2013). The Power of Market Intermediaries: From Information to Valuation Processes. Valuation Studies. Volume 1, Issue 1, pp. 83–117.
10. Bommert, B. (2010). Collaborative Innovation in The Public Sector. International Public Management Review, Volume 11, Issue 1, pp. 15-33.
11. Borins, S. (2001). Encouraging Innovation in The Public Sector. Journal of Intellectual Capital. Volume 2, Issue 3, pp. 310-319.
12. Borrás, S., and Edquist, C. (2013). The Choice of Innovation Policy Instruments. Technological Forecasting & Social Change. Volume 80, Issue 8, pp. 1513–1522.
13. Cabrilo, S., Nesic, L. G., and Mitrovic, S. (2014). Study on Human Capital Gaps for Effective Innovation Strategies in the Knowledge Era. Journal of Intellectual Capital. Volume 15, Issue 3, pp. 411-429.

14. Campbell , J. L. (2007). Why Would Corporations Behave in Socially Responsible Ways? An Institutional Theory of Corporate Social Responsibility. The Academy of Management Review. Volume 32, Issue 3, pp. 946-967.
15. Castaño, M.-S., Méndez, M.-T., and Galindo, M.-Á. (2015). The Effect of Social, Cultural, and Economic Factors on Entrepreneurship. Journal of Business Research. Volume 68, Issue 7, pp. 1496-1500.
16. Chesbrough, H. W., and Appleyard, M. M. (2007). Open Innovation and Strategy. California Journal of Management. Volume 50, Issue 1, pp. 57-76.
17. Dang, J., and Motohashi, K. (2015). Patent Statistics: A Good Indicator for Innovation in China? Patent Subsidy Program Impacts on Patent Quality. China Economic Review. Volume 35, Issue C, pp. 137-155.
18. Edler, J. and Georghiou, L. (2007). Public Procurement and Innovation—Resurrecting The Demand Side. Research Policy. Volume 36, Issue 7, pp. 949–963
19. Engen, M., and Holen, I. E. (2014). Radical Versus Incremental Innovation: The Importance of Key Competences in Service Firms. Technology Innovation Management Review. Volume 4, Issue 4, pp. 15-25.
20. European Commission. (2019). European Innovation Scoreboard 2019: Methodology Report. European Commission
21. Fagerberg, J. (2003). Schumpeter and The Revival of Evolutionary Economics: An Appraisal of The Literature. The Journal of Evolutionary Economics. Volume 13, Issue 2, pp. 125-159.
22. Franz, H. -W., Hochgerner, J., and Howaldt, J. (2012). Social Innovation Theories: Can Theory Catch Up with Practice? G. Mulgan, Challenge Social Innovation: Potentials for Business, Social Entrepreneurship, Welfare and Civil Society (pp. 19-42). London: Springer Heidelberg New York Dordrecht
23. Fukuda, K. (2020). Science, Technology and Innovation Ecosystem Transformation Toward Society 5.0. International Journal of Production Economics. Volume 220, Issue C, pp. 1-14
24. Fukuyama, M. (2018, July / August). Society 5.0: Aiming for a New Human-Centered Society. Japan SPOTLIGHT, pp. 47-50.
25. Gani, A. (2009). Technological Achievement, High Technology Exports and Growth. Journal of Comparative International Management. Volume 12, Issue 2, pp. 31-47
26. Gault, F. (2013). Handbook of Innovation Indicators and Measurement. UK: Edward Elgar Publishing

27. Godin, B. (2009). National Innovation System: The System Approach in Historical Perspective. Science, Technology and Human Values. Volume 34, Issue 4, pp. 476-501.
28. Hajiyeva, S. (2018). Priority Directions Of State Support To Small And Medium-Sized Entrepreneurship In The Agrarian Sector Of The Republic Of Azerbaijan. Интернаука, (6), 62-65.
29. Hall, B., and Rosenberg, N. (2010). Handbook of The Economics of Innovation. North-Holland: Handbooks in Economics, Volume 01.
30. Halpern, N. (2010). Marketing innovation: Sources, Capabilities and Consequences at Airports in Europe's Peripheral Areas. Journal of Air Transport Management. Volume 16, Issue 2, pp. 52-58.
31. Halvorsen, T., Hauknes, J., Miles, I., and Røste, R. (2005). Innovation in the Public Sector: On the Differences Between Public and Private Sector Innovation. Publin Report No. D9, NIFU STEP, Oslo.
32. Harris, R., and Moffat, J. (2011). R&D, Innovation and Exporting. SERC Discussion Paper 73.
33. Hartley, J., Sørensen, E., and Torfing, J. (2013). Collaborative Innovation: A Viable Alternative to Market Competition and Organizational Entrepreneurship. Public Administration Review. Volume 73, Issue 6, pp. 821-830.
34. Hasanov, N., & Akbulaev, N. (2020). Innovative development of key sectors of economy based on the creation of technological parks in the Republic of Azerbaijan. New Trends and Issues Proceedings on Advances in Pure and Applied Sciences, (12), 44-56.
35. Hittmár, Š., Varmus, M., and Lendel, V. (2014). Proposal of Model for Effective Implementation of Innovation Strategy to Business. Procedia - Social and Behavioral Sciences. Volume 109, pp. 1194-1198
36. Hornborg, A. (2011). Technology as Fetish: Marx, Latour, and the Cultural Foundations of Capitalism. Theory, Culture & Society. Volume 1, Issue 4, pp. 119-140.
37. Huseynova, A., Salifova, T., & Mazanova, O. (2019). Estimation of innovation activity of the regions of the Azerbaijan republic. Economic and Social Development: Book of Proceedings, 41-50.
38. Hutschenreiter, G., Weber, J., and Rammer, C. (2019). Innovation Support in The Enterprise Sector: Industry and SMEs. OECD Science, Technology and Industry Policy Papers, 82.

39. Ibraghimov, E. A. (2022). Management of Innovation in Azerbaijan: Relationships with Competitiveness and Sustainable Development.
40. Kerr, W. R., and Nanda, R. (2015). Financing Innovation. Bank of Finland Research Discussion Papers. Pp. 1-27.
41. Kurz, H. D. (2008). Innovations and Profits Schumpeter and The Classical Heritage. Journal of Economic Behavior & Organization. Volume 67, Issue 1, pp. 263-278.
42. Lember, V., Kattel, R., and Kalvet, T. (2014). Public Procurement and Innovation: Theory and Practice. Public Procurement, Innovation and Policy: International Perspectives (pp. 13-34). Springer Publications.
43. Malerba, F. (2006). Innovation and The Evolution of Industries. Journal of Evolutionary Economics. Volume 16, Issue 1, pp. 3-23.
44. Martin, S. and Scott, J. T. (2000). The Nature of Innovation Market Failure and The Design of Public Support for Private Innovation. Research Policy. Volume 29, Issue 4-5, pp. 437-447.
45. Mohnen, P. (2019). R&D, innovation and productivity. The Palgrave handbook of economic performance analysis, 97-122.
46. Moser, P. (2013). Patents and Innovation: Evidence from Economic History. Journal of Economic Perspectives. Volume 27, Issue 1, pp. 23-44.
47. Norman, D. A. and Verganti, R. (2014). Incremental and Radical Innovation: Design Research vs. Technology and Meaning Change. Massachusetts Institute of Technology. Volume 30, Issue 1, pp. 78-96
48. OECD. (2018). OECD Science, Technology and Innovation Outlook 2018: Adapting to Technological and Societal Disruption. Paris: OECD Publications
49. OECD. (2019). University-Industry Collaboration: New Evidence and Policy Options. Paris: OECD Publications
50. OECD. (2019). University-Industry Collaboration: New Evidence and Policy Options. Paris: OECD Publications.
51. OECD. (2020). Compendium of Information on R&D Tax Incentives 2019. http://www.oecd.org/sti/rd-tax-stats-compendium.pdf
52. Paic, A., and Viros, C. (2019, October). Governance of science and technology policies. OECD Science, Technology and Industry Policy Papers. No. 84.
53. Potts, J. (2003). Evolutionary Economics an İntroduction to the Foundation of Liberal Economic Philosophy. Discussion Paper No 324

54. Prajogo, D. I., and Sohal, A. S. (2006). The Integration of TQM and Technology/R&D Management in Determining Quality and Innovation Performance. The International Jaurnal of Management Science. Volume 34, pp. 296-312.
55. Rahmanov, F. P., Suleymanov, E., & Özdemir, Y. (2018). Improving the Institutional Environment of the Innovation Economy in Azerbaijan. AJIT-e: Online Journal of Information Technologies, 9(35), 7-15.
56. Ramadani, V., and Gerguri, S. (2010). Innovation: Principles and Strategies. MPRA Paper No. 22267
57. Scarbrough, H. (2003). Knowledge Management,HRM and The Innovation Process. International Journal of Manpower. Volume 24, Issue 5, pp. 501-516
58. Schneider, S., and Spieth, P. (2013). Business Model Innovation: Towards an Integrated Future Research Agenda. International Journal of Innovation Management. Volume 17, Issue 1, pp. 1-34.
59. Schot, J., and Steinmueller, W. E. (2018). Three Frames for Innovation Policy: R&D, Systems of Innovation and Transformative Change. Science Policy Research Unit. Volume 47, Issue 9, pp. 1554-1567
60. Schumpeter, J. (1939). Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process. New York Toronto London: McGraw-Hill
61. Shapira, P., Youtie, J., and Kay, L. (2011). National Innovation Systems and the Globalization of Nanotechnology Innovation. The Journal of Technology Transfer. Volume 36, Issue 6, pp. 587-604
62. Singh, A., and Majumdar, S. (2015). Technology and Innovation for Creating Social Change: Concepts and Theories. S. Majumdar, S. Guha, & N. Marakkath. Technology and Innovation for Social Change (pp. 109 123). London.
63. Smits, R. and Kuhlmann, S. (2004). The Rise of Systemic Instruments in Innovation Policy. International Journal of Foresight and Innovation Policy. Volume 1, Issue ½, pp. 4-32.
64. Sosa, M. L. (2013). Decoupling Market Incumbency from Organizational Prehistory: Locating The Real Sources of Competitive Advantage in R&D for Radical Innovation. Strategic Management Journal. Volume 34, Issue 2, pp. 245-255
65. Stenberg, A. (2017). What Does Innovation Mean - a Term Without a Clear Definition. http://www.diva-portal.org/smash/get/diva2:1064843/FULLTEXT01.pdf
66. Storper, M. and Scott, A. J. (2009). Rethinking Human Capital, Creativity and Urban Growth. Journal of Economic Geography. Volume 2, pp. 147-167

67. Takalo, T., and Tanayama, T. (2010). Adverse Selection and Financing of Innovation: Is There a Need for R&D Subsidies? Journal of Technology Transfer. Volume 35, Issue 1, pp. 16-41.
68. Taylor, S. P. (2017). What Is Innovation? A Study of the Definitions, Academic Models and Applicability of Innovation to an Example of Social Housing in England. Open Journal of Social Sciences. Volume 5, Issue 11, pp. 128-146.
69. Tishler, A., and Milstein, I. (2009). R&D Wars and The Effects of Innovation on The Success and Survivability of Firms in Oligopoly Markets. International Journal of Industrial Organization. Volume 27, Issue 4, pp. 519–531.
70. Tohidi, H., and Jabbari, M. M. (2012). Different Stages of Innovation Process. Procedia Technology. Volume 1, pp. 574-578.
71. Ungerman, O., Dedkova, J., and Gurinova, K. (2018). The Impact of Marketing Innovation on The Competitiveness of Enterprises in The Context of Industry 4.0. Journal of Competitiveness. Volume 10, Issue 2, pp. 132-148
72. Vivarelli, M. (2007, February). Innovation and Employment: A Survey. IZA Discussion Paper No. 2621, February
73. Watkins, A., Papaioannou, T., Mugwagwa, J., and Kale, D. (2015). National Innovation Systems and The Intermediary Role of Industry Associations in Building Institutional Capacities for Innovation in Developing Countries: A Critical Review of The Literature. Research Policy. Volume 44, Issue 8, pp. 1407–1418.
74. Zhao, F. (2005). Exploring The Synergy Between Entrepreneurship and Innovation. International Journal of Entrepreneurial Behaviour & Research. Volume 11, Issue 1, pp. 25-41.