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The impact of locating the Information and Communication Technology (ICT) firms in science and technology parks on their Innovation

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The impact of locating the Information and Communication Technology (ICT) firms in science and technology parks on their Innovation

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1. Executive Summary

Role of Science and Technology Parks (STPs) in supporting firms in different aspects to be more effective and profitable is clear to everyone. STP performance has a significant impact on every economy, regardless of at which level of development they are, so every economy needs to have a comprehensive report of their STP performances. In this paper, we aim to investigate the impact of establishing Information and Communication Technology (ICT) firms in STPs on their innovation, as Parks has provided a comprehensive convention from internal and external factors which affected the firm's performance such as suppliers, financial suppliers and so on. In this regards, we have utilized data from a national innovation survey in Iran which covers 962 ICT firms to investigate whether on-park firms are more innovative or off-park firms. Results indicate that locating information and communication technology sector NTBFs inside science and technology parks has little impact on their technological innovation level in Iranian Science and technology parks.

2. Introduction

Nowadays, Science and Technology Parks (STPs) are an important element in growth and development in both developing and developed countries. A majority of technology management experts believe that economic growth depends on Innovation capacity in long-term [1]. The innovation capacity depends on research and development (R&D) and application to respond market needs. This is almost an outcome of an innovative environment and creative manpower which can be found in new technology-

[1] Á. R. Vásquez-Urriago, A. Barge-Gil, and A. M. Rico, "Science and technology parks and cooperation for innovation: Empirical evidence from Spain," *Research Policy,* vol. 45, no. 1, pp. 137-147, 2016.

based firms (NTBFs)[2]. Findings present that STPs provide and share resources, reduce the risk for located firms and totally, make them more innovative. Hence, STPs can play a significant role in economic growth and the development as a place to locate firms[3].

STPs are places to locate technology incentive and innovative firms. They provide services and facilities such as infrastructure, financing, training and mentoring, commercialization, networking and so on, for located firms to foster their innovation activities and competitiveness[4]. There are 41 Science and Technology Parks in Iran which many located firms in these parks are active in ICT sector.

In this paper, we aim to investigate the impact of locating Information and Communication Technology (ICT) firms in Science and Technology Parks on their Innovation. There are several reasons for selecting ICT sector which will explain as follow. The first, Iran's Information and Communication Technology market volume is about 20 billion dollars and it is expected to increase to more than 30 billion dollars by 2020[5]. ICT and related sectors also have a huge share of the market. The second, based on The Perspective of Iran's Development, Iran is going to be one of the first three countries in Information and Communication Technology in the region (West Asia) by the end of the year 2025[6]. The Third, Iran has a great advantage over most of the countries on the same level and that is its young and educated manpower which can help this sector to grow in a proper and prompt way. The fourth, ICT sector is a High-Tech level of technology and it increases the importance of this sector. The fifth, Information and Communication Technology needs less machinery than other sectors. It can make it easier for newcomers to enter the market. Furthermore, governmental and financial institutions supports and funds for newcomers in this sectors have decreased the initial risk of a new company, since such companies are able to start their services. That's why ICT can make a massive value added in comparison with other industrial sectors.

On one hand, observing and monitoring the innovation activities in ICT firms will help the experts and managers to have a better understanding of their innovation status, on the other hand, it makes the government aware of what policy tools they need to implement in order to foster ICT development. In this regards, it is important to find and implement tools which can help to realize ICT firms' innovation level. One of the main tools is innovation survey.

Innovation Survey is a common tool for Science and Technology policymakers to measure the innovative behavior of firms in different aspects. It can also help them to evaluate the effectiveness of policies. Innovation survey can show firms status in the field of innovation and help them to get rid of barriers to an innovative atmosphere. Therefore, Innovation Survey is an appropriate tool for policymakers in macro level which is accurate and based on precise self-declared Information. It is also utilized as a compliment tool to monitor and evaluate other corporates[7].

Many countries utilize Innovation survey in different period time. Iran's vice-presidency of science and technology conducted Iran national innovation survey. We employed data from a National Innovation survey in Iran. The conductors of national innovation survey have covered all provinces and gathered enormous data from firms in 14 selected sectors including some NTBFs. The survey was started in 2015 A.D. and has observed participant firms' innovation activities from 2012 A.D to 2014 A.D. in a period of 3 years. To do this, 2563 questionnaires were distributed and 2,476 were answered

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[2] P. Lindelöf and H. Löfsten, "Science park location and new technology-based firms in Sweden–implications for strategy and performance," *Small Business Economics,* vol. 20, no. 3, pp. 245-258, 2003.

[3] A. Basile, "Networking system and innovation outputs: the role of science and technology parks," *International Journal of Business and Management,* vol. 6, no. 5, p. 3, 2011.

[4] F. Lamperti, R. Mavilia, and S. Castellini, "The role of Science Parks: a puzzle of growth, innovation and R&D investments," *The Journal of Technology Transfer,* vol. 42, no. 1, pp. 158-183, 2017.

[5] https://www.statista.com/statistics/557279/iran-telecom-industry-size/

[6] The 20-Year National Vision of the Islamic Republic of Iran for the dawn of the Solar Calendar Year 1404 [2025 C.E.]

[7] . H. Van de Ven, H. L. Angle, and M. S. Poole, *Research on the management of innovation: The Minnesota studies*. Oxford University Press on Demand, 2000.

acceptably. The survey has investigated 962 firms in information and communication technology sector.

We believe the results of this research will help managers and experts to acquaint the innovation status of firms in ICT. Another result of this paper is to clarify the impact of establishing firms in Science and Technology Parks on their innovation. Eventually, the results of this paper can provide policy recommendation in order to enhance the effectiveness of STP, and promote innovation in located firms. In this aim, after the discussion on main titles in Introduction, the third section of this research belongs to previous works for clarification and more discussion on main topics which authors have provided to investigate. Methodology and pathways have noted in the fourth section. Finally, results have shown and some notes have suggested in the last section.

3. Study Area and Previous Work

Theoretical Basis

Generally, Innovation needs two kinds of infrastructures; A Potential Innovation Infrastructure which called Innovation Capacity, and The Actual Innovation Infrastructure which called Innovation Capability. The Innovation Capacity has the vital importance of measuring Innovation as it is necessary for the realization of innovation[8]. The Innovation Capacity indicates the firm's capability to innovate ahead of competitors permanently. These capabilities must enable the firm to enter new markets and achieve a higher level of quality as well as faster in competition with other firms to gain a competitive advantage[9]. Contrary to the concept of innovation which has a relative consensus, the concept of innovation capacity has been defined in many ways. Therefore, there is little consensus to measure its variables, so related studies to the measurement of innovation capacity have not been so comprehensive[10][11]. In a review of previous works for measuring innovation capacity variables[12][13], we have divided them into two main groups of internal and external organization factors which internal organization factors included: personal characteristics of entrepreneurs, strategic planning, and organizational climate; and external factors are: customer cooperation, organizational location, and Institutional support[14][15][16].

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[8] M. Arasti, A. Karamipoor, and B. Ghoreyshi, "Investigation of Factors affecting Innovation Capacity: The Case of Industrial Automation Companies of Iran," *Iranian journal of management sciences,* vol. 4, no. Number 15, pp. 1-32, 2009

[9] . G. QIAN and L. LI, "Profitability of Small and Medium Sized Enterprises in High Tech Industry: The Case of the Biotechnological Industry," *Strategic Management Journal,* vol. 24, no. 9, pp. 881-887, 2003.

[10] Mauricio Massao Oura, Silvia Novaes Zilber and Evandro Luiz Lopes, "Innovation capacity, international experience and export performance of SMEs in Brazil," *International Business Review,* 2015.

[11] S. Lall, "Technological capabilities and industrialization," *World Development,* vol. 20, no. 2, pp. 165-186, 1992.

[12] P. Fidel, A. Cervera and. W. Schlesinger, "Customer's role in knowledge management and in the innovation process: effects on innovation capacity and marketing results," *Knowledge Management Research & Practice,* vol. 14, p. 195–203, 2016.

[13] T. Koc, "Organizational determinants of innovation capacity in software companies," *Computers & Industrial Engineering,* vol. 53, p. 373–385, 2007.

[14] H. Forsman, "Innovation capacity and innovation development in small enterprises. A comparison between the manufacturing and service sectors," *Research Policy,* vol. 40, p. 739–750, 2011.

[15] João J. M. Ferreira, Cristina I. Fernandes and Mário L. Raposo, "The Effects of Location on Firm Innovation Capacity," *Journal of the Knowledge Economy,* vol. 8, p. 77–96, 2017.

[16] V. Boly, L. Morel, N. G. Assielou and M. Camargo, "Evaluating Innovative Processes in French Firms: Methodological Proposition for Firm Innovation Capacity Evaluation," *Research Policy,* vol. 43, no. 3, pp. 608-622, 2014.

Innovation

In a dynamic and active environment, rivals emerge continuously, new technologies develop, the absorption of new resources become more difficult, so the manner and demands of customers constantly change in relation to goods and services. In this situation, dynamic firms and organizations have found that innovation is the most strategic source and the pivot of the competition[17]. Innovation is one of the most important resources which small and medium-sized firms can help enhance the economic dynamism of each industry[18]. Innovation can provide a competitive position for the firm and endanger other firm's position in the market at the same time. Investing in research and development (R&D) alone does not guarantee the success of firms, only a few firms are able to achieve their research goals. Actually, the creation of innovative ideas at the research stage is not the fundamental problem of technology-based companies but is on the effective transfer of technology from the discovery stage to the market, which requires the cooperation of all affiliated sectors, including all customers and suppliers, which is the prerequisite for this issue[19]. When innovation studies began in the 1960s as separated and specialized research fields, this was largely beyond the range of existing disciplines and famous universities. The emergence of a Science Policy Research Unit (SPRU) at Sussex University was an important occurrence in this flow[20]. Continuous innovation is the key to create and maintain a firm's competitive advantage. Firm's innovation success criteria include three indicators:

1. Output indicators: Patents, Products, and Papers.
2. Process Indicators: Enhancing working procedures.
3. Strategic Success Indicators: Enhancing overall performance, increasing revenue and market share[21].

The importance of innovation in recent decades is the commercialization of goods and services. It means firms should provide products and services which are acceptable by the market[22]. Schumpeter's proposed five categories for different types of innovation, which includes: new product, new production procedures, new sources of supply, exploiting new markets, and new ways to organize business, which the first two types have more usage in industries[15]. later on, by other researchers, these five types of innovation divided into four broad types of: product innovation (changing the goods or services which an organization offers), process innovation (changing the ways which products and services are created or delivers), position innovation (changing in context in which products or services are framed and presented) and paradigm innovation (Changing the mental models which forms the logic of the firm's behaviors)[23, 16].

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[17] M. Sadeghi and A. Sadeghi, "Analysis of a Model for External Organizational Factors Influencing Innovation Development in Industrial Research Organizations," Innovation Management Journal, vol. 2, no. 1, pp. 1-20, 2013.

[18] J. A. Keizer, L. Dijkstra, and J. I. Halman, "Explaining innovative efforts of SMEs: An exploratory survey among SMEs in the mechanical and electrical engineering sector in The Netherlands," *Technovation,* vol. 22, no. 1, pp. 1-13, 2002.

[19] S. K. Bagheri, M. Rezapour, and H .Kamali, *Technology management in technology-based organizations* (no. First). Tehran: Rasa Publication, 2014.

[20] J. Fagerberg, "Innovation: a guide to the literature," 2004: Georgia Institute of Technology.

[21] J. Tidd and J. Bessant, *Managing innovation integrating technological, market and organizational change*, 4 ed. John Wiley and Sons Ltd, 2009.

[22] P. Hall, "Creative cities and economic development," *Urban studies,* vol. 37, no. 4, pp. 639-649, 2000.

[23] M. E. Porter, "LOCATION, COMPETITION, AND ECONOMIC DEVELOPMENT: LOCAL CLUSTERS IN A GLOBAL ECONOMY," *Economic Development Quarterly,* vol. 1.۲۰۰۰ ,۴

Measuring innovation is a complex operation, and often its measurement criteria are unreliable and ineffective, however, researchers have introduced and utilized some measurable criteria[24]. Over time, many researchers have focused on factors affecting firm's innovation. Table 1. Illustrated some notable researchers focuses on emphasized factors.

Researcher(s)	Year	Factors Affecting Firms Innovation	Reference
Amabile	**1988**	***Environmental** **~*Positive Effects*** **-Organizational climate** **-Innovation should be worthwhile** **-Existence of enthusiasm** **-Support should be expanded for meaningful risks and the discovery of new ideas** **~*Negative Effects*** **-Organizational unwillingness to accept new commitments** **-Too much focus on maintaining the status quo** ***Non-Environmental** **~Overall valuation of innovation** **~Tendency toward risk** **~Sense of pride among the members of the firm and what they are able to do** **~Having an aggressive strategy to acquire leadership in the future**	25
Feldman and Florida	**1994**	***Regional basic technological infrastructure** **~University Research and Development** **~Industry Research and Development** **~Density dependence of industries** **~Specialist business support**	26
Khalil	**2000**	***Creativity (driving engine of innovation)** ***Dynamic environment** ***Communication and its systems improvement** ***R&D in multiple locations** ***Time to market** ***Education consideration** ***Changing in Inter-organizational and Intra-organizational relations** ***Changing in organizational structures** ***Utilizing existing resources to design and develop technology and marketing**	27

[24] S. J. Appold, "Research parks and the location of industrial research laboratories: an analysis of the effectiveness of a policy intervention," *Research Policy,* vol. 33, no. 2, pp. 225-243, 2004.

[25] T. M. Amabile, "A model of creativity and innovation in organizations," *Research in organizational behavior,* vol. 10, no. 1, pp. 123-167, 1988.

[26] M. P. Feldman and R. Florida, "The Geographic Sources of Innovation: Technological Infrastructure and Product Innovation in the United States," Annals of the Association of American Geographers, vol. 84, no. 2, pp. 210-229, 1994/06/01 1994.

[27] T. M. Khalil, Management of technology: The key to competitiveness and wealth creation. McGraw-Hill Science, Engineering & Mathematics, 2000.

Nieto & Quevedo	**2005**	***A positive and significant relation between absorption capacity and innovative effort** ***Measuring firm's absorption capacity tool** **~Registered patents** **~Technical Publications produced by the firm** **~R&D expenditures rate to sales** **~Established R&D department in the firm**	28
Anderson et al.	**2014**	***Individual Innovation** ***~Individual Factors*** ***~Task Contexts*** ***~Social Contexts*** ***Team Innovation** ***~Team Structure and Composition*** ***-Team Climate and Processes*** ***~Team Leadership*** ***Organizational Innovation** ***~Management-Related Factors*** ***~Knowledge Utilization and Networks*** ***~Structure and Strategy*** ***~Size*** ***~Resources*** ***~Culture and Climate*** ***~External Environment*** ***~Innovation Diffusion*** ***~Corporate Entrepreneurship as Organizational Innovation*** ***Multilevel Innovation** ***~Team Structure and Individual Innovation*** ***~Team Climate and Individual Innovation*** ***~Leadership and Team/Individual Innovation***	29
Gërguri-Rashiti et al.	**2017**	***R&D expenditures and activities** ***Ownership structure** ***Competitive pressure from foreign firms** *** Human capital** ***The level of education of the employees** ***The firm's export activity** ***The age of the firm**	30

Table 1 – A brief summary of Factors Affecting Firms Innovation

The role of government in innovation

Solow's economic studies have a significant effect on the position of science and technology and its development in the center of economist's attention, so that, in several reviews by economists on Solow studies, they have concluded repeatedly which the importance of science and technology is quite more

[28] M. Nieto and P. Quevedo, "Absorptive capacity, technological opportunity, knowledge spillovers, and innovative effort," Technovation, vol. 25, no. 10, pp. 1141-1157, 2005/10/01/ 2005.

[29] N. Anderson, K. Potočnik, and J. Zhou, "Innovation and creativity in organizations: A state-of-the-science review, prospective commentary, and guiding framework," Journal of Management, vol. 40, no. 5, pp. 1297-1333, 2014.

[30] S. Gërguri-Rashiti, V. Ramadani, H. Abazi-Alili, L. P. Dana, and V. Ratten, "ICT, innovation and firm performance: the transition economies context," Thunderbird International Business Review, vol. 59, no. 1, pp. 93-102, 2017.

in comparison with capital and human resources. Through the importance of science and technology, economists tried to provide the appropriate mechanisms and institutions for technology development, but also science and technology market was ineffective, on the other hand, the classical economists view emphasized on the free market and its main role in the development of the economy in that period. So economists considered the solution to this issue in order to get rid of this dichotomy over the role of the government in developing science and technology, and the role of the free market perspective, so finally, Science and Technology Policy, become the solution to this issue[31]. Due to possible failure of innovation in the market, the government approves numerous proceedings to encourage investment and share risk, mainly including tax incentives, R & D grants, and financial aids[32]. Evolving demands of societies and firms require a change in infrastructures to meet new daily needs. These infrastructures include physical infrastructure, software infrastructure, and new applied Concepts. Governments have found the importance of investing in these infrastructures, in scientific progress and increasing countries competitive ability[33]. STPs are one of the infrastructures which governments should care about.

First Community Innovation Survey (CIS) for the European Union was conducted by Eurostat[34] in 1992 which provides consonant data on enterprises' innovation activities. The CIS was the second standard survey in the history of science and technology measuring, after the international survey on research and development (R&D) in 1963 which was based on Solow's study. Measuring firms' innovation activity and published results are based on company size, innovation types and innovation process varied levels such as objectives, information sources, investment, and public funds and so on. Innovation survey and measuring the products and processes is a standard way to convince the government of the relevance of research to society and the economy[35][36].

Science and Technology Parks

Population density and the process of industrialization can be two main factors in explaining why centralized innovation areas have emerged powerfully[19]. Competition has a dynamic nature and is based on innovation and the search for strategic differences. Close communication with buyers, suppliers and other institutions is important not only for efficiency but also for improvement and innovation. The location affects the competitive advantage through its impact on productivity, and in particular productivity growth[18]. Developing the firm innovation capacity is a difficult and complicated task by the government, so in order not to interfere in the firm's internal affairs, it provides indirect ways to support the development of firm innovation. One of these ways can be government policies, which can vary between different industries, but there are also common points[37]. Among the constructive policies related to the support of innovation and technology by the government, clause 45 in chapter four (Knowledge-based Development) of the Fourth Development Plan of Iran:

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[31] A. Vahdat and A. Nazemi, "Similarities and differences in government funding for research and innovation," E. S. F. f. R. D. (ESFRD), Ed., ed. Tehran: Electronic Support Fund for Research & Development (ESFRD), 2017.

[32] C.-H. Yang, K. Motohashi, and J.-R. Chen, "Are new technology-based firms located on science parks really more innovative?: Evidence from Taiwan," *Research Policy,* vol. 38, no. 1, pp. 77-85, 2009/02/01/ 2009.

[33] L. Foster and c. kesselman, *The Grid: Blueprint for a new computing infrastructure*, Second ed. Elsevier Inc, 2004.

[34] Directorate-General of the European Commission (http://ec.europa.eu/eurostat)

[35] J. Alquézar Sabadie and C. Kwiatkowski, "The Community Innovation Survey and the innovation performance of enterprises funded by EU's Framework Programmes," fteval Journal for Research and Technology Policy Evaluation, no. 44, pp. 3-16, 2017.

[36] B. Godin, "The rise of innovation surveys: Measuring a fuzzy concept.," 2002.

[37] A. Karamipour, M. Khaleghi, M. R. Arasti, and N. G. Mokhtarzadeh, "How can the government support the Enhancement of Innovation-based capabilities in large firms?," *Journal of Technology Development Management* vol. 3, no. 2, 2015.

"The government is required to take steps to expand the knowledge-based product market, commercialize the research and innovate achievements, and to expand the role of the private and cooperative sector in this area:

- Developing the essential structures and infrastructure for the development of knowledge-based activities in the public and private sectors, in particular, the establishment and expansion of parks and centers for the development of science and technology"[38].

Science and technology parks are considered to be the results of the industrial revolution, in which functional characteristics have undergone changes during World War II and industrial change. In the 1980s, the British government questioned universities to bring their relationships closer to the industry. This request was the beginning of a new era of STPs, which had played a diminutive role previously[39]. In latest classifications of Parks' functions, four type of functions have determined overall:

- ***Access to services***- Facilitate the launch of a new product, growth capacity enhancement
- ***physical infrastructures and reputation effects***- Machinery, Procedures or installations, Intellectual Property Rights
- ***Human resources***- Inter-firm human mobility between firms, Hiring personnel from universities, such as researchers or graduate students, Running training programs for existing staff
- ***Relational capital*** - facilitate firms' learning by either steering knowledge through a network of participants or collectively creating new knowledge inside the network. It is the outcome of social ties such as interactions, collaborations, trust, which consider the development of reputation and the mobility of localized knowledge among different firms, where interactions are non-hierarchical but based on different kind of relationships, such as commercial transactions, trust-based agreements, friendship interactions, formal agreements, and so on[40].

In other description of Parks' functions and specifying the role of STPs and areas of innovation, IASP has presented a comprehensive description of primary functions, which are:

- "stimulate and manage the flow of knowledge and technology between universities and companies
- facilitate the communication between companies, entrepreneurs, and technicians
- provide environments that enhance a culture of innovation, creativity, and quality
- focus on companies and research institutions as well as on people: the entrepreneurs and 'knowledge workers'
- facilitate the creation of new businesses via incubation and spin-off mechanisms, and accelerate the growth of small and medium-size companies
- Work in a global network that gathers many thousands of innovative companies and research institutions throughout the world, facilitating the internationalization of their resident companies"[41].

Another similar study, which has reviewed and categorized the key functions of the park, divided into four main groups which are: Commercial, Stakeholder Perspective, Brand & Reputation, Internal

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[38] *The Fourth Development Plan of Iran,* I. P. R. C. O. T. I. R. O. IRAN, 2004.

[39] P. C. Vilà and J. L. Pagès, "Science and technology parks: creating new environments favorable to innovation," *Paradigmes: economia productiva i coneixement,* 2008.

[40] I. Diez-Vial and M. Fernández-Olmos, "The effect of science and technology parks on a firm's performance: a dynamic approach over time," *Journal of Evolutionary Economics,* vol. 27, no. 3 ,pp. 413-434, 2017.

[41] IASP. *The role of STPs and areas of innovation*. Available: https://www.iasp.ws/Our-industry/The-role-of-STPs-and-areas-of-innovation

Business Processes; And also, has set key factors for each indicator to measure the performance of the parks[42].

Science and Technology Parks and incubators have relatively a little history in Iran and the first steps towards their establishment goes back in the 1990s and the city of Isfahan. The first incubator of Iran in 2000, called the Ghadir incubation, launched with 17 technology units.Implementing and launching of this project was done by Esfahan Steel Company in 1992. Then, the primary studies of Pardis Technology Park (PTP) began in 2000, Studies devoted to assigning a location for PTP began from December 2000 and after locating and admitting technology units, in 2001, it began its activities with the cooperation of I.R of Iran Presidential Center for Innovation and Technology Cooperation (CITC) and currently, is the largest and most important National Science Park in Iran. Subsequently, in 2002, some of the scientific and industrial research institutes of other provinces were dissolved and became a Science and Technology Park, including East Azerbaijan, Semnan, Khorasan, Fars, Gilan, Markazi, and Yazd provinces science and technology parks[43].

Information and Communication Technology (ICT) Sector

Rapid changes in information and communication technology since the 1970s have revolutionized global transformation. Even in countries with a Sluggish Economy, the ICT revolution has been widespread, as the penetration of ICT has been increasing quickly since the 1980s. Therefore, investing in ICT should have a significant effect on the country's economic development and it can become an advantage by achieving the right ability in this field quickly. Of course, achievements of this industry is much less costly and faster than other leading industries[44]. International Telecommunication Union (ITU) is the United Nations specialized agency for the Information and Communication Technology department, in an era which the countries of the world are constantly and increasingly interacting with one another, is the only international organization which has gathered all the players in this growing area. ITU publishes an ICT Development Index (IDI) report annually which ranks countries based on this indicator in terms of the extent of development in ICT. The IDI is a combination of 11 sub-indicators that link these sub-indicators together and is a criterion which can be employed to monitor and compare ICT progress between countries over time. According to the latest report in 2017, the Islamic Republic of Iran IDI among the 176 countries surveyed, ranked 81th after Brazil, Turkey, and China, with 4 steps up from last year (2016). IDI is estimated to be 5.58 for Iran in 2017, ranked 37th among all developing countries, with 130 countries in this category, while the average of global IDI is 5.11 and has increased 0.18 points from last year, but the rate of Iran’s improvement has been 0.54, which reflects the country's ability and capacity to develop this industry[45].

IT market separation into its components in its traditional classifications, which are divided into hardware, software, and services account for only 53% of the total market. Telecom Services is the next major component of the market, which includes 30% of the market volume. The remaining 17% includes emerging technologies that do not fall into any of the previous categories or cover several categories. Three categories of most affecting emerging technologies in the next four years that are

[42] J. Dabrowska, "Measuring the success of science parks: performance monitoring and evaluation," in *XXVIII IASP world conference on science and technology parks*, 2011, pp. 19-22.
[43] M. Soleymani, "Science and Technology Parks and Incubators with a Global Perspective," *Journal of Science and Technology Parks and Incubators*, vol. 4, no. 8, 2012.
[44] E. Lechman, *ICT DIFFUSION IN DEVELOPING COUNTRIES*. Cham: Springer, 2016.
[45] B. Sanou, "Measuring the Information Society Report 2017," International Telecommunication Union, Switzerland2017, vol. 1.

predicted by governments and businesses are machine learning, Internet of Things (IoT) and Blockchain[46].

Every developing country have a national ICT strategy which can be the basis to realize the potential of ICTs, progress the development, utilizing technology and reducing communication problems[47].Some substantial and influential factors in acquiring a positive and beneficial investment in this sector are the availability of skillful and educational manpower, existing and growing investments in the ICT industry, mainly with government support. Investing in this industry can be more effective in terms of growth, along with better organization and management of the public sector and more effective participation of the private sector in the economy[48].

4. Methodology

The purpose of this study is to describe and examine if there is any difference between the innovation level in information and communication technology sector NTBFs located in science and technology parks and off-park firms. To this end, we carried out a statistical analysis of Iranian innovation survey data which is done by the vice presidency of science and technology of Iran. The survey was started in 2015 A.D. and has observed participant firms' innovation activities from 2012 A.D to 2014 A.D. in a period of 3 years. To do this, 2563 questionnaires were distributed and 2,476 were answered acceptably. The survey has investigated 962 firms in information and communication technology sector. In order to understand the difference between innovation level among information and communication technology NTBFs, we split them into two groups. The first group is ICT NTBFs located inside science and technology parks and the other one is ICT firms outside the parks. Since the distribution of the of technological innovation level variable and sales of NTBFs was not normal, the Mann-Whitney nonparametric test was used to compare the two groups. In order to investigate the factors affecting sales on NTBFs, the regression method was used and being on-off-park was entered into the model as a dummy variable.

SPSS proposed Forward stepwise method for estimating regression. In this method, the variables are entered into the model in terms of the highest correlation coefficient, and if this variable is not significant, then the variable will be removed. The explanatory variables used in the regression model respectively are:

RD EXPENDITURE1: research and development expenditure done inside the firm (without cooperation)

BOUGHT EQUIPMENT: firms expenditure for buying equipment

PROCESS INNOVATION 3: Creating new or substantive improvements to existing backup processes (such as maintenance processes, accounting, quality management, purchasing operation, etc.)

PROCESS INNOVATION 2: Establishing new or substantive improvements in existing supply chain and distribution processes (such as procurement, the supply of raw materials, distribution of goods, after sales services, etc.)

PROCESS INNOVATION 1: Creating new methods or fundamental improvements in existing methods of manufacturing and producing products/services

INTERNATIONAL PATENTS: patents registered in international offices

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[46] CompTIA, "IT Industry Outlook 2018," 2018.

[47] A. Abbasi, A. Niaraki, and B. Dehkordi, "A review of the ICT status and development strategy plan in Iran," *International Journal of Education and Development using ICT*, vol. 4, no. 3, 2008.

[48] R. Gholami, S. Moshiri, and S. Y. T. Lee, "ICT and Productivity of the Manufacturing Industries in Iran," *The Electronic Journal of Information Systems in Developing Countries*, vol. 19, no. 1, pp. 1-19, 2004.

PATENTS IN IRAN: patents registered in Iran

SOLD LICENSE: licenses sold to other firms

COMMERCIALIZED PATENTS: patents commercialized

LOCATION: being on-off-park

PRODUCT INNOVATION 1: The number of significant improvements in existing products

INDUSTRIAL PLANS: industrial plans done by the firm

PRODUCT INNOVATION 2: Number of new products

NUMBER OF TRADEMARKS: number of trademarks registered by the firm

RD EXPENDITURE 2: research and development expenditure with the cooperation of other firms

All calculations were carried out by Microsoft Excel 2016 and IBM-SPSS version 22.0 (IBM Corporation).

5. Results

Since the dependent variable does not have a normal distribution, its logarithm is used in the equation.

Table 1 Normality test for dependent variable

	Test statistic	Significancy
sale	0.438	0.0

For the regression estimation method, the forward stepwise method was used.

For this purpose, the correlation between the dependent variable and the independent variables is measured and the variables with the highest correlation coefficient are entered into the model, respectively.

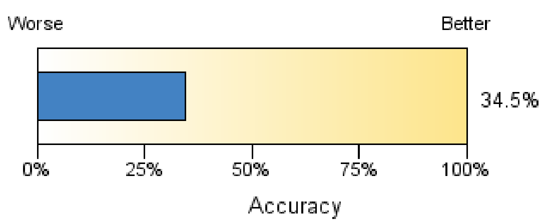
Table 2 regression

Order of variables	name	t	Significancy	Variable status
1	RD EXPENDITURE1	5.545	0	Remained
2	BOUGHT EQUIPMENT	0.392	0.697	Removed
3	PROCESS INNOVATION 3	0.457	0.649	Removed
4	PROCESS INNOVATION 2	- 0.026	0.979	Removed
5	PROCESS INNOVATION 1	- 0.055	0.956	Removed
6	INTERNATIONAL PATENTS	- 0.138	0.891	Removed
7	PATENTS IN IRAN	- 0.413	0.681	Removed
8	SOLD LICENSE	- 0.319	0.751	Removed
9	COMMERCIALIZED PATENTS	- 0.337	0.737	Removed
10	LOCATION	0.229	0.820	Removed
11	PRODUCT INNOVATION 1	- 0.237	0.813	Removed
12				Removed
13				Removed
14				Removed
15				Removed

Model Summary

Target	SALE
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	5,823.903

The information criterion is used to compare to models. Models with smaller information criterion values fit better.



The results of the F test show the validity of the estimated regression model.

Table 3 Anova

Normality test of residuals also indicates that this random variable is normal.

Table 4 Normality test of residuals

	Test Statistic	Asymp. Sig. (2-tailed)

	variable	Test statistic	signifficancy
1	Sale	0.346	0.729
2	Product innovation	- 1.156	0.248

Residuals	0.104	0.54

Normality test of residuals also indicates that this random variable is normal.

Comparative hypothesis

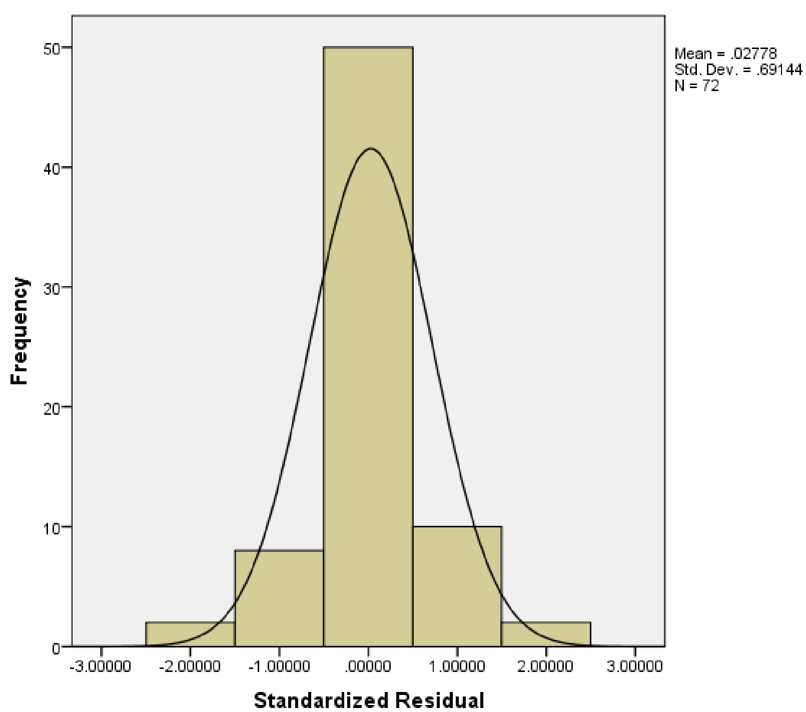
In order to test the assumption of the equality of sale and the number of innovations of NTBFs inside and outside the park, we ensure that these variables are normal.

	F statistic	Significancy
sale	30.743	0.0

Table 5 Normality test

Since the distribution of these variables is not normal, we use nonparametric tests for equality testing. For this purpose, we use Mann-Whitney.

The results of the estimation show that there is no significant difference in the level of sale and the



number of innovations of NTBFs located in the park and outside it.

Table 6 Mann-Whitney

	variable	Z statistic	significancy
1	Sale	- 0.346	0.729
2	Product innovation	- 1.156	0.248

As is shown above, the location variable did not have a significant effect on the innovation level of sale of firms.

	variable	Test statistic	significancy
1	Sale	0.346	0.729
2	Product innovation	- 1.156	0.248

6. Conclusions

This paper has compared the innovation level between NTBFs located inside the park and outside the park. The generalizability of much-published research on this issue is problematic. One unanticipated finding was that locating information and communication technology sector NTBFs inside science and technology parks has little impact on their technological innovation level in Iranian Science and technology parks. based on the data from Iranian national innovation survey locating information and communication technology NTBFs also has little impact on their innovation sale. Despite the fact that prior studies have noted the importance of location on firm's innovation capacity, our results show innovation level among NTBFs located inside science and technology parks in Iran and NTBFs off-parks is not significantly different. However, the results show increasing the budget for research and development inside the firms leads to an increase in technological innovation level and sale. A possible explanation for this might be that the science and technology parks in Iran weren't able to provide an appropriate and innovative environment for information and communication NTBFs. Another possible explanation for this results is all information and communication firms did not fill the national innovation survey accurately. The results that indicate being off or on-park does not affect its innovation and sale was the same also for all companies in this sector. One of the issues that emerges from these findings is information and communication technology sector NTBFs located in science and technology parks in Iran need more effort on their marketing. Since the data and analysis focused on information and communication NTBFs these findings cannot be extrapolated to all sectors. Further research investigating the effectiveness of science and technology parks with regard to other sectors may provide insight into significant correlations between on and off-park firms.

7. Appendix

One-Sample Kolmogorov-Smirnov Test

		SALE
N		104
Normal Parameters[a,b]	Mean	274282937623 .3846
	Std. Deviation	175948764881 3.22750
Most Extreme Differences	Absolute	.438
	Positive	.413

	Negative	-.438
Test Statistic		.438
Asymp. Sig. (2-tailed)		.000[c]

a. Test distribution is Normal.

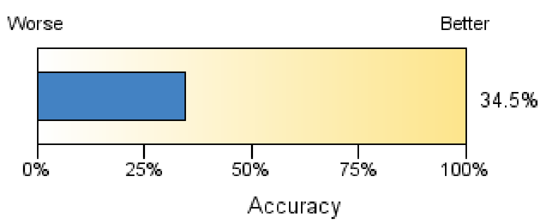
b. Calculated from data.

c. Lilliefors Significance Correction.

Model Summary

Target	SALE
Automatic Data Preparation	On
Model Selection Method	Forward Stepwise
Information Criterion	5,823.903

The information criterion is used to compare to models. Models with smaller information criterion values fit better.



Correlations

		PRODUCTIN NOVATION1	PRODUCTIN NOVATION2	PROCESSIN NOVATION1	PROCESSIN NOVATION2	PROCESSIN NOVATION3	RDEXPENDIT URE1	RDEXPENDIT URE2	BOUGHTLIC ENSE	BOUGHTEQU IPMENT	PATENTSINI RAN	INTERNATIO NALPATENT	COMMERCIA LIZEDPATEN T	INDUSTRIAL PLANS	NUMBEROFT RADEMARKS	SOLDLICENS E	LOCATION	LOGSELL
PRODUCTINNOVATION1	Pearson Correlation	1	.629**	-.115	.096	-.094	-.019	-.058	-.060	-.046	.015	.148*	.013	.159*	-.008	.002	-.032	.027
	Sig. (2-tailed)		.000	.107	.175	.188	.852	.696	.700	.694	.841	.046	.856	.029	.915	.974	.659	.796
	N	199	161	199	199	199	96	47	43	75	187	183	186	188	189	185	199	92
PRODUCTINNOVATION2	Pearson Correlation	.629**	1	-.120	.057	-.115	-.027	.267	.267	-.035	.099	.032	.104	.071	-.022	-.037	-.057	.010
	Sig. (2-tailed)	.000		.105	.440	.120	.806	.096	.115	.780	.202	.681	.182	.359	.776	.636	.440	.932
	N	161	183	183	183	183	88	40	36	67	169	165	168	170	172	167	183	82
PROCESSINNOVATION1	Pearson Correlation	-.115	-.120	1	.161*	.199**	-.118	-.191	-.187	.064	.064	.092	.111	.085	.055	.060	.008	.116
	Sig. (2-tailed)	.107	.105		.013	.002	.219	.178	.208	.563	.348	.183	.105	.216	.423	.382	.902	.247
	N	199	183	237	237	237	110	51	47	85	216	211	214	215	218	213	237	101
PROCESSINNOVATION2	Pearson Correlation	.096	.057	.161*	1	.288**	-.035	.169	.196	.151	-.077	.098	.018	.131	.087	.041	.094	.126
	Sig. (2-tailed)	.175	.440	.013		.000	.720	.236	.187	.168	.262	.156	.799	.054	.201	.556	.148	.209
	N	199	183	237	237	237	110	51	47	85	216	211	214	215	218	213	237	101
PROCESSINNOVATION3	Pearson Correlation	-.094	-.115	.199**	.288**	1	.095	-.184	-.179	.106	.013	.072	-.009	.071	.003	.108	.006	.189
	Sig. (2-tailed)	.188	.120	.002	.000		.323	.197	.229	.334	.846	.301	.898	.298	.959	.118	.928	.059
	N	199	183	237	237	237	110	51	47	85	216	211	214	215	218	213	237	101
RDEXPENDITURE1	Pearson Correlation	-.019	-.027	-.118	-.035	.095	1	.c	-.025	.197	.023	-.011	-.035	-.045	-.062	-.033	.017	.564**
	Sig. (2-tailed)	.852	.806	.219	.720	.323		.000	.870	.079	.823	.918	.732	.659	.543	.748	.856	.000
	N	96	88	110	110	110	110	50	46	80	99	95	97	98	100	96	110	68
RDEXPENDITURE2	Pearson Correlation	-.058	.267	-.191	.169	-.184	.c	1	1.000**	.021	.060	.c	.174	.051	.889**	-.025	.355*	.c
	Sig. (2-tailed)	.696	.096	.178	.236	.197	.000		.000	.883	.676	.000	.221	.721	.000	.861	.011	.000
	N	47	40	51	51	51	50	51	40	50	51	49	51	51	51	51	51	25
BOUGHTLICENSE	Pearson Correlation	-.060	.267	-.187	.196	-.179	-.025	1.000**	1	.017	.031	.c	.186	.049	.891**	-.016	.352*	.010
	Sig. (2-tailed)	.700	.115	.208	.187	.229	.870	.000		.913	.838	.000	.210	.745	.000	.916	.015	.965
	N	43	36	47	47	47	46	40	47	46	47	45	47	47	47	47	47	23
BOUGHTEQUIPMENT	Pearson Correlation	-.046	-.035	.064	.151	.106	.197	.021	.017	1	.016	-.055	.065	-.072	-.004	-.066	.247*	.471**
	Sig. (2-tailed)	.694	.780	.563	.168	.334	.079	.883	.913		.891	.632	.567	.523	.968	.564	.023	.001
	N	75	67	85	85	85	80	50	46	85	80	77	79	80	81	79	85	48
PATENTSINIRAN	Pearson Correlation	.015	.099	.064	-.077	.013	.023	.060	.031	.016	1	.470**	.364**	.092	.008	-.023	.233**	.046
	Sig. (2-tailed)	.841	.202	.348	.262	.846	.823	.676	.838	.891		.000	.000	.182	.911	.739	.001	.666
	N	187	169	216	216	216	99	51	47	80	216	210	212	214	215	212	216	90
INTERNATIONALPATENT	Pearson Correlation	.148*	.032	.092	.098	.072	-.011	.c	.c	-.055	.470**	1	.097	.149*	.009	-.036	.208**	.073
	Sig. (2-tailed)	.046	.681	.183	.156	.301	.918	.000	.000	.632	.000		.162	.030	.896	.602	.002	.498
	N	183	165	211	211	211	95	49	45	77	210	211	210	210	210	211	211	88
COMMERCIALIZEDPATENT	Pearson Correlation	.013	.104	.111	.018	-.009	-.035	.174	.186	.065	.364**	.097	1	.063	.064	.029	-.025	-.033
	Sig. (2-tailed)	.856	.182	.105	.799	.898	.732	.221	.210	.567	.000	.162		.360	.353	.677	.719	.761
	N	186	168	214	214	214	97	51	47	79	212	210	214	212	212	212	214	89
INDUSTRIALPLANS	Pearson Correlation	.159*	.071	.085	.131	.071	-.045	.051	.049	-.072	.092	.149*	.063	1	.116	.130	-.026	.013
	Sig. (2-tailed)	.029	.359	.216	.054	.298	.659	.721	.745	.523	.182	.030	.360		.090	.059	.709	.903
	N	188	170	215	215	215	98	51	47	80	214	210	212	215	215	212	215	89
NUMBEROFTRADEMARKS	Pearson Correlation	-.008	-.022	.055	.087	.003	-.062	.889**	.891**	-.004	.008	.009	.064	.116	1	.090	.001	-.005
	Sig. (2-tailed)	.915	.776	.423	.201	.959	.543	.000	.000	.968	.911	.896	.353	.090		.191	.987	.964
	N	189	172	218	218	218	100	51	47	81	215	210	212	215	218	212	218	91
SOLDLICENSE	Pearson Correlation	.002	-.037	.060	.041	.108	-.033	-.025	-.016	-.066	-.023	-.036	.029	.130	.090	1	-.069	.034
	Sig. (2-tailed)	.974	.636	.382	.556	.118	.748	.861	.916	.564	.739	.602	.677	.059	.191		.318	.755
	N	185	167	213	213	213	96	51	47	79	212	211	212	212	212	213	213	88
LOCATION	Pearson Correlation	-.032	-.057	.008	.094	.006	.017	.355*	.352*	.247*	.233**	.208**	-.025	-.026	.001	-.069	1	.029
	Sig. (2-tailed)	.659	.440	.902	.148	.928	.856	.011	.015	.023	.001	.002	.719	.709	.987	.318		.774
	N	199	183	237	237	237	110	51	47	85	216	211	214	215	218	213	237	101
LOGSELL	Pearson Correlation	.027	.010	.116	.126	.189	.564**	.c	.010	.471**	.046	.073	-.033	.013	-.005	.034	.029	1
	Sig. (2-tailed)	.796	.932	.247	.209	.059	.000	.000	.965	.001	.666	.498	.761	.903	.964	.755	.774	
	N	92	82	101	101	101	68	25	23	48	90	88	89	89	91	88	101	101

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

c. Cannot be computed because at least one of the variables is constant.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	82.649	1	82.649	30.743	.000[b]
	Residual	177.432	66	2.688		
	Total	260.081	67			

a. Dependent Variable: LOGSELL

b. Predictors: (Constant), RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.242	.219		106.169	.000
	RDEXPENDITURE1	8.483E-11	.000	.564	5.545	.000

a. Dependent Variable: LOGSELL

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RDEXPENDITURE1, BOUGHTEQUIPMENT[b]	.	Enter

a. Dependent Variable: LOGSELL

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.575[a]	.330	.300	1.76500

a. Predictors: (Constant), RDEXPENDITURE1, BOUGHTEQUIPMENT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.577	2	33.788	10.846	.000[b]
	Residual	137.070	44	3.115		
	Total	204.646	46			

a. Dependent Variable: LOGSELL

b. Predictors: (Constant), RDEXPENDITURE1, BOUGHTEQUIPMENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.331	.290		80.451	.000
	BOUGHTEQUIPMENT	6.000E-13	.000	.082	.392	.697
	RDEXPENDITURE1	7.125E-11	.000	.506	2.410	.020

a. Dependent Variable: LOGSELL

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RDEXPENDITURE1, BOUGHTEQUIPMENT[b]	.	Enter

a. Dependent Variable: LOGSELL

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.575[a]	.330	.300	1.76500

a. Predictors: (Constant), RDEXPENDITURE1, BOUGHTEQUIPMENT

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	67.577	2	33.788	10.846	.000[b]
	Residual	137.070	44	3.115		
	Total	204.646	46			

a. Dependent Variable: LOGSELL

b. Predictors: (Constant), RDEXPENDITURE1, BOUGHTEQUIPMENT

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	23.331	.290		80.451	.000
	BOUGHTEQUIPMENT	6.000E-13	.000	.082	.392	.697
	RDEXPENDITURE1	7.125E-11	.000	.506	2.410	.020

a. Dependent Variable: LOGSELL

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PROCESSINNOVATION2, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716[a]	.513	.498	1.51222E+12

a. Predictors: (Constant), PROCESSINNOVATION2, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.614E+26	2	8.068E+25	35.283	.000[b]
	Residual	1.532E+26	67	2.287E+24		
	Total	3.146E+26	69			

a. Dependent Variable: SALE

b. Predictors: (Constant), PROCESSINNOVATION2, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.796E+11	2.882E+11		-1.664	.101
	PROCESSINNOVATION3	1.682E+11	3.678E+11	.039	.457	.649
	RDEXPENDITURE1	109.103	13.082	.713	8.340	.000

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PROCESSINNOVATION2, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716[a]	.513	.498	1.51222E+12

a. Predictors: (Constant), PROCESSINNOVATION2, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.614E+26	2	8.068E+25	35.283	.000[b]
	Residual	1.532E+26	67	2.287E+24		
	Total	3.146E+26	69			

a. Dependent Variable: SALE

b. Predictors: (Constant), PROCESSINNOVATION2, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.809E+11	2.452E+11		-1.554	.125
	RDEXPENDITURE1	109.705	13.341	.717	8.223	.000
	PROCESSINNOVATION2	-9735025951	3.733E+11	-.002	-.026	.979

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PROCESSINNOVATION1, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716[a]	.513	.498	1.51219E+12

a. Predictors: (Constant), PROCESSINNOVATION1, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.614E+26	2	8.069E+25	35.285	.000[b]
	Residual	1.532E+26	67	2.287E+24		
	Total	3.146E+26	69			

a. Dependent Variable: SALE

b. Predictors: (Constant), PROCESSINNOVATION1, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.688E+11	3.502E+11		-1.053	.296
	RDEXPENDITURE1	109.727	13.161	.717	8.337	.000
	PROCESSINNOVATION1	-2.251E+10	4.099E+11	-.005	-.055	.956

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	INTERNATIONALPATENT, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.256[a]	.065	.032	1.80022E+11

a. Predictors: (Constant), INTERNATIONALPATENT, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.269E+23	2	6.346E+22	1.958	.151[b]
	Residual	1.815E+24	56	3.241E+22		
	Total	1.942E+24	58			

a. Dependent Variable: SALE

b. Predictors: (Constant), INTERNATIONALPATENT, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.958E+10	2.750E+10		1.803	.077
	RDEXPENDITURE1	4.399	2.223	.256	1.979	.053
	INTERNATIONALPATENT	-7112552433	5.167E+10	-.018	-.138	.891

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PATENTSINIRAN, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.262[a]	.069	.037	1.76732E+11

a. Predictors: (Constant), PATENTSINIRAN, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.340E+23	2	6.701E+22	2.145	.126[b]
	Residual	1.812E+24	58	3.123E+22		
	Total	1.946E+24	60			

a. Dependent Variable: SALE

b. Predictors: (Constant), PATENTSINIRAN, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.149E+10	2.751E+10		1.872	.066
	RDEXPENDITURE1	4.413	2.175	.257	2.029	.047
	PATENTSINIRAN	-2672923992	6468224974	-.052	-.413	.681

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	SOLDLICENSE, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.258[a]	.067	.033	1.79889E+11

a. Predictors: (Constant), SOLDLICENSE, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.296E+23	2	6.481E+22	2.003	.145[b]
	Residual	1.812E+24	56	3.236E+22		
	Total	1.942E+24	58			

a. Dependent Variable: SALE

b. Predictors: (Constant), SOLDLICENSE, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.088E+10	2.769E+10		1.838	.071
	RDEXPENDITURE1	4.344	2.222	.253	1.955	.056
	SOLDLICENSE	-577018395	1806528726	-.041	-.319	.751

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	COMMERCIALIZEDPATENT, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.260[a]	.068	.035	1.78335E+11

a. Predictors: (Constant), COMMERCIALIZEDPATENT, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.317E+23	2	6.587E+22	2.071	.135[b]
	Residual	1.813E+24	57	3.180E+22		
	Total	1.945E+24	59			

a. Dependent Variable: SALE

b. Predictors: (Constant), COMMERCIALIZEDPATENT, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.103E+10	2.775E+10		1.839	.071
	RDEXPENDITURE1	4.408	2.195	.257	2.008	.049
	COMMERCIALIZEDPATENT	-1.433E+10	4.251E+10	-.043	-.337	.737

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	LOCATION, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.716[a]	.513	.499	1.51163E+12

a. Predictors: (Constant), LOCATION, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.615E+26	2	8.074E+25	35.336	.000[b]
	Residual	1.531E+26	67	2.285E+24		
	Total	3.146E+26	69			

a. Dependent Variable: SALE

b. Predictors: (Constant), LOCATION, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.013E+11	2.128E+11		-1.886	.064
	RDEXPENDITURE1	108.749	13.607	.710	7.992	.000
	LOCATION	1.050E+11	4.592E+11	.020	.229	.820

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PRODUCTINNOVATION1, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.319[a]	.102	.072	1.78565E+11

a. Predictors: (Constant), PRODUCTINNOVATION1, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.136E+23	2	1.068E+23	3.350	.042[b]
	Residual	1.881E+24	59	3.189E+22		
	Total	2.095E+24	61			

a. Dependent Variable: SALE

b. Predictors: (Constant), PRODUCTINNOVATION1, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.080E+10	2.622E+10		1.937	.057
	RDEXPENDITURE1	7.333	2.853	.317	2.571	.013
	PRODUCTINNOVATION1	-47482454.7	199991986.4	-.029	-.237	.813

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	INDUSTRIAL PLANS, RDEXPENDIT URE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.243[a]	.059	.026	1.78278E+11

a. Predictors: (Constant), INDUSTRIALPLANS, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.134E+23	2	5.670E+22	1.784	.177[b]
	Residual	1.812E+24	57	3.178E+22		
	Total	1.925E+24	59			

a. Dependent Variable: SALE

b. Predictors: (Constant), INDUSTRIALPLANS, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.036E+10	2.746E+10		1.834	.072
	RDEXPENDITURE1	4.176	2.289	.236	1.824	.073
	INDUSTRIALPLANS	-1831855075	6079630453	-.039	-.301	.764

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	PRODUCTINNOVATION2, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.737[a]	.543	.527	1.59968E+12

a. Predictors: (Constant), PRODUCTINNOVATION2, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.702E+26	2	8.508E+25	33.249	.000[b]
	Residual	1.433E+26	56	2.559E+24		
	Total	3.135E+26	58			

a. Dependent Variable: SALE

b. Predictors: (Constant), PRODUCTINNOVATION2, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.360E+11	2.364E+11		-1.845	.070
	RDEXPENDITURE1	116.109	14.252	.737	8.147	.000
	PRODUCTINNOVATION2	353827688.9	2687557589	.012	.132	.896

a. Dependent Variable: SALE

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	NUMBEROFTRADEMARKS, RDEXPENDITURE1[b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.733[a]	.538	.522	1.56876E+12

a. Predictors: (Constant), NUMBEROFTRADEMARKS, RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.689E+26	2	8.444E+25	34.310	.000[b]
	Residual	1.452E+26	59	2.461E+24		
	Total	3.141E+26	61			

a. Dependent Variable: SALE

b. Predictors: (Constant), NUMBEROFTRADEMARKS, RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-4.966E+11	2.543E+11		-1.953	.056
	RDEXPENDITURE1	114.736	13.873	.732	8.270	.000
	NUMBEROFTRADEMARKS	9.950E+10	1.556E+11	.057	.639	.525

a. Dependent Variable: SALE

Warnings

For models with dependent variable SALE, the following variables are constants or have missing correlations: RDEXPENDITURE2. They will be deleted from the analysis.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	RDEXPENDITURE1 [b]	.	Enter

a. Dependent Variable: SALE

b. All requested variables entered.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.127[a]	.016	-.025	2.39434E+11

a. Predictors: (Constant), RDEXPENDITURE1

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.274E+22	1	2.274E+22	.397	.535[b]
	Residual	1.376E+24	24	5.733E+22		
	Total	1.399E+24	25			

a. Dependent Variable: SALE

b. Predictors: (Constant), RDEXPENDITURE1

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.196E+11	5.352E+10		2.235	.035
	RDEXPENDITURE1	-2.690	4.271	-.127	-.630	.535

a. Dependent Variable: SALE

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	82.649	1	82.649	30.743	.000[b]
	Residual	177.432	66	2.688		
	Total	260.081	67			

a. Dependent Variable: LOGSELL

b. Predictors: (Constant), RDEXPENDITURE1

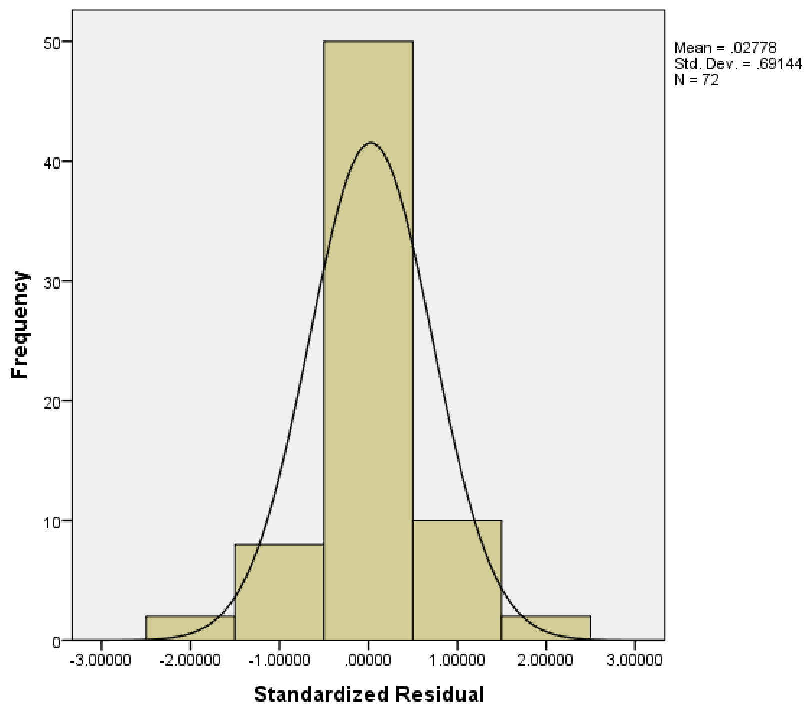
One-Sample Kolmogorov-Smirnov Test

		Standardized Residual
N		72
Normal Parameters[a,b]	Mean	.0814524
	Std. Deviation	1.02179163
Most Extreme Differences	Absolute	.104
	Positive	.104
	Negative	-.089
Test Statistic		.104
Asymp. Sig. (2-tailed)		.054[c]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.



One-Sample Kolmogorov-Smirnov Test

		SALE	PRODUCTINNOVATION
N		104	153
Normal Parameters[a,b]	Mean	274282937623.3846	8.1895
	Std. Deviation	1759487648813.22750	8.29771
Most Extreme Differences	Absolute	.438	.243
	Positive	.413	.243
	Negative	-.438	-.228
Test Statistic		.438	.243
Asymp. Sig. (2-tailed)		.000[c]	.000[c]

a. Test distribution is Normal.

b. Calculat

c. Lilliefors

Ranks

	LOCATION	N	Mean Rank	Sum of Ranks
SALE	OUTSIDE OF THE PARK	82	53.03	4348.50
	INSIDE OF THE PARKS	22	50.52	1111.50
	Total	104		
PRODUCTINNOVATION	OUTSIDE OF THE PARK	125	75.05	9381.50
	INSIDE OF THE PARKS	28	85.70	2399.50
	Total	153		

Test Statistics[a]

	SALE	PRODUCTINNOVATION
Mann-Whitney U	858.500	1506.500
Wilcoxon W	1111.500	9381.500
Z	-.346	-1.156
Asymp. Sig. (2-tailed)	.729	.248

a. Grouping Variable: LOCATION