An-Najah National University

Faculty of Graduate Studies

Building the Innovation Strategy of the Palestinian Industrial Sector based on a Triple Helix Model (Industry, University and Government)

By

Hana M. Nayef Hajhamad

Supervisor

Dr. Rabeh Morar

This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Economic Policy Management, Faculty of Graduate Studies, An-Najah National University, Nablus, Palestine.

2017

Building the Innovation Strategy of the Palestinian Industrial Sector based on a Triple Helix Model (Industry, University and Government)

By

Hana M. Nayef Hajhamad

This Thesis was defended successfully on 19/12/2017, and approved by:

Defense Committee Members	Signature
– Dr. Rabeh Morar / Supervisor	.....
– Dr. Suhail Sultan / External Examiner	.....
– Dr. Yahya Saleh / Internal Examiner	.....

Dedication

To teacher of humanity, Prophet Muhammad (peace be upon him).

To my father’s soul, may Allah have mercy on him, and forgive him.

To my mother, may Allah give her health and strength.

To my husband (Sultan) & my sons (Qusai & Qais).

To my imprisoned brother (Yahya), our hero.

To my brothers (Abdallah) & (Abood).

To my sisters (Laila, Lama, Lubna, Yusra, Dina, Ola, Israa, & Mais).

Acknowledgement

First of all, I am very thankful to Allah, the Almighty, who provided me with all the strength I need and granted me the courage to complete this research successfully.

I thank all those who supported me during my research.

I am also very grateful to Dr. Rabeh Morrar, my supervisor, for his support and help during my research. I thank him for his constructive suggestions, valuable supervision, great efforts and assistance are appreciated.

I would also like to thank the committee for their efforts which will me in producing my research.

I would like to express my deepest gratitude to my parents and family for their motivation, support, and encouragement throughout my research

I am also very thankful to the Higher Council for Innovation and Excellence, especially Mr. Khaled Qalalwa, for their support and encouragement.

I am greatly thankful for the staff of the Management of Economic Policy Program at An-Najah National University, for their professional material and knowledge.

Many thanks to my colleagues for the friendly and beautiful memories they left for me to remember during our days of study.

الإقرار

أنا الموقعة أدناه، مقدمة الرسالة التي تحمل العنوان:

Building the Innovation Strategy of the Palestinian Industrial Sector based on a Triple Helix Model (Industry, University and Government)

أقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وأن هذه الرسالة كاملة، أو أي جزء منها لم يقدم من قبل لنيل أي درجة أو لقب علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

Student's name: **اسم الطالبة:**

Signature: **التوقيع:**

Date: **التاريخ:**

Table of Contents

List of Tables

List of Figures

Building the Innovation Strategy of the Palestinian Industrial Sector based on a Triple Helix Model (Industry, University and Government)

By
Hana M. Nayef Hajhamad
Supervisor
Dr. Rabeh Morar

Abstract

The triple helix model is a model that clarifies university, industry and government collaboration relationships. The contribution of the industrial sector to the gross domestic production (GDP) is only13.4% (BCBS, 2015), which attributed to the lack of research and development (R&D) and the lack of technological innovations. This has lead the Palestinian industrial firms to find innovative solutions to bridge the knowledge gap for better product development. Moreover, the industrial firms, with their own capabilities, are not able to fulfill their needs for knowledge and technology. Therefore, the triple helix model is considered one of the most important solutions where universities- as a centre of excellence and knowledge- can provide the industrial firms with the required knowledge, technological competences and R&D. This will be supported and facilitated by the institutional competencies of governmental bodies including laws, regulations, technological infrastructure, financial and non-financial subsidies, and environmental investment. The triple helix model will provide a conceptual framework for exploring innovation dynamics and for forming national innovation and development policy-making for the industrial sector.

This study works out the degree of interaction between the triple helix elements (industry, university and public sector) and their impact on the performance of the Palestinian industrial firms, and their ability to develop new innovation. In this regard, a collection of primary data was collected from a sample for 340 industrial firms in the West Bank. Then, a set of quantitative measures and econometric models were applied to answer the research questions in light of the data collected.

Data analysis was based on a number of methods including the Ordinary Least Square regression (OLS), Robust Least Square, Generalized Linear Model (GLM), and Logit Model.

The descriptive statistics show that 17.94% of the industrial firms collaborate with Palestinian universities in order to develop new innovations. 25.29% of the industrial firms collaborate with the Palestinian government in order to acquire knowledge necessary for the development of the innovation process. In addition, 4.71% of the industrial firms collaborate with non-governmental organizations (NGOs).

The analysis of the relationship of collaboration between the triple helix members and product innovation found that the existence of an organizational body as the Higher Council for Innovation and Excellence, (HCIE) regulates the cooperation relationships between triple helix model actors. This is necessary for the triple helix model to succeed as a non-conventional solution for the lack of knowledge and technologies that might be important for industrial firms to grow and compete in an open international economy.

Chapter One

Introduction

1.1 Overview

The Triple Helix model states that the university can play a vital role in the innovation process in an increasingly knowledge-based society (Etzkowitz and Leydesdorff, 2000). The hybridization of elements from industry, university and government to generate new institutional and social formats is important for the production, assimilation and application of knowledge needed for innovation output.

Etzkowitz and Leydesdroff (1995) define the triple helix model as a “spiral model of innovation", having the ability to capture multiple reciprocal linkages at different stages of the capitalization of knowledge, including three main actors: university, industry and government. The overlapping between them is vital to generate new ideas, knowledge, and information. The triple helix model of innovation clarifies the synergies between university, industry, and government, where each of them provides one or more competences in order to provide technological and non-technological innovations. The role of universities is mainly embodied in providing R&D and new technology for the industrial sector so as to develop new or innovative products. The government or public sector enact laws and regulations to facilitate the relationship between universities and the industrial.

The triple helix model has been employed in both developing and developed countries. For example, Martini et al. (2012) analyzed the capabilities of triple helix actors (academicians, local businesses and local government) and proposed a model of collaboration to develop the

economic corridors for Indonesia. They found that all economic corridors still had lots of opportunities to grow integrated R&D institutions, vocational education programs and innovation clusters. Moeliodihardjo et al. (2012) evaluated the readiness of universities to contribute to the Indonesian government's 2011-2025 economic development strategy. They found that the role of each element in the triple helix model needs to be developed and formulated in order to obtain a systematic and beneficial interaction among them.

Palestine, one of the developing countries, suffers from weak performance and fragility of in its manufacturing sector. It contributed around 14.1% to the GDP in Palestine in 2014 (PCBS, 2014). In addition to the political instability and the constraints imposed by the Israeli occupation, this also might be attributed to the weak innovation performance and the nonexistence or weak structure of innovation framework that organizes and facilitates the flow and exchange of knowledge and technologies among the key stakeholders of the innovation process. Thus, the industrial sector needs new technologies, skills and competencies to grow and develop, which can be obtained through a systematic process of knowledge and idea generation, built mainly on R&D efforts.

Statistics show a very weak R&D performance for the Palestinian private sector, where only 25% of firms spent on R&D, and just 11 patents were recorded in Palestine in 2013 (PCBS, 2013). Therefore, we expect that collaboration with universities might provide the needed knowledge and technologies for the industrial firms through some type of collaboration

arrangements protected and organized by laws and regulations provided by public bodies.

1.2 General Problem Statement

The low contribution of the industrial sector to the Palestinian GDP (13.4% only in 2015) is due to lack of R&D and technological innovations. This drives the Palestinian industrial firms to find innovative solutions to bridge the knowledge gap that is needed for new product development. Also, the industrial firms with their own capabilities are not able to provide the needed knowledge and technologies. In addition, the collaboration between industrial sector and government, universities or NGOs are low in terms of innovation. Where 17.94% of the industrial firms collaborate with Palestinian universities in order to develop new innovations, and 25.29% of the industrial firms collaborate with the Palestinian government in order to acquire the necessary knowledge to develop the innovation process, where 4.71% of the industrial firms collaborate with non-governmental organizations (NGOs). Therefore, the Triple helix model is likely to be one of the most important solutions where universities as a center of excellence and knowledge can provide the industrial firms with the needed knowledge, technological competences, and R&D. This will be supported and facilitated by the institutional competencies of government bodies (for example, laws, regulations, technological infrastructure, financial and non-financial subsidies, and investment environments).

1.3 Objective of the Study

This research aims at figuring out the impact of the collaboration relationship between the triple helix actors on the innovation performance of the Palestinian industrial firms. It sheds light on issues concerned with innovation in the Palestinian industrial sector such a innovation performance, obstacles of innovation, the innovation environments and the degree to which the industrial firms cooperate with academic institutions, the public sector, and NGOs.

1.4 Research Questions

The main research question is:

What is the role of cooperation between the triple helix model members (industrial firms, universities and public sector) on the innovation performance of the industrial sector in Palestine?

Moreover, the research aims at answering the following questions to provide information on the innovation system in Palestine:

1. What are the main obstacles facing the development of innovation in the industrial sector in Palestine?
2. What is the main role of public institutions within the Palestinian government in the provision of institutional frameworks required for industrial organizations to build a strategic relationship with universities and other members of the society?
3. What is the level of innovation application in the Palestinian industrial sector?

4. Do the industrial firms in Palestine depend on information sources?
5. What is the percentage of industrial firms collaborating with any of other the triple helix actors (universities, governments, and NGOs)?
6. Is the existence of an organizational body (for example; the Higher Council for Innovation and Excellence, HCIE) important for the success of the triple helix model in Palestine?

1.5 Research Hypotheses

In order to answer the research questions, analysis is based on answering a set of hypotheses:

The first hypothesis: there are no statistically significant relationships at $\alpha = 0.05$ between the collaboration relationships among the helix actors and the ability of industrial firms to enhance their innovation performance. This hypothesis is divided into twelve main hypotheses based on the collaboration relationship and the type of innovation:

$H1_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and universities regarding the ability of industrial firms to introduce new product innovation.

$H2_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and government regarding the ability of industrial firms to introduce new product innovation.

$H3_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and NGOs regarding the ability of industrial firms to introduce new product innovation.

$H4_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and universities regarding the ability of industrial firms to introduce new process innovation.

$H5_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and government regarding the ability of industrial firms to introduce new process innovation.

$H6_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and NGOs regarding the ability of industrial firms to introduce new process innovation.

$H7_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and universities regarding the ability of industrial firms to introduce new organizational innovation.

$H8_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and government regarding the ability of industrial firms to introduce new organizational innovation.

$H9_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and NGOs regarding the ability of industrial firms to introduce new organizational innovation.

$H10_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and universities regarding the ability of industrial firms to introduce new marketing innovation.

$H11_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and government regarding the ability of industrial firms to introduce new marketing innovation.

$H12_0$: There are no statistically significant differences at $\alpha = 0.05$ in the collaboration relationships between the industrial sector and NGOs regarding the ability of industrial firms to introduce new marketing innovation.

The second hypothesis: there are no statistically significant differences at $\alpha = 0.05$ in the relationship between obstacles of innovation (internal and external) regarding the tendency of the industrial firms to collaborate with other triple helix actors (government, NGOs, and university). This hypothesis is divided into three main hypotheses based on the type of collaboration relationship:

$H13_0$: There are no statistically significant differences at $\alpha = 0.05$ in the relationship between obstacles of innovation (internal and external) regarding the tendency of the industrial firms to collaborate with the government institutions.

$H14_0$: There are no statistically significant differences at $\alpha = 0.05$ in the relationship between obstacles of innovation (internal and external) regarding the tendency of the industrial firms to collaborate with universities.

$H15_0$: There are no statistically significant differences at $\alpha = 0.05$ in the relationship between obstacles of innovation (internal and external) regarding the tendency of the industrial firms to collaborate with NGOs.

1.6 Significance of the Study

The importance of the study arises from its ability to tackle the collaboration relationships between the triple helix modal actors as a solution to the lack of knowledge resources in the industrial sector.

The study seeks to find a solution through innovation to increase the contribution of the industrial sector to GDP and employment, regardless of the many distortions caused by the long period of Israeli constraints on the Palestinian economy since 1967.

Moreover, the study introduces the triple helix model as a non-conventional solution for the lack of knowledge and technologies that are important for industrial firms to grow and compete in an open international economy. It

need be noted that Palestine considers the membership of the World Trade Organization (WTO) a priority which, if achieved, will add extra competitive pressures on Palestinian industries.

In the era of globalization, no firm can survive or compete in the medium and long-run without innovation. Innovation has become the solution to competitive pressures at national and international levels. Therefore, one of the important points in this study is to introduce an innovative solution for Palestinian industries that enables them to grow and compete.

1.7 Limitations of the Study

The researcher faces two main limitations:

First, geographical limitation as the study only tackles innovation in the Palestinian industrial sector and its collaboration with the other members of the triple helix model (universities, governments, and NGOs) in the West Bank, exempting both Gaza and some areas in Jerusalem which have been under Israeli occupation since 1967. These have been excluded due to the difficulty of accessing and collecting information.

The weakness of innovation and triple helix model culture and understanding in Palestine, along with the lack of research and studies in relation to the innovation and the Triple Helix model in Palestine are the second limitation.

1.8 Structure of the Study

The thesis comprises seven chapters. Chapter 1 includes an introduction, and the objectives and it outlines the whole thesis. Chapter 2 is the Literature Review including related previous research, studies, reports and analysis (local and international) which define the triple helix model, illustrate its relation with innovation, and mention some of its applications in many developed and developing countries. Chapter 3 includes the analysis of the Palestinian industrial sector; it talks about the history of the Palestinian economy and the structure of its activities. It also introduces the structure of the Palestinian industrial sector, and the main challenges facing it. Chapter 4 talks about innovation and academia industry collaboration in Palestine through applications of innovation in the industrial sectors of many countries and applied innovation in specific industries. It presents the reality of innovation and academia industry collaboration in Palestine. Chapter 5 describes the methodology used including data collection, data analysis and the statistical models. Chapter 6 contains the results of data analysis (descriptive statistics) and discusses population characteristics (demographic variables). Chapter 7 contains results of data analysis (econometric models and testing hypothesis), and analyzes the research hypotheses which are tested using the Ordinary Least Square OLS regression, Robust Least Square, and Generalized Linear Model GLM. Finally, chapter 8 includes the thesis conclusions and recommendations.

1.9 Ethical Considerations

The collected data from firms in the Palestinian industrial sector will be secret and will be used just for analysis purposes. No names or detailed data are to be published.

Chapter Two

Literature Review

2.1 Overview

In the last two decades, there has been a rapid increase in the literature on the triple helix model of innovation and its applications in the different economy sectors (Etzkowitz and Leydesdroff (1995); Goktepe (2002), Rosenlund (2015), etc). This section introduces literatures from both developed and developing countries in order to reach an understanding of how the mechanism of tripe helix models works and its importance in the enhancement of innovation.

2.2 Triple Helix definition

There is no unified definition for the triple helix model, but most of the definitions describe it as a collaboration relationship between university, industry, and government. Etzkowitz and Leydesdroff (1995) were among the first who discussed this model. They define it as a “spiral model of innovation", which is able to capture multiple reciprocal linkages at different stages of the capitalization of knowledge, including three main actors: university, industry and government. Similarly, Etzkowitz (2002) defines the triple helix model as a spiral model of innovation that captures multiple reciprocal relationships at different points in the process of knowledge capitalization. Viale and Ghiglione (1998) clarify that the triple helix model is a spiral (versus traditional linear) model of innovation that captures multiple reciprocal relationships among institutional settings (public, private and academic) at different stages in the capitalization of knowledge. Goktepe (2002) describes the triple helix model as a model of

technological development in terms of university, industry, and government relations.

Leydesdorff (2013) denotes that the triple helix is not only the relationship between university, industry and government, but also the internal transformation within each of these spheres. He shows that the role of the university has been transformed from a teaching institution into one which combines teaching with research; a revolution that is still ongoing, not only in the USA, but in many other countries. In another work, Leydesdroff (2000) describes the triple helix model as the overlay which operates by reflexively selecting from the observables on the basis of expectations that are socially distributed. Expectations can be improved when they are made the subject of systematic research. Thus, expectations and their interactions are the basis of social order in a knowledge-based economy. This overlay continuously reshapes the observable institutions in university–industry–government relations.

Etzkowitz, et al, (2007) clarify that the triple helix model has three main components which are university, industry and government, and each component plays a prominent role in the process of innovation. In a knowledge-based society; it is a movement towards collaborative relationships among the three actors, in which innovation policy is increasingly an outcome of interactions among the spheres rather than a prescription from the government or an internal development within industry. In addition to that, each institutional sphere “takes the role of the other” (Etzkowitz, et al, 2007) operating on a y axis of their new role as

well as an x axis of their traditional function. Rosenlund (2015) indicates that the triple helix modal can be used as an initial framework for such a dialogue through which the model is redefined by input from all sectors.

In general, we can conclude that the triple helix model is a model that clarifies the collaboration relationship between university, industry, and government, where each of them provides one or more competences, to modern innovation development.

2.3 The triple helix model and innovation:

Sutz (2015) notes that university structures -molded by interactions with other social actors will be mediated by the distinct styles of national systems of innovation. The state in the National System of Innovation operates mainly in a widespread way; its duties towards the innovation health of firms and the whole country are a necessity to assure the smooth operation of a smart network of incentives able to push each part of the system towards the road of innovative. In the triple helix model, the role of the state undergoes some changes. The problem is no longer that of getting the innovative milieu right, but rather shaping the course and the direction of the innovative behavior at the micro and institutional levels. Egorov et al. (2015) introduced an econometric method; a quantitative assessment of the innovative activity of a region’s economy actors at different levels on the basis of the innovation dimensional space model. They assessed the role of every triple helix participant in the innovative development of the region as a whole. They considered the municipality a real economy sector,

and divided it into territory specific innovative clusters. Numerical calculations were used to analyze the degree of contribution of the main innovation actors (science/education, business, state) to the innovative development of the regions on the basis of 2012 statistics. The level of innovative development in the economy of a region under analysis is mainly determined by the innovative activity of science/education. This outcome indicates insufficient mobilization and exploitation of the creativity of the human mind at universities and R&D centers, in enhancing the development of the region's innovative activity. In another article, Leydesdorff (2000) uses the ''lock-in'' model by Arthur, W.B. (1988). He explains that the lock in model can be extended to the case of two and even three sources of random variation, which is found in the triple helix university–industry– government relation. In the case of two sources, the stabilization of a technological trajectory is enhanced, whereas in the case of three sources, a complex regime can be generated. Conditions for lock-in, lock-out, return to equilibrium, substitution, etc., are specified in relation to the assumed complexity of the dynamics under study with reference to the stage of development, that is, before or after lock-in. Some normative implications of the triple helix model of innovation can be specified. Leydesdorff and Etzkowitz (1998) developed the triple helix into a cursive model showing how an overlay of communications operates at the underlying institutions. Market selections, innovative dynamics, and network control provide different codes of communication at the global level. Local translations at the interfaces induce adaptation mechanisms in

the institutional arrangements. While two dynamics tend to evolve into trajectories, a regime of transitions emerges when trajectories are recombined. The emerging hyper-networks are expected to be in flux. Institutions can then be flexible in temporarily assuming the roles of other partners. Niche management and human capital management become crucial**.** In another work for Leydesdorff (2010), he examines the changing nature of knowledge-based innovation systems in light of the dynamic interconnections between the university, industry and government. Industries have to assess in what way and to what extent they decide to internalize R&D functions. Universities position themselves in markets, both regionally and globally. Governments make informed trade-offs between investments in industrial policies, science and technology policies, and/or delicate and balanced interventions at the structural level. Such policies can be expected to succeed insofar as one can anticipate and/or follow trends according to the dynamics of the new technologies in their different phases. The evolutionary perspective in economics can be complemented with a turn towards reflexivity in sociology in order to obtain a richer understanding on how the overlay of communications in university-industry-government relations reshapes the systems of innovation that are currently the subjects of debate, policy-making, and scientific study.

In another article, Leydesdorff (2010) explains that the triple helix model was first defined as university, industry, and government. These institutional carriers of an innovation system are expected to entertain a

dually layered network: one layer of institutional relations in which they constrain each other's behavior, and another layer of functional relations in which they shape each other's expectations. He added an example on how the function of university-industry relations can be performed by different institutional arrangements such as transfer offices, spin-off companies, licensing agreements, etc. The institutional relations provide us with network data, but the functions in a knowledge-based economy are to be analyzed in terms of the transformative dynamics. The knowledge base of an economy can be considered a specific configuration in the structure of expectations which feeds back as a transformation mechanism on the institutional arrangements. In another work, Rosenlund (2015) notes that the triple helix model claims that interaction between university, industry and public sector, is the key to modern innovation development, which has become a common way to solve environmental problems. It is of considerable importance to gain more knowledge about this process. The objective of this research is to study and explain cross-sector collaboration using the interactive research method, characterized by joint learning and interaction with the participants. This is applied to two case studies. The first case was an international collaboration between representatives of the triple helix sectors. The triple helix framework was used both on the intended analytical level and at a management level closer to the actor level of the participants. The second case was a three-year environmental research project. This collaboration was extended to include more actors in the region during the process. The actual practice of these cases showed the

importance of a dialogue between participants. Triple helix can be used as an initial framework for such a dialogue through which the model is redefined by input from all sectors. Rosenlund (2015) claims that interaction between university, industry and public sector, is the key to modern innovation development.

2.5 Conceptual Framework for Triple Helix Model:

Rosenlund (2015) explains that the idea of the triple helix model is a means for different spheres to solve problems and to support each other in a cooperative manner. Consequently, a university may apply an entrepreneurial approach to its research and education. Industry will need to appreciate the value of knowledge, research and education within companies, and the government, or the public sector in general can be the driver of this triple helix development by financing universities, projects and infrastructure. The triple helix model can be compared with the national innovation system and the regional innovation system approach. The triple helix does not restrict itself to any particular geographical level. This opens the way for a broader range of analytical perspectives when studying such a model empirically. In a triple helix model, innovations evolve by selection (market), stabilization (politics) and globalization (knowledge). When traditional innovation systems used the first two, they faced difficulties in performing on a global level. Rozenlund (2015) sees the national innovation system as a type of triple helix where the sectors keep their traditional roles, whereas in a triple helix, the sectors become

more interconnected through innovation processes. Predicting where the innovation actually occurs is harder in a triple helix model because of this interconnection.

Etzkowitz (2007) elucidates that the triple helix begins from different starting points: from separate institutional spheres that operate apart from each other; or from any one encompassing and directing others. The global trend is towards a mode in which the various spheres are autonomous but overlapping, not entirely distinct but not completely merged either. There is a shift from bilateral to trilateral interactions, from single and double helixes to university-industry-government joint projects. A typology of innovation systems incorporates various national perspectives.

There is Triple Helix I, a statist triple helix in which the state encompasses academia and industry and directs the relations between them. Triple Helix II, a laissez- faire triple helix, consisting of separate institutional spheres, where government, university and industry operate apart from each other. In this model, the university provides basic research and trained persons. It is expected that firms in an industry should operate completely apart from each other in competitive relationships, linked through the market, whereas the government is limited to addressing problems that can be defined as market failures, with solutions that the private sector cannot or will not support.

Triple Helix III, an interactive model, which consists of overlapping, yet relatively independent, institutional spheres. Therefore, academia plays a role as a source of firm-formation and regional development in addition to

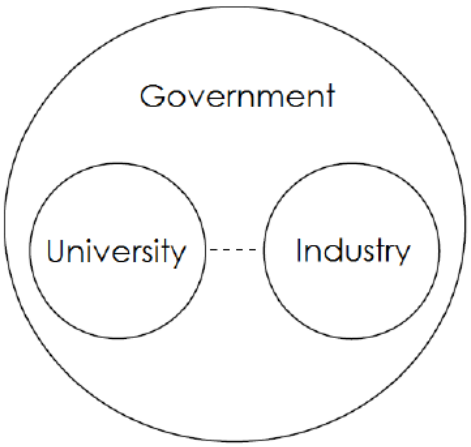
its traditional role as a provider of trained persons and basic knowledge. The government helps to support the new developments through changes in the regulatory environment, tax incentives and provision of public venture capital, while industry takes the role of the university in developing, training and research, often at the same high level as universities.

Most countries and regions are presently trying to attain some form of Triple Helix III, with university spin-off firms, trilateral initiatives for knowledge based economic development and strategic alliances among firms (large and small, operating in different areas and with different levels of technology), government laboratories and academic research groups. These arrangements are often incentivized (but not controlled) by governments, whether through new "rules of the game" (Etzkowitz, 2007) or through direct or indirect financial assistance.

In 2011, Martynovich wrote that the neo-institutional perspective (on the triple helix model) acts as an operationalization of an innovation system (regional, national, etc.) through specifying its main institutional actors: university, industry and government. The main focus of analysis in this case is on the networked interrelationships between these spheres. Neo-institutional perspective suggests that the development of an economic system- in the situation of increasing importance of knowledge and innovation- is enhanced when the main institutional actors start taking the role of each other, stimulating interrelations among them and forming, therefore, interactive trilateral relationships. This overlay of communications becomes as important for the dynamics of the system as

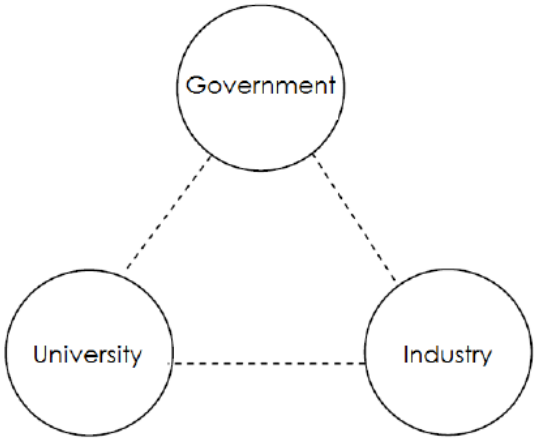
the original knowledge infrastructure of university, industry, government and bilateral relations among them. However, such structure of institutional arrangements in a system is not given naturally – it is developed from one of the opposing standpoints: etatistic (statist) society (Figure 2-1-1) or "laissez faire" society (Figure 2-1-2).

Figure 1. Etatistic (Statist) Society



Source: Etzkowitz, Leydesdorff 2000, p. 111

Figure 2. "Laissez Faire" Society



Source: Etzkowitz, Leydesdorff 2000, p. 111

Figure 2-1: Etatistic (Statist) Society (1) or "Laissez Faire" Society (2)

In statist societies, governments act as a dominant institutional actor, who coordinate the relations between university and industry, and play the main role in developing new initiatives.

The role of the government in this case is limited to solving the problems of the so called "market failures", which is supported by liberal political agendas and neo-classical economic schools. In such societies, the institutional spheres of university, industry and government are clearly divided, and the relations between them are performed ad hoc on the bilateral basis across decently defended boundaries. Each of the spheres is supposed to be appointed to the functions on the one-to-one basis.

University is for basic research, government for normative regulations and industry as a productive force. With the development of the knowledge-based economy, two major transformations, which shape the brand new structure of an innovation system, can be distinguished. First, the formation of reciprocal relations between institutions in the system on the constant basis, and second, the replacement of industry by university as a core institutional actor. Metcalfe (2010) distinguishes three steps for this transformation, which reflect the evolutionary aspect of the model:

1. Internal transformation in each one of the institutional actors, during which they "take the role of each other" – for example universities may take the "third mission" of wealth creation through firm formation, business oriented research, etc. as they keep the core competencies for education and basic research,.
2. Formation of the new overlay of trilateral relations among the institutional spheres. To create a science park for private companies to acquire technologies and knowledge is one example. This knowledge is developed in a university, with governmental financial support. (The science park, in this case, acts as an intermediary organization between the three actors).
3. Recursive development of the triple helix networks. This depends on developments achieved in each one of the helix model elements and on the past configuration of the networked overlay of the relations.

As a result, a complex system of relations is developed, forming some kind of a hierarchy of internal dynamics among the components, and the bilateral and trilateral relations among them (Figure 2-2).

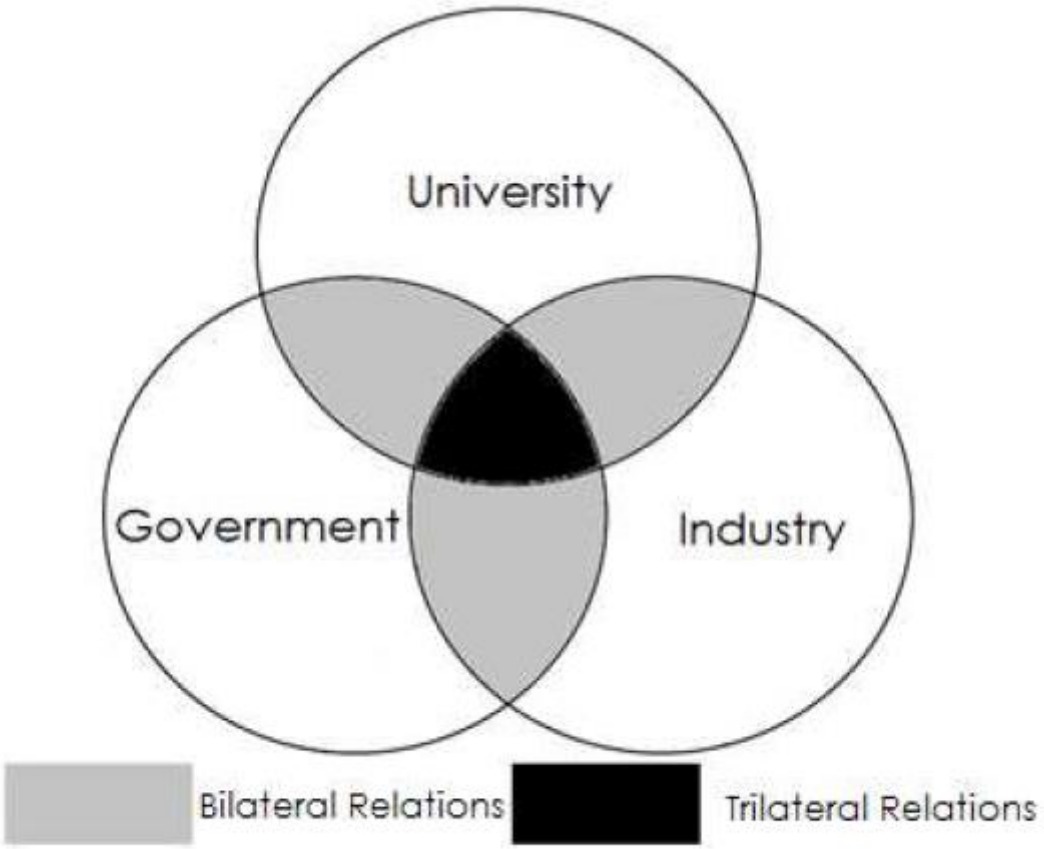


Figure 2-2: Triple Helix Society

In this system, the traditional university transforms into the so-called "entrepreneurial university", which becomes the main institutional actor in the system. Such form of a university is based on 5 norms:

- **Capitalization of knowledge**. This states that the production and transfer of knowledge is to be driven through means of practical application and product development as well as disciplinary

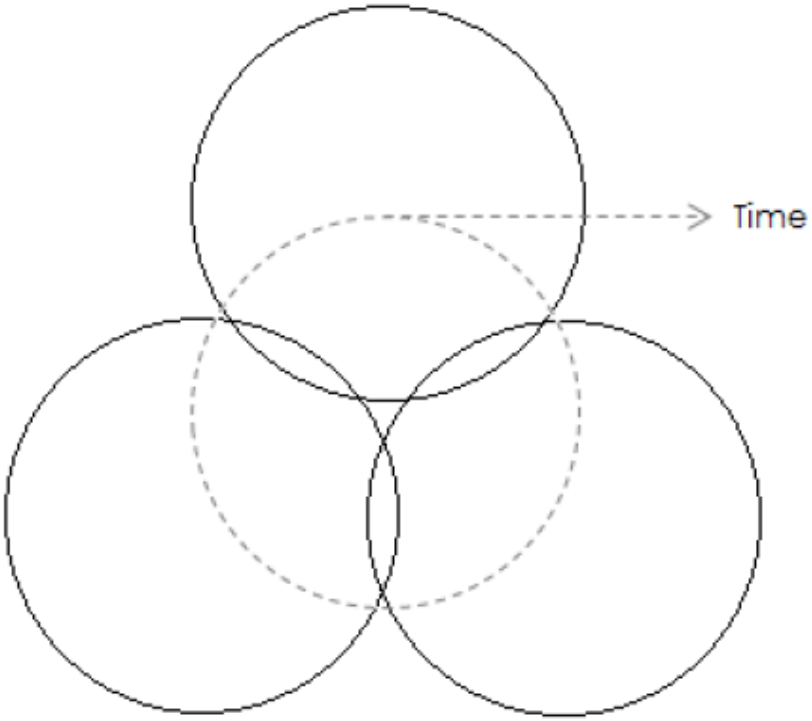
advancement. Gibbons et al. (1994) state that this type of knowledge production is also the main idea of the “Mode 2” thesis.

- **Interdependence**. This refers to the close reciprocal relations with governmental agencies and industry.

- **The entrepreneurial university** should stay independent from the other institutional actors.
  - **Hybrid organization**. This refers to the combination of “core” and “supportive” missions of knowledge production and contribution to the society.
  - **Reflexivity**. This is achieved through a continuous reflexive reconstruction of the internal structure of a university along with its networks.

To sum up, the neo-institutional perspective on the triple helix model is considered as one of the approximations for the structure of an innovation system (national, regional, etc.). The evolutionary character of the model is reflected in the mechanism of transformation to the triple helix society.

The neo-evolutionary perspective aims at studying possible synergies between these functions, which are supposed to enhance the development of the knowledge base in the national (or regional) innovation system. The graphical representation of neo-evolutionary triple helix by Leydesdorff (2011) is different from – if not opposing – the neo-institutional one (Figure 2-3).



Source: Leydesdorff 2011, p. 7

Figure 2-3: Hypercycle in the Neo-Evolutionary Triple Helix Model

It is clear from the figure that all functions are highly interdependent. When two of the helices form bilateral relations, the third helix acts as a selection environment (context) through having mutual relations with the first two (but not with their interaction). Hence, the third element reduces the uncertainty in the system, when two helices interact. Brought together on the level of a system, such selective environments form the synergetic mechanism, which enforces the systemness of an economic as well as an innovative system and the ability to enhance self organization. This synergetic mechanism acts as the next-order system, coordinating the helices over time. The co-evolution between knowledge exploitation and knowledge production under some circumstances may form the

technological trajectory, due to the interdependence between demand for and supply of technologies. The synergy between knowledge production and normative control may give impetus to the formation of a national innovation system or enforce changes.

In another work for Leydesdorff and Etzkowitz (1998), they explain that the triple helix is a model for analyzing innovation in a knowledge-based economy, and this model accounts for the phenomenon of emergence, that is, it helps us to understand how the innovation system is based on expectations. While the complex phenomenon of innovation is what has to be explained, different theories provide us with a variety of possible suggestions. More than a single explanation is expected because different perspectives are useful. To use an evolutionary metaphor, the perspectives can be considered as the 'genotypes' that reflect on specific interactions within and among the helices, while the complex dynamics of innovation are 'phonotypical,' that is, beyond the control of any given perspectives. In contrast to biological evolution, the 'genes' are not given, but constructed in the social, technical, and economic evolution of modern societies with their tendency to transform themselves and their interactions operationally by rearranging their configurations. In a new regime, the system is reconstructed from a set of its own previous states, including the natural environment and society's communal roots. Thus, technology celebrates community as a social achievement, including its ongoing redefinition of 'nature' and 'culture.'

Leydesdorff (2000) writes about the evolution of innovation systems, and the current conflict over which path to be taken in university–industry relations. These are reflected in the varying institutional arrangements of university–industry–government relations. First, one can distinguish a specific historical situation which can be labeled as Triple Helix I. In this configuration the nation state encompasses academia and industry and directs the relations between them.

2.7 Innovation-Industry Collaboration

Several studies indicate the importance of innovation in industry. For example, Misthal and Eddy (2013) wrote a research about across industries on 20 countries. They found a clear correlation between innovation and success in growing revenues. In breakthrough innovation and growth, they report that the most innovative companies overall are growing significantly faster than the least innovative. The difference for industrial manufacturing companies is dramatic. The sector’s most innovative companies grew 38% over the last three years—nearly 12% per year—while the least innovative managed just 10% growth over the same period. Looking forward, the sector’s top innovators have somewhat more modest expectations, but they’re still targeting annual growth of 6.9%, while the least innovative companies are expected to manage just 3.6%. In another article, OECD (2009) confirms that to meet the growing environmental challenges, much attention has been paid to innovation as a way of developing sustainable solutions, also known as eco-innovation. This concept is gaining ground in

industry and among policy makers as a way to facilitate the more radical and systemic improvements in corporate environmental performance that are increasingly needed. This has led to understanding eco-innovation in the sense that solutions concern not only technological developments but also non-technological changes such as those in consumer behavior, social norms, cultural values, and formal institutional frameworks. Changes across all these areas, however, cannot be achieved by a single company.

Hongqi and Jianlong (2014) show that strategic emerging industry is a typical innovation- driven industry, and major technological breakthrough is the key to sustainable development of strategic emerging industry. Thus, from the angle of modular theory, they built radical technology innovation paths for strategic emerging industry: "peripheral modules →core modules" path, "core modules →architecture rules" path and "architecture rules →core modules" path. These paths are based on analyzing the connotation and modular characteristics of radical technology innovation of strategic emerging industry, and then validating the paths as being scientific and feasible with the example of a typical representative of high-end equipment manufacturing industry, radical technology innovation paths of large aircraft industry. The purpose is to provide theoretical and method support as well as decision references for strategic emerging industry to carry out the radical technology innovation.

In addition, several authors studied the impact of innovation on one or more branches of industry. For example, Hurley and Hunter (2013) discuss that innovation in the oil and gas industry isn’t only centered on increasing

production; making sure that operations run safely is another top priority. That can mean finding new ways to monitor the integrity of materials in changing environments or creating new systems for inspection, maintenance and repair. And as the industry enters more challenging environments, innovation to ensure safety is becoming more vital. Take deep-sea drilling as an example. Hurley and Hunter (2013) found that one of the keys to driving growth is to focus on a balanced innovation portfolio which means finding the right mix of investments in incremental, breakthrough and radical innovation across the whole range of innovation areas. The right mix for oil and gas companies will depend on where they are in the value chain.

Another study by ITRE committee, Hamza et al., (2015) describe the mutual reinforcement of open innovation and additive manufacturing and address recommendations for different policy levels. The study tries to avoid two potential pitfalls: not to underestimate the potential of open innovation and 3D printing and at the same time not to overestimate it. The study found that technical innovation in additive manufacturing and 3D printing is speeding up and is supported by European programmers. The social aspect, consequences for the labor market and the work flow and new business models need further research and development.

On innovation in the automotive industry, Wyman (2015) analyzes the innovation strategies of the industry's most successful auto companies. The study identifies the levers that car manufacturers and suppliers must pull to become state-of-the-art innovation leaders. Depending on the business

design of the supplier and OEM, four dimensions must be brought into alignment: innovation proposition, competence focus and collaboration, innovation business case, and innovation organization and structure. The leading suppliers in innovation management generate a 16 percent higher EBIT margin than their peers – all by employing a clear innovation strategy and balance along these four dimensions. Wyman concludes with five recommendations for innovation management in the automotive industry:

- Increase customer orientation and marketing focus on R&D.
- Generate a diverse innovation product and services' portfolio.
- Improve R&D effectiveness and efficiency; reduce innovation risks.
- Enhance the innovation culture and organization.
- Align innovation strategy according to Oliver Wyman's "Innovation Strategy Framework"

In agriculture industry, Winger and Wall (2006) wrote a paper to provide a background context to discussions that will define further work in the area of agricultural food system innovation. They define Product Development as systematic, commercially oriented research to develop products and processes, satisfying a known or suspected consumer need. They define the innovation spectrum using terms such as "new to the world", "product improvements" and "cost reductions". This paper describes the food industry as being one in which there is a large number of new products offered to retailers each year and the inclusion of a new product almost always leads to discontinuation of another product. However, only a very small proportion of new products encountered radical changes, the majority faced incremental changes. Even then, 75% of new products were

considered to be failures. It was noted that in comparison to other industries (e.g. electronics, bio-technology), a very low level of R&D is undertaken. This was determined when the economic impact of the food industry was examined. Their analysis also shows that there is a much greater influence on the non-food sector from stimulating the processed food sector, rather than the raw material (agricultural) sector. It was noted that there is a stronger correlation between growth in manufacturing exports and processed food exports, than there is between processed food exports and primary products exports. It was noted that countries are seeking to capture value-added locally and implement trade regulations that encourage imports of relatively less-processed agricultural commodities. The paper concludes with three questions in relation to innovation in the food industry and specifically in the area of food product development. First, what actions can individual companies, or the private sector as a whole, take to improve food product development? Second, what can the public sector within countries do to create an environment that might engender more successful product development and can it obtain better leverage from existing investments in food sector R&D? Third, what can multilateral organizations do to assist individual countries or geographical regions to add value to agricultural products through food product development?

Atalya et al. (2013) wrote a study which aims at examining the relationships between innovation and firm performance. Their study survey was conducted on top level managers of 113 firms operating in the automotive supplier industry which is one of the most innovative industries

in Turkey, for 2011. They concluded that technological innovation (product and process innovation) has significant and positive impact on firm performance, but no evidence was found for a significant and positive relationship between non-technological innovation (organizational and marketing innovation) and firm performance.

Chapter Three

The Palestinian Industrial Sector

3.1 Overview

In this part the researcher sheds the light on the Palestinian economics history and its structure based on economic activities and the size of enterprises. This sector suffer from many distortions, basically occupation and affect the economic growth. Extensive details on the industrial sector, its structure and its components are necessary as it also contributes to the Palestinian GDP.

3.2 A historical brief on Palestinian Economics

Historically, Palestinian economics has a three joint period; the time before 1994, the period between 1994 to 2000, and the period after 2000 up till today.

Before 1994, Palestinian economics was fully under occupation. The Israeli occupation had control over of the elements of Palestinian production, land, natural resources, work, capital, management and organization. Making change in the Palestinian economic infrastructure requires the Palestinian economy to be totally independent from all Israel constrains. One-third of the Palestinian work force was employed in Israel; approximately 90 percent of the imports were of Israeli origin; and some 80 percent of exports were sold in Israel or passed through its ports. The main features of Israel's policy were[1]:

[1] http://www.btselem.org/freedom_of_movement/economy_1967_1994

- Delaying, obstructing, and failing to encourage investment in the Occupied Territories. The civil administration bureaucracy and military legislation were used for this purpose.
- Creating a "captive market" for Israeli goods by blocking imports to the Occupied Territories from other countries.
- Encouraging mass entry of Palestinians into the Israeli labor market, particularly in construction, agriculture, and services.
- Causing investment to fail in the development of physical infrastructure in the Occupied Territories, and channeling some tax revenues collected from Palestinians to the Israeli treasury, rather than investing them in the Occupied Territories.
- Damaging agriculture, a main component of the Palestinian economy, by dispossessing Palestinians of their land, limiting the water quota, and restricting export of agricultural products to Israel.

The period between 1994 to 2000 is known for the establishment of the Palestinian National Authority as a self-governing body. Abu Alqumsan (2005) notes that the Palestinian National Authority (PLA) has been trying to develop a constituent mechanism of action through an action plan for the formation of economic and institutional structures and for the coordination with other countries. He confirms that the PLA needs to activate the role of the productive sectors through development programs at macro and micro levels accompanied with the reformation of the financial and economic laws necessary to motivate both local investment and foreign direct investment.

The macroeconomic indicators of this period show a steady increase in economic growth and a decrease in unemployment growth. For example, the economic growth rate between 1998 and 1999 was 11% with 8.2% growth in real GDP, and the unemployment rate decreased by 1.8% for the same period (PCBS). This was mainly due to the state of the temporal political stability following the Oslo Accords accompanied with an increase in foreign aid granted to the Palestinian Authority, mainly for infrastructure projects, as well as an increase in employment in the Palestinian public sector and in Israel.

Despite these positive statistical results, we cannot conclude that they represent a real economic development in terms of failure of economic policies to achieve economic pillars and props necessary for the survival of the positive economic indicators including: low competitiveness for Palestinian products, widening the trade deficit, and increasing the role of service sectors; mainly public services, while the role of productive sectors is diminished.

The next period started with the breaking out of the second Intifada at the end of the year 2000 and since then, Palestine has witnessed a dramatic fall in all economic indicators at micro and macro levels. Siege and closure against the Palestinian territories in the West Bank and Gaza, and the destruction of the infrastructure (roads, airport, public institutions, industrial infrastructure, etc.) stand behind this fall.

Figure (3-1) shows the Palestinian real GDP for the 2000 to 2015 period. Because of the intifada, GDP decreased between 2000 and 2002. However,

GDP started to increase following 2002, and since 2007 it increased from 4913.4 million US dollars to reach 7721.7 million US dollars in 2015

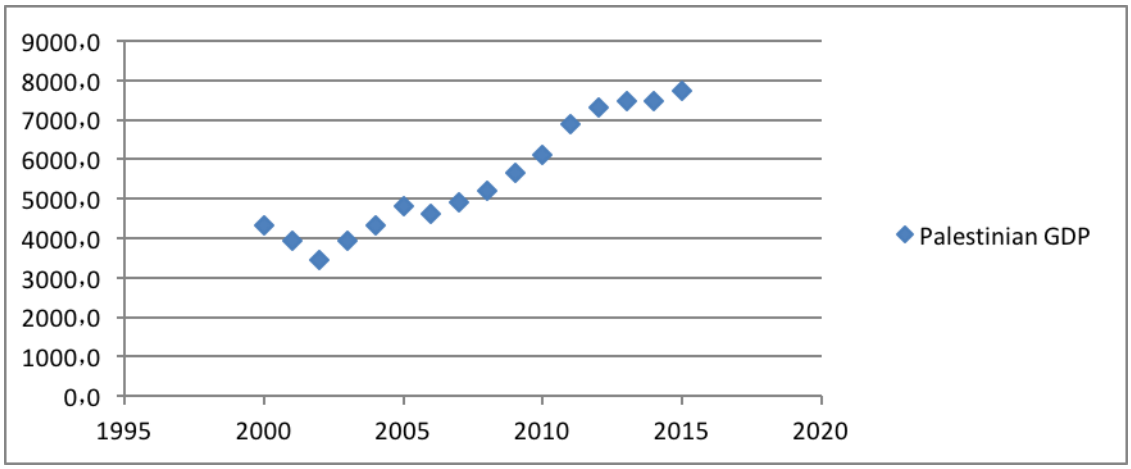


Figure 3-1: The Palestinian GDP 2000-2015

But, until now, the Palestinian economics is still suffering from distortions and weaknesses in the macroeconomic indicators. For example, the Palestinian nominal GDP reached 12,673 million US dollars in 2015, while it was 12,715.6 million US dollars in 2014. The nominal GNP per capita in 2015 reached 2863.9 US dollars while it was 2960.1 US dollars in 2014. (PCBS, 2016). Theses distortions are a result of many reasons like wars that lead to the destruction of the Palestinian economy every time it tries to stand on its feet. The state of interdependence existing between the Palestinian economies on the one hand and Israel and tangles on the other hand caused the transitional phase of the Oslo Accords (1994-2000) to fail in strengthening the independence of the Palestinian economy.

3.3 The Structure of the Palestinian Economic sectors

The Palestinian economy is described as a small sized enterprise economy, as most of the Palestinian enterprises are small and medium (SMEs). Table (3-1) elucidates the size of the Palestinian sectors in terms of the number of employees. It shows that about 90% of enterprises in Palestine are small and medium (SMEs). Enterprises are classified as SMEs if they employ less than twelve employees in industry, transport, and storage sectors; less than seventeen employees in construction sectors, or less than eight employees in trade sectors. The services sector is considered an SME when it employs less than fifteen employees, while he information and communication sector is an SME when it employs less than sixteen employees.

Table 3-1: Palestinian Enterprises Size Percentage as Economic Activity Based on Number of Employees 2015

Economic activities	Palestinian enterprises size					
	Small		Medium		Large	
	No. employees	percent	No. employees	Percent	No. employees	Percent
Industry	1-3	68%	4-11	27%	12 and above	5%
Construction	1-5	59%	6-16	31%	17 and above	10%
Trade	1-2	80%	3-7	18%	8 and above	2%
Services	1-3	80%	4-14	17%	15 and above	3%
Transport and storage	1-4	53%	5-11	32%	12 and above	14%
Information and communication	1-3	60%	4-15	32%	16 and above	8%

Source: PCBS, 2015

Regarding the contribution of each economic sector to the GDP, data from the Palestinian Central Bureau of Statistics (PCBS) for 2015 show that the service sector contributes to about 49.5% of GDP, 17.7% for wholesale and retail trade, 13.4% for the industrial sector, 8.3% for the construction sector, 5.9% for information and communication technology, 3.3% for agriculture, and only 1.9% for transport and storage.

It is clear that the level of economic activities varies. Service activities and other branches ranked first in the Palestinian economy in terms of value added and employment, followed by wholesale and retail activities, and industry activities, while transport, storage and farming activities occupied a lower rank. As for the average worker's share of value-added, information and communication, activities ranked first, followed by service activities and other branches, then industrial activities. Daily wage nominal rate reached its highest value in information and communication activities followed by service activities and other branches. It had less value in transport and storage activities along with agriculture activities.

Regarding employment share, data in table 3.2 show that the service sector contributed to 42.1% of total employment rates in 2015, while the industrial sector's contribution was only 13.7%, with a real daily wage of 66.1 NIS per labor. Despite its low contribution to employment rates (around 1%), information and communication activities had a real daily wage of 108 NIS per labor, which is the highest among other economic sectors. This might be attributed to the high skills required for jobs in the information and communication sector which leads to high value added and productivity.

Table 3-2: Economic Activities Contribution in 2015

Economic Activities	Contribution to Employment Rate (%)	Real Daily Wage NIS /Labor
Agriculture	8.7	46.2
Industry	13.7	66.1
Construction	9.1	77.5
Wholesale and retail trade	20.0	50.0
Transport and storage	5.4	39.3
Information and communication	1.0	108.2
Services and Other Branches	42.1	86.4

Source: PCBS, 2015

3.4.3 The number of industrial firms in Palestine

Data show that there were around 18,662 industrial enterprises in Palestine in 2015, distributed in the West Bank with 13594 facilities (73%) and 5,068 in Gaza Strip (27%).

3.4.4 Size of employment in the industrial sector

The Palestinian industrial sector employs 90483 employees, 75% in the West Bank, and 25% in Gaza Strip. In addition, the industrial sector's contribution to value added is 1458699.9 thousand dollars, 21.5% in the West Bank, and 78.5% in Gaza Strip. But the industries which contribute the most to the value added are manufacture of food products and other non-metallic mineral products, followed by manufacture of furniture and manufacture of fabricated metal products, except machinery and equipment.

3.4.5 Gross capital formation in the industrial sector

Palestinian industrial sector contributes to 30347.1 thousand dollars of total capital formation (91% in the West Bank and 9% in Gaza). The food products sector has the largest contribution to gross capital formation in the Palestinian industrial sector with 13376 thousand dollars, followed by basic pharmaceutical products and pharmaceutical preparations, and other non-metallic mineral products. Also rubber and plastic products contribute to gross capital formation with 4419, 3024.1, 2204.3 thousand dollars respectively. Other sectors do not contribute to gross capital formation like remediation activities and other waste management services, other transport equipment, and coke and refined petroleum products.

3.3.5 The classification of the Palestinian industrial sector in terms of size

The Palestinian industrial sector is characterized as small in terms of size. Small enterprises which employ less than four employees form about 68% of the total industrial firms. Medium firms which employ from four to eleven employees form about 27% from the total industrial firms, whereas large enterprises which employ more than eleven employees represent only about 5% of the number of Palestinian industrial enterprises

The small enterprises are important in developing economies as in Palestine; they have several benefits as:

- Increasing the value added of products, by producing many goods and services.

- Decreasing the unemployment rate even to a small rate, by employing some of the Palestinian working forces.
- Increasing self-employment of graduates from universities and institutes, especially in the professional and technical fields.
- Encouraging individual initiatives, skills and talents, especially those that do not require significant funding to implement.
- Exploiting the savings of individuals, especially that the savings of members of the Palestinian society are low due to the low average per capita income which equaled 2864 $ in 2015.
- Increasing the role of Palestinian women in the labor market, which usually helps in creating traditional and agricultural projects and others.
- Establishing small enterprises as the first step for the development and expansion in the future so as to become big enterprises.

3.5 Challenges facing the Palestinian Industrial Sector

Industrial sectors in states around the globe suffer from several challenges. These challenges differ from one state to another pursuant to economic and political stability and the level of development. The Palestinian industrial sector suffers continuous challenges because of Israeli occupation and the sieges. Following is an illustration of these challenges.

3.5.1 Economics challenges

These include production elements as land and water sources, which are controlled by Israeli occupation. Add to that, almost 85% of inputs are imported via "Israel". Consequently, the Palestinian economy is dependent on Israel. The Ministry of National Economy estimates the Palestinian domestic product share as only 20%; 70% from Israel. Another issue is the absence of a Palestinian currency and the use of the Israeli shekel with its low value. As a result, Palestinians' import from inputs, machines, equipment and raw material is more expensive leading to high costs on Palestinian industrial enterprises. Another challenge is the lack of appropriate infrastructure for industrial zones, in terms of roads, transport, communication, water and electricity networks.

3.5.2 Political challenges

Due to the Israeli occupation, the Palestinian industrial sector suffers from many political challenges including the political instability, the presence of occupation, and the intifada cascade through every few years along with siege and border closing. Such situations make it difficult to import production requirements from overseas market, or to export Palestinian products to foreign markets. The Paris Protocol was signed in 1994 between PLO and Israel and was incorporated as a supplement into the Oslo Accords in 1995. The protocol cancels any fees or customs between Palestinians and the Israeli occupation. Palestinians are not allowed to impose fees or customs less than those imposed by the Israeli occupation

on imports from any other country. The protocol also identifies specific lists of goods that Palestinians can import with specific quantities from certain Arab and Islamic states and other countries under specific conditions.

3.4.3 Legal challenges

Legal challenges are those related to strategies of establishment and expansion, in terms of the long and complex procedures of project registration, the large number of required documents, and the duplication of certain fees like license fees for profession. The Palestinian Presidential Decree No. (8) of 2011 concerning income tax[1], in the fourth chapter on Tax rates and segments, Article (16) imposed an income tax on enterprises by 15%. Another legal challenge is the Palestinian Investment Promotion Law affecting mainly small and medium enterprises which accounts for 95% in this sector. This law targets the 5% big enterprises. The Presidential Decree No. (7) of 2014, on an amendment to encourage the Palestinian Investment Law No. (1) of 1998, and its amendments[2], Article (8) imposed a tax on new industrial enterprises which employ more than 24 employees; new industrial enterprises which export more than 40% of production; new industrial enterprises which use 70% of domestic components (equipment and raw materials), and existing industrial enterprises who hire 25 new employees. These enterprises can benefit from tax incentives. Examples of incentives are the 5% income tax rate for up to five years starting from the

[1] http://muqtafi.birzeit.edu/pg/getleg.asp?id=16266
[2] http://legal.pipa.ps/files/server/Law%20on%20the%20Encouragement_Merged.pdf

date of making profit and not exceeding four years; and the 10% income tax rate for a period of three years starting from the end of the first stage, and then calculated as valid percentages and slides. But in Article (12), businesses and real estate projects and real estate development, electricity projects of all kinds, communications, crushers, quarries, and corporate developments on the concession contracts of the Council of Ministers engaged in monopolistic companies are enterprises excluded from tax incentives.

The absence of effective laws for the protection of innovation in terms of intellectual property rights and product patent is also a legal challenge affecting the Palestinian industrial sector.

Chapter Four

Innovation and Academia Industry Collaboration in Palestine

4.1 Overview

Innovation is a necessity for both developed and developing countries to stay on the path of development. Palestine needs innovation in every sector especially with the suffering caused by occupation and its control over boarders and markets. This chapter highlights Palestinian innovation, innovation index, academia industry collaboration, in addition to some innovation-related centers such as the Higher Council for Innovation and Excellence (HCIE) and An-Najah Business Innovation and Partnership Center (NaBIC).

4.2 Innovation in Palestine

Innovation is the process of translating an idea or invention into a good or service that creates value or for which customers will pay. Any idea to be called an innovation, must be replicable at an economical cost and must satisfy a specific need. Innovation involves deliberate application of information, imagination and initiative in deriving greater or different values from resources, and includes all processes by which new ideas are generated and converted into useful products. In business, innovation is often achieved when ideas are applied by the company in order to further satisfy the needs and expectations of the customers[1].

Palestine, as any country, needs innovation to stimulate economic development to be a knowledge society. Khatib et al. (2013) analyzed a community innovation survey on two major Palestinian industrial sectors,

[1] http://www.businessdictionary.com/definition/innovation.html

namely quarrying and stone fabrication and the food and beverages sector. The analysis revealed high innovative potentials in both sectors; where employment, export, and revenues are clearly improved in innovative enterprises. They also analyzed the importance of cooperation between the industrial sector, higher education and R&D institutions, considering the lack of such cooperation a major problem that should be tackled in order to strengthen the enterprises' ability to innovate.

Palestine is one of the developing countries that suffers from weak performance and the fragility of the manufacturing sector which only contributed to 13.4% of the GDP in Palestine during 2015 (PCBS, 2015). The political instability and the constraints imposed by the Israeli occupation, can be considered as a cause of the weak innovation performance and the inexistence or weak structure of innovation frameworks that organize and facilitate the flow and exchange of knowledge and technologies among the key stakeholders of the innovation process. Thus, the industrial sector needs new technologies, skills and competencies to grow and develop. These can be obtained through a systematic process of knowledge and idea generation, built mainly on R&D efforts. Despite the importance of R&D, the statistics are weak, because it's very poor in Palestine. A research and development survey was carried out by PCBS, in 2013. It reached the following findings:

1. Research and Development Personnel: In 2013, there were 8,715 employees in R&D, representing 5,162 full-time equivalent (FTE) workers. There were 4,533 researchers, which represent 2,492 FTE

researchers, including 3,510 male and 1,023 female researchers. There were 566 FTE researchers per one million inhabitants.

2. Research and Development Outputs: The major outputs of R&D in 2013 were 72 international awards and 116 local awards, 149 international standard book numbers (ISBN), and nine patents. Research was distributed by fields of research as follows: 26.7% studies and consultations, 34.4% basic research, 30.6% applied research, and 8.3% experimental research.
3. Expenditure on Research and Development: The total expenditure on R&D was USD 61.4 million, representing USD 24,641 per (FTE) researcher. The governmental sector contributed 56.1% of all R&D expenditure, non-governmental organizations contributed 20.9%, and higher education contributed 23.0% of total expenditure on Research and Development.

So, we expect that the collaboration with universities might provide the needed knowledge and technologies for the industrial firms through some types of collaborative arrangements protected and organized by laws and regulations provided by public bodies.

4.3 The Palestinian Innovation Index

Developing a Palestinian Innovation Index is very important to provide an initial database of private institutions, official bodies and researchers in Palestine. It is also important to assist the decision-maker in developing successful and effective policies in this regard. It enables Palestine to be

enlisted within the Arab Innovation Index, which has been published annually since 2014. The index helps assess the level of innovation in Palestine compared with other Arab countries as well as developing countries that have similar economic conditions (PCBS & Morrar, 2016).

In 2016 and in cooperation with the PCBS, Morrar (2016) developed a Palestinian Innovation Index based on the Global Innovation Index, and the Arab Innovation Index. He divides the indicators to inputs and outputs; the inputs contain the legal system, the human element and research, the infrastructure of information technology and communication, the size of partnership in innovation, and the flow of knowledge from abroad, supported by innovative projects. The outputs contain intellectual products, and goods and services of a creative nature. The author found that a large number of the indicators from the Global Innovation Index, and the Arab Innovation Index are not available in Palestine. He concludes with the final indicators of innovation in Palestine according to the Arab innovation panel, as in the table (4-1) below.

Table 4-1: The Final Indicators of Innovation in Palestine According to the Arab Creativity Panel

Indicator	Year	Value
Population (million)	Mid 2016	4.82
Population aged 25-64 years (in thousands)	Mid 2016	1.691
GDP at current prices in US $ (billion)	2015	12.6
Share of goods and services in GDP	2015	18.3%
Input of Innovation Human Resources		
Higher education graduates per 1000 population (25-64 years)	2011\2012	20.9
Number of PhD graduates in higher education	2011\2012	1
Number of graduates of higher education	2011\2012	37383
Percentage of science graduates of higher education graduates	2011\2012	7.9%
Percentage of engineering graduates of higher education graduates	2011\2012	8.4%
Percentage of science and engineering graduates of higher education	2011\2012	16.3%
Number of R&D staff	2013	8715
Number of R&D staff in full time equivalent	2013	5162
Number of enrolled in secondary vocational education	2014/2015	2734
Enrollment in education	2014/2015	721004
Empowerment		
Foreign direct investment ratio of GDP	2014	0.9%
Foreign direct investment (US $)	2014	120
The quality		
Total Tertiary Students' Achievement in Mathematics and Science (TIMSS)	2014	824
Eighth Grade Students in Mathematics (TIMSS)	2014	404
Eighth Grade Students in Science (TIMSS)	2014	420
Total commodity exports in US $ (million)	2014	943.72
Exports of high-tech goods in US $ (million)	2014	24.9
Percentage of information technology from exports	2013	0.3%
Percentage of exports of goods with heavy technology of commodity exports	2013	2.7%
Intellectual products		
Applications for resident patents	2015	18
Registration of resident trademarks	2015	915
Industrial design registration	2015	37

Source: PCBS, 2016

4.4 Academia Industry Collaboration in Palestine

The discussion on industry-academia collaboration has increased in Palestine within the last few years, aligned with global trends in this field. To build a strategic collaboration based on a win-win relationship is crucial for the industrial firms to provide the R&D and knowledge required to grow and develop.

In Palestine, Abu Hanieh et al. (2015) discuss the existing status of industry academia partnership with relevance to engineering education and the horizons of implementing new scenarios and strategies in developing countries, particularly in Palestine. To strengthen the relationship between academia and industry, they propose an innovative model built on "awareness and market needs feedback" in order to create modern learning techniques which are capable of bringing the two sectors together. They found that a strong industry-academia partnership is likely to be optimal for understanding constrains and real life settings, and will reflect on the solutions provided by engineering graduates to serve more sustainability. This can lead to improvements in sustainable development and significant increase in the added value. Abu Hanieh confirms that industry-academia partnership can be applied on two tracks; the first track is based on curricula development, while the second track is based on taking modern structural measures.

In another study, Albydah and Saleh (2016) found that the link between industry and universities is weak which affects the innovation system in Palestine. Regardless of the low role that the Palestinian government plays

in knowledge generation and transfer, the development of such knowledge and technology transfer collaboration will provide the environment needed to raise the level of innovation by providing the knowledge and technology needed for all participants. They clarify the whole knowledge and technology transfer process by identifying the factors that affect the knowledge and technology transfer collaboration, determining the stakeholders of these collaborations and evaluating the current states of these factors according to each participant's role in the knowledge and technology transfer collaborations. Depending on exploratory and qualitative research methodology, they found that universities are the core participant in the knowledge and technology transfer, and this system must start with the researcher’s development and end with the transformation of the university to the entrepreneurial form. They confirm that the industrial sector must be involved in knowledge and technology transfer collaboration, to help in providing necessary knowledge, technology and profit. .

They found that it is important to build independent knowledge and technology centers inside universities to identify and coordinate knowledge and technology transfer process activities with the existence of the right structure and experts inside these centers.

4.5 Innovation-related Centers in Palestine

Despite political instability and the lack of financial and non-financial resources, many trials have been developed in the last few years to build

the infrastructure for R&D and innovation in Palestine such as innovation centers and centers of excellence in universities, technology incubators, the Higher Council for Innovation and Excellence.

4.5.1 Higher Council for Innovation and Excellence (HCIE)

HCIE was founded in 2012 following a Palestinian presidential decree. HCIE is taking in consideration the importance of its existence, which is putting more responsibility on its role in leading change through its faith and confidence in the potential creative capacities and the energies of the Palestinian people. It recognizes the vital role of creativity in building up the State of Palestine and strengthening the steadfastness, resilience and prosperity of the Palestinian people. HCIE seeks to play a leading role in consolidating a culture of innovation and excellence among the Palestinian community and very fair and just empowerment of all those innovators and creative people. It aims at strengthening the structure of creativity systems in various sectors, so that creativity becomes the mainstay of economy and the knowledgeable society which we seek.

HCIE has several strategic goals: [1]

1. Dissemination and entrenchment of a culture of excellence and innovation amongst the Palestinian people, especially among the youth. This is achieved through:

a. Setting up a code that includes values, directives, and standards, functioning and stimulating creativity and excellence.

[1] http://www.hcie.ps/ar

b. Embracing creative people and providing them with care and support in various forms.
c. Working with the Ministry of Education and Higher Education to develop policies, regulations and supportive programs for innovation and excellence, especially at the level of primary education and higher education.

2. Strengthening the structure of the innovation system within the various sectors. This is achieved through:
    a. Supporting institutions that work in the field of innovation and excellence, strengthening institutional capacities and stimulating the coordination and concerted efforts and the integration of their roles in order to maximize the collective impact, and put an end to the duplication and fragmentation of efforts.
    b. Encouraging the private sector in Palestine and in the Diaspora to increase its investment in the field of innovation and creativity, and stimulating the issue of establishing multi-party partnerships including the public sector, private sector, the national sector, and universities and institutions concerned so as to form an organizational structure or framework that stimulates and enhances innovation, and facilitates the realization of economic and developmental outcomes.
    c. Building information systems, knowledge resources, and providing information services that support the individual and public corporations working in the field of innovation.

d. Providing a legal, stimulating and supportive environment for innovation and creativity.
e. Cooperating with parties concerned with the preparation of legislative drafts related to innovation and excellence.

3. Representing Palestine adequately and effectively within the regional and international systems of creation and innovation; facilitating thereby the use of all available opportunities for networking, and transfer and domestication of adequate technological and cognitive creations and innovations.
4. Building effective communication channels with the Palestinian competencies in the Diaspora, and creating innovative methods and programs to facilitate and stimulate the use of their various resources in the fields of excellence and innovation.
5. Working with related establishments in determining the national priorities in the field of innovation and excellence.

HCIE council provides many services for both private and public institutions as well as entrepreneurs and innovative people like financial resources, and investment. It supports initiatives and the work of exhibitions, competitions and prizes for creators and innovators in the territories under the rule of the State of Palestine and in the occupied territories and even in the Diaspora. It also participates in local and international conferences and forums. The Council is a member of international institutions such as the Center for Science and Technology of Non-Aligned Countries S&T CENTER "NAM", IFIA, MIT Enterprise

Forum, Pan Arab Region: Through the Memorandum of Understanding, signed by the Board with the Massachusetts Institute of Technology (MIT) competition for entrepreneurship in its Arabic version, as well as the World Organization for Science and Technology.

4.5.2 An-Najah Business Innovation and Partnership Center (NaBIC)

An-Najah Business Innovation and Partnership Center (NaBIC) was founded in November 2013 through the project on Strengthening of University-Industry Interaction (STEP)[1] which is supported by the European Union project TEMPUS. STEP identifies a clear need for action in Palestine to assist the process for entrepreneurship opportunities, through improving conditions for quality growth and jobs, to economic development and employability. The project persuades the cooperation culture between university and enterprises in Palestine by supporting good practices for setting internal-interfaces in universities, creating capacities in human resources, and promoting coherent information and communication strategies amongst the universities' communities and within the local business environment. It will also provide necessary strategic input for the creation of long-term partnerships and collaborative research with enterprises[2].

In the last three years, NaBIC has organized several workshops and training programs, as well as awareness seminars at the level of students of

[1] https://www-old.najah.edu/node/31000

[2] https://www.najah.edu/en/community/community-news/2016/06/06/an-najah-holds-the-step-project-final-conference/

An-Najah National University and also for the private sector. NaBIC has signed several cooperation agreements at national levels including a Memorandum of Understanding with the Food Industry Federations and Sama Pharmaceutical Industries, and a memorandum of understanding on intellectual property rights with the ministry of national economy. At the international level, NaBIC has signed a memorandum of understanding with the International Institute of Inspiration Economy (IIIE) in the kingdom of Bahrain which allows NaBIC to participate in joint projects and training courses provided by the IIIE.[1]

4.5.3 Palestinian Food Industries Union

The Palestinian Food Industries Union is an industrial union which seeks to secure the Palestinian society with healthy food and optimal use of the environment and to continuously develop the quality of the food industry with a distinct Palestinian flavor. The union aims at promoting and developing the food industry in Palestine to meet the growing consumer needs. It aims at representing the interests of this sector and works to achieve its hopes and aspirations in building a competitive food industry. It provides expertise, training opportunities and technical assistance to members to achieve the objectives of the commission, and open channels of communication, cooperation and full coordination with relevant public and private sector institutions to regulate the food industry through a common understanding language based on a unified strategy. Additionally,

[1] https://www.najah.edu/ar/research/news/2016/02/10/an-najah-innovation-centre-agreement

the union aims at opening foreign markets for national products and have access to resources of expertise, raw materials and modern technology in order to increase the contribution of this sector to the Palestinian national economy.[1]

The union has signed an agreement with the Silatech enterprises to train, employ and create opportunities for young Palestinian women through training target groups in modern food processing techniques, food safety and quality. The union has also signed an agreement with An-Najah National University, represented by the Center for Practical Training and NaBIC. It is a joint project which aims at developing the capabilities of graduate students in disciplines related to the food industry, training and employment of fresh graduates in the food industries. There are many other training and capacity-building activities such as the food safety course level I and II, the practical and theoretical maintenance course, olive oil quality course, the internal audit course, and the feasibility study course.[2]

[1] http://pfiu.org/ar/who-are-we/about
[2] http://pfiu.org/ar/who-are-we/goals

Chapter Five

Methodology approach

5.1 Overview

Researches on the triple helix model have applied several methodologies; some worked on the theoretical field and others on the practical field by using qualitative or quantitative analysis and sometimes both.

This chapter explains the methodological approach used in order to answer the research questions. A two way methodology has been adopted, as will be discussed in this chapter. This is followed by an explanation of the instrumentations that were used in the study and the procedures. Following is an explanation of methodology used in the design of the questionnaire, sampling calculations, collecting data, and analysis.

5.2 Research Approach

This research uses quantitative approaches to analyze the questions in the questionnaire which was the tool used to collect data necessary to answer the research questions. The questionnaire targeted the industrial sector in the West Bank in Palestine, which was written in Arabic to ease understanding by workers in the industrial sector.

The questions of the questionnaire were shaped to satisfy the following objectives:

- To determine the value of innovation in the industrial sector in Palestine and restrict the challenges facing it.
- To define the relations between the industrial sector and every other actors in the triple helix model (government, NGOs, and university).

- To cognize the acceptability of the triple helix model by the industrial sector in Palestine.

5.3 Research Strategy

As mentioned earlier, this research adapted both qualitative and quantitative methods. The research introduces the triple helix model as a non-conventional solution for the lack of knowledge and technologies that might be important for industrial firms to grow and compete in an open international economy. It introduces it as a solution for the low contribution of the industrial sector to GDP and employment. It introduces an innovative solution for Palestinian industries so they can grow and compete.

This research applies two approaches to answer the research questions. In the first part of the study, data are described and analyzed on demographic variables of industrial firms like; number of employees, percentage of male and female employees, the amount of annual revenue, legal status, types of manufacture provided, who offers its services, and their target markets. In addition, the descriptive analysis is applied to analyze data and the degree of innovation application in industrial firms (products innovation, processing, organization and marketing). It also analyzes the internal and external obstacles, the innovation environment, and the relationships between the triple helix actors, along with the existence of an organizational body that regulates the relationship between the triple helix actors.

In the second part of the study assessment of the impact of collaboration relationships between the helix nodes on innovation in industrial firms is implemented. The impact of innovation obstacles, internal and external, on the industrial firms' probability of collaboration with triple helix actors, by using several models and makes some tests is also assessed.

The research relies on a number of models in the analysis of the data.

One model is the Ordinary Least-Squares (OLS) regression**.** It is a generalized linear modeling technique that may be used to model a single response variable which has been recorded on at least an interval scale. In addition, the technique may be applied to single or multiple explanatory variables and also categorical explanatory variables that have been appropriately coded. The OLS regression model can be extended to include multiple explanatory variables by simply adding additional variables to the equation. The form of the model has a single response variable (Y), but this time Y is predicted by multiple explanatory variables (X_1 to X_3). Hutcheson, G. D. (2011).

$$\boldsymbol{Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3}$$

The OLS assumptions should be valid, but if some of these assumptions are invalid, then robust regression is easier to use for estimation. Robust regression refers to methods which provide an alternative to ordinary least squares regression by requiring less restrictive assumptions. These methods attempt to dampen the influence of outlying cases in order to provide a better fit to the majority of the data.[1]

[1] https://onlinecourses.science.psu.edu/stat501/node/353

I In case of the absence of normal distribution, then the Generalized Linear Model (GLM) is commensurate with this case. **GLM** is a flexible generalization of ordinary linear regression that permits response variables that have error distribution models other than a normal distribution. GLM generalizes linear regression by allowing the linear model to be related to the response variable via a link function and by allowing the magnitude of the variance of each measurement to be a function of its predicted value.[1] GLM term can also refer to conventional linear regression models for a continuous response variable when given continuous and/or categorical predictors, and it includes multiple linear regression, as well as ANOVA and ANCOVA (with fixed effects only). [2] In addition, a generalization of the analysis of variance is given for these models using log-likelihoods. These generalized linear models are illustrated by examples related to four distributions; the Normal, Binomial (probit analysis, etc.), Poisson (contingency tables) and gamma (variance component). (Nelder and Weederburn, 1972).

Some common problems could exist in estimation. To avoid such problems, a number of tests need to be carried out. Following is an illustration of some tests: 1. **Heteroscedasticity Test**. In assumptions of linear regression, there should be no heteroscedasticity of residuals, in other words; the variance of residuals should not increase with fitted values of response variable. Heteroscedasticity is the opposite homoscedasticity; it

[1] https://en.wikipedia.org/wiki/Generalized_linear_model
[2] https://onlinecourses.science.psu.edu/stat504/node/216

is used in statistics, especially in the context of linear regression or for time series analysis, to describe the case where the variance of errors or the model is not the same for all observations, while often one of the basic assumption in modeling is that the variances are homogeneous and that the errors of the model are identically distributed. [1] 2. **Multicollinearity Test.** Multicollinearity is a problem that one faces when fitting a regression model, or other linear models. It refers to predictors that are correlated with other predictors in the model. It is a problem because it can increase the variance of the coefficient estimates and result in estimates that are very sensitive to minor changes in the model, and are unstable and difficult to interpret.[2]3. **The Normality Tests**. T These are supplementary to the graphical assessment of normality. The tests compare the scores in the sample to a normally distributed set of scores with the same mean and standard deviation. The small sized samples most often pass normality tests, because the normality tests have little power to reject the null hypothesis, but the large sized samples, show significant results which can be derived even in the case of a small deviation from normality. (Ghasemi and Zahediasl, 2012)

4. Wald Test (Coefficient restriction). This test computes a test statistic based on the unrestricted regression. It also measures how close the unrestricted estimates come to satisfying the restrictions under the null

[1] https://www.xlstat.com/en/solutions/features/heteroscedasticity-tests
[2] http://blog.minitab.com/blog/adventures-in-statistics-2/what-are-the-effects-of-multicollinearity-and-when-can-i-ignore-them

hypothesis, where if the restrictions are in fact true, then the unrestricted estimates should come close to satisfying the restrictions. [1]

The impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new product innovation is measured as follows:

$$Prodinno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i$$

However, the impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new process innovation, the following model is applied:

$$Procinno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i$$

To estimate the impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new organizational innovation, the following model is applied:

$$Orginno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs +$$

[1] http://www.eviews.com/help/helpintro.html#page/content/testing-Coefficient_Diagnostics.html

$\beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i$

The impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new marketing innovation is estimated with the following model:

$$Mrkinno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i$$

Following is a definition of terms used in the models mentioned above.

Prodinno: the product innovation in industrial firms,

Procinno: the process innovation in industrial firms.

Orgdinno: the organizational innovation in industrial firms and

Mrkdinno: the marketing innovation in industrial firms. **Univcoll**: the collaboration between the industrial firm and one or more of the academic institutions in Palestine.

Govcoll:the collaboration between the industrial firm and one or more of the public institutions in Palestine.

Univcoll*Govcoll: measures the interaction between the collaboration with the public institution and the collaboration with the academic institution. In other words, it shows if the collaboration of the industrial firm with the public institution improves the efficiency or feasibility of the collaboration with the academic institution through the increasing of positive impact on product innovation.

NGOcoll: the collaboration between the industrial firm and one or more of the non-government institutions (NGO) in Palestine.

Orgbody: the importance of having an organizational body which coordinates or organizes the relationship between the industrial, academic and public institutions.

Degrrocol: the awareness of the industrial firms of the importance of the collaboration relationships between the helix model partners.

Intobs: the internal or intra-firm obstacles of innovation.

Extobs: the external or Extra-firm obstacles of innovation.

Innoenvi: the innovation environment in Palestine.

Localmrk: shows if the industrial firm products target the local market.

Nationalmkt: shows if the industrial firm products target the national market.

Israelmkt: shows if the industrial firm products target the Israeli market.

Intnatiomkt: shows if the industrial firm products target the international market (export).

To estimate the relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with the government institution the following empirical equation is used:

$$Prob\ (Govcoll) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14} + B_{15}X_{15} + B_{16}X_{16} + ui$$

And to estimate the relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with universities, the following empirical equation is applied:

$$Prob\ (Univcoll) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14} + B_{15}X_{15} + B_{16}X_{16} + ui$$

The relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with NGOs is estimated via the following empirical equation:

$$Prob\ (Ngocoll) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14} + B_{15}X_{15} + B_{16}X_{16} + ui$$

Terms used in the equations are defined as follows: **Prob (GovColl):** the probability of collaboration between the industrial firms and government institutions.

Prob (UnivColl): the probability of collaboration between the industrial firms and universities.

Prob (NgoColl): the probability of collaboration between the industrial firms and non- government organizations (NGOs).

X1: lack of internal fund inside the industrial firms.

X2: lack of qualified skills inside the firm.

X3: there is no need for innovation due to prior innovation products for the firm.

X4: lack of technological knowledge inside the firm.

X5: lack of information on the market

X6: bureaucracy.

X7: lack of clear management systems inside the firm.

X8: lack of external funds.

X9: lack of technological platforms for Palestine.

X10: lack of knowledge base for Palestine.

X11: the difficulty of finding a partner for innovation.

X12: the high cost of innovation.

X13: weak competition in the market.

X14: the uncertainty of the future of innovative products.

X15: no need for innovation as innovative products are not needed in the market.

X16: weak government role in innovation process.

5.4 Research Data

This research relies on multiple sources of data collection. It includes primary data and secondary data. Primary data rely on the data and information collected through the survey by the researcher, while secondary data depend on the literature review of previous studies and analysis proceeded by other researchers or institutions in addition to journals, books and publications relevant to the topic.

5.5 Research Sample

Data were obtained through a questionnaire for around 340 industrial firms in different industrial subsectors in all Palestinian governorates in the West

Bank. Industrial firms which employ less than three employees were excluded in accordance with many previous studies in other developing countries which found that the innovation performance in micro firms is very weak. Also, it will be difficult to measure the relationship between universities and micro industrial firms with less than three employees.

The research used a randomized stratified sample from the Palestinian governorates in the West Bank excluding areas from occupied Jerusalem. The sample studied is as follows: Jenin 15 firms, Tulkarem 22 firms, Nablus 82 firms, Qalqilya 16 firms, Ramallah 40 firms, Jerusalem 33 firms, Bethlehem 47 firms, and Hebron 85 firms.

5.6 Empirical Survey and Data Collection

The empirical survey was collected through a structured questionnaire that was filled in by different industrial firms. It was structured based on a deep analysis of the research questions and guidelines to reach the information required for the analysis and assessment. To obtain the required data, the questionnaire was divided into four main sections divided into nine sub-sections. The first main section consists of the cover letter that communicates the purpose of the research, the researcher's name and the department. The second main section includes data about general firm. The third main section is about innovation in firms. The first sub-section measures the extent and type of innovation in a facility. The second sub-section determines the degree of cooperation of the enterprise with each source of innovation information. The third identifies the importance of each of the impediments of innovation for the industrial institution, and was divided into internal and external obstacles. The fourth sub-section

determines the impact of external factors on building the innovation culture for the establishment. As for the fourth main section, it discusses the triple helix model. The first sub-section clarifies if there is any collaboration between the firms and other members in the triple helix model (university, government and NGOs), while in the second sub-section; the industrial firm articulates its evaluation of the importance of partnership between the private sector, government and universities, if the firm has any partnership. In the third sub-section, the industrial firm evaluates the partnership between university and government. And finally, in the forth sub-section the industrial firm evaluates the importance of a regulatory body governing the relationship between universities, the private sector and the government to apply the triple helix model. (See figure 5-3)

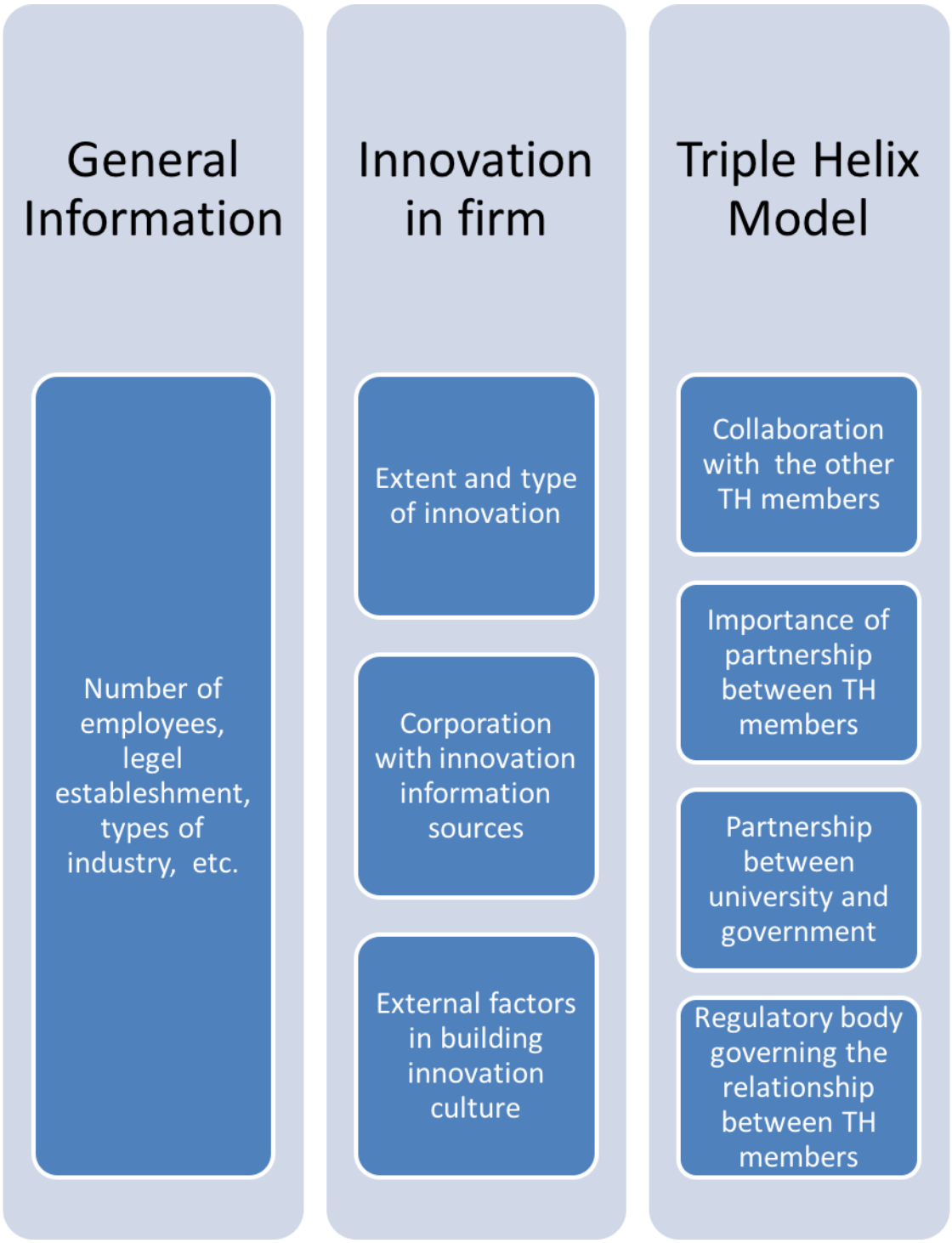


Figure 5-1: The Structure of the Questionnaire

5.6 Quality Standards for the Research Tool

This part shows the quality standards for the research questionnaire. They include pilot study, internal and structural validity using Pearson Correlation, and reliability test using the Cronbach's alpha value.

5.6.1 Validity

Assessing the validity of the research instrument is one of the major quality assurance tests to measure the reliability and validity of the research tools. In this study, the researcher depends on different factors to examine the validity of the questionnaire used for data collection.

5.7.2 Structure Validity.

This is a measure of the validity of a tool used to measure the achievement of the tool's objectives, and show the correlation in which each area of study with the overall score of the questionnaire. See Table (5-15) on the total degree of questionnaire correlation, which shows the coefficient of correlation between the degree of each of the areas of the questionnaire and the total degree of the questionnaire. It also shows that all correlation coefficients in all domains of significance are statistically significant at **α =0.01**, except enterprises academia collaboration in innovation, and enterprises government collaboration in innovation. Moreover, all areas of the questionnaire are validated by the measurement except enterprises' academia collaboration in innovation, and enterprises' government collaboration in innovation.

Table 5-1: The Total Degree of Questionnaire Correlation

No.	Item	Pearson Correlation	Sig. at α=0.01
1	Innovation in products	0.551	0.000**
2	Innovation in process	0.625	0.000**
3	Innovation in the marketing process	0.257	0.000**
4	Innovation in the organizational process	0.720	0.000**
5	Information resources for innovation	0.145	0.007**
6	Internal obstacles of innovation	0.277	0.000**
7	External obstacles of innovation	0.573	0.000**
8	External environment of innovation	0.631	0.000**
9	Enterprise's academia collaboration in innovation	0.240	0.063
10	Enterprise's government collaboration in innovation	-0.011	0.918
11	Enterprises NGOs collaboration in innovation	0.623	0.010**
12	The importance of triple helix model collaboration	0.575	0.000**
13	The evaluation of academia government collaboration	0.261	0.000**
14	The importance of an organizational body (e.g. HCIE) which regulates the relationship between triple helix members	0.489	0.000**

5.7.3 Reliability

To enable the dissemination of research results to the study population, we should concentrate on reliability. Reliability is achieved when the same results of the study community must be obtained using another sample for the same period of time and the same used methodology.

In order to test the reliability of the research instrument, the Cronbach's alpha test was used to assess the internal consistency of the questionnaire items according to the rating below for the Cronbach's alpha value and the internal consistency.

Table 5-2: Cronbach's Alpha Reliability Test

Cronbach's Alpha (α)	Internal Consistency
$\propto \geq 0.9$	Excellent
$0.8 \leq \propto < 0.9$	Good
$0.7 \leq \propto < 0.8$	Acceptable
$0.6 \leq \propto < 0.7$	Questionable
$0.5 \leq \propto < 0.6$	Poor
$\propto < 0.5$	Unacceptable

Source: (Farrell, 2012)

The Cronbach's alpha test was conducted on the questionnaire sections in order to capture the value of the Cronbach's alpha for the all items in the questionnaire. (see table 5-17)

Table 5-3: Cronbach's Alpha Coefficient of the Questionnaire

No.	Section	No. of Items	Cronbach's Alpha	Internal Consistency
1	Innovation in products	5	0.681	Questionable
2	Innovation in process	3	0.743	Acceptable
3	Innovation in the marketing process	6	0.863	Good
4	Innovation in the organizational process	6	0.908	Excellent
5	Information resources for innovation	9	0.902	Excellent
6	Internal obstacles of innovation	6	0.660	Questionable
7	External obstacles of innovation	10	0.854	Good
8	External environment of innovation	7	0.843	Good
9	Enterprise's academia collaboration of innovation	9	0.770	Acceptable
10	Enterprise's government collaboration of innovation	8	0.768	Acceptable
11	Enterprise's NGOs collaboration of innovation	3	0.667	Questionable
12	The importance of triple helix model collaboration	17	0.973	Excellent
13	The evaluation of academia government collaboration	7	0.823	Good
14	The importance of an organizational body (e.g. HCIE) to regulate the relationship between triple helix members	11	0.974	Excellent
All questionnaire sections			**0.516**	**Poor**

Table (5-17) shows that all Cronbach's alpha coefficients of the questionnaire's sections are good in all sections in the questionnaire, and its values are between (0.660 - 0.974). Moreover, the Cronbach's alpha coefficient for all questionnaire sections equals (0.516), which means the reliability coefficient is good, and the questionnaire is in its final form, as in appendix (B&C). Thus, the researcher has verified the validity and reliability of the study questionnaire, and has assured its validity to analyze the results and answer the questions of the study and test the hypotheses.

5.8 Research Limitations

- The research population target covered was the West Bank only. Gaza strip and areas of occupied Jerusalem were not covered in the study.
- The lack of research and studies in relation to the innovation and the triple helix model.
- The weakness of the innovation culture and its understanding.
- The weakness of the triple helix model culture and its understanding.

Chapter Six

Data Analysis

(Descriptive Statistics)

6.1 Overview

Data analysis is the process of transforming raw data into usable information, often presented in the form of a published analytical article, in order to add value to the statistical output (OCED, 2013). This part of the research is allocated to analyze the data to reach the results and recommendations that will help in answering the questions posed by the research. This will be done through the use of statistical programs SPSS and E-Views.

First, this chapter discusses population characteristics (demographic variables). After that, descriptive statistical methods are addressed in order to answer the research questions. At the end of the chapter, the research hypotheses are tested using Heckman model.

6.2 Respondents' Characteristics

This section aims to describe and analyze data on the demographic variables of respondents.

6.2.1 Number of Employees in the Respondent Establishments

Results show that 38.24% of the establishments employed less than 6 employees, 29.71% employed from 6-10 employees, 12.94% employed from 11-20 employees, while 19.12% employed 21 employees and more.

6.2.2 Percentage of Females to Males in the Respondent Establishments

Results show that 88.53% of the respondent establishments have more than 50% male workers, while 8.24% employ 20-50% females to males. Only 3.24% of respondent establishments employed females with a percentage less than 20% for males.

6.2.3 The Amount of Annual Revenue of the Respondent Establishments:

Results show that the higher percentage of respondent establishments was 40.37% with an annual revenue of $11000-50000. 22.02% establishments amounted an annual revenue of $110000. Having a similar percentage of respondent establishments, 21.10% amounted an annual revenue of $51000-200000, and only 16.51% amounted an annual revenue of more than $200000.

6.2.4 Legal Status of the Respondent Establishments:

Results show that 80.88% of the respondent establishments are private companies. Only 12.35% are private joint stock companies, 6.47% are non-governmental organizations, and 0.29% are public shareholding companies.

6.2.5 Types of Manufactures Provided by Respondent Establishments

Results show that three manufactures have the highest percentage provided by respondent establishments with 10.59% for both mining and quarrying

and other machines and equipment; 10.29% for leather and products related to it, followed by nonferrous metal products with 9.41%, and wearing apparels with 8.82%. Machinery and equipment reached 6.76%, printing, and cloning of media with 6.18%; furniture 5.59%, beverages 5.88%, food 4.71%; paper and its products 3.24%, both textiles and vehicles with engines 2.65%; basic metals, rubber and plastic products 2.35%; chemicals and their products 1.76%; and both tobacco products and wood and cork 1.47%; pharmaceutical products 1.18%, computers, electronics and optical products 0.88%; finally, both coke and refined petroleum products and motor vehicles and trailers 0.59%.

6.2.6 To Whom the Respondent Establishments Offer Services

Results show that 49.12% of respondent establishments offer their services to final consumers. 11.18% of respondent establishments offer services to intermediate consumers, while 39.71% respondents offer services to both final and intermediate consumers.

6.2.7 Target Markets for the products of the Respondent Establishments

According to table (6-1), more than 50% of respondent establishments target both local and national markets, and less than 50% do not target the Israeli market or any market abroad. According to the table below, 72.94% of respondents target the local market, 59.12% target the national markets, 33.53% target the Israeli market, while 13.82% of respondents export abroad.

Table 6-1: Target Markets for the products of the Respondent Establishments

Items	Yes	No
Local market	72.94%	27.06%
National market	59.12%	40.88%
The Israeli market	33.53%	66.47%
Export abroad	13.82%	86.18%

6.3 Descriptive analysis

This part of the chapter analyzes descriptively all the sections of the questionnaire, using the frequencies and mean.

6.3.1 Innovation in industry

This section aims at measuring the type and extent of innovation within industrial establishments during the last three years compared with previous years. Innovation here is associated with the introduction of a certain renewal at the level of origin and not necessarily at the market level only. It's divided into four sections: product/goods innovation, process innovation, marketing innovation, and organizational innovation.

To achieve the objectives of this section, a five-point Likert scale is used as follows: 1: do not apply 2: weak 3: medium 4: high 5: very high.

6.3.1.1 Product/goods Innovation

This refers to the introduction of new services or significant improvements to existing goods. Once again, the new goods are those new goods for the establishment and not necessarily new for the market.

Table (6-3) shows the application degree of product/ good innovation in terms of frequency, mean and application which is classified into five degrees that are related to five intervals as shown in table (6-2).

Table 6-2: Scaling Degrees

Interval	Degree
1.00-1.80	Very low
> 1.80-2.60	Low
> 2.60-3.40	Moderate
> 3.40-4.20	High
> 4.20-5.00	Very High

The table below shows that more than 50% of respondent establishments applied high product/goods innovation, in terms of introducing new services or significant improvements to current goods. Also in terms of the quality of current goods, improvement to goods, increased ease of use, increased customer satisfaction, and providing new items for the market, due to competition in the Palestinian market.

Table 6-3: Application Degree of Product/ goods Innovation

No.	Item	Percent of Frequency					Mean	Application Degree
		Don't apply	Weak	Medium	High	Very high		
1	Quality of current goods	6.8	5.9	6.8	17.4	63.2	4.2	High
2	Reduce the cost of manufacturing current goods	33.5	5.9	22.9	19.4	18.2	2.8	Moderate
3	Improvements to goods, increased ease of use and increased customer satisfaction	11.8	5.9	11.2	20.9	50.3	3.9	High
4	Provide new items for the establishment	21.8	5.9	29.4	19.7	23.2	3.2	Moderate
5	Provide new items for the market	20.6	6.8	19.4	26.8	26.5	3.3	Moderate

According to the table above, the quality of current goods is high with a mean of 4.2. Second, reducing the cost of manufacturing current goods has a moderate application degree with a mean of 2.8. Improvements to goods, increased ease of use and increased customer satisfaction have a high application degree with a mean of 3.9. Providing new items for the establishment has a moderate application degree with a 3.2 mean, while providing new items for the market has a moderate application degree with a 3.3 mean.

6.3.1.2 Process Innovation

Process innovation is a significant development in the provision of a service and mandates or activities supporting the service delivery process.

Table (6-4) shows the degree of application of process innovation. It follows the same criteria used in table (6.2) and (6.3). According to the table below, more than 50% of respondent establishments applied high innovation in product/production delivery processes to achieve significant development in service delivery procedures, development in activities supporting service delivery, improvement of commodity delivery processes through the introduction of new technology (production methods, computerized equipment or software), or the cancellation of procedures for any activities which do not add value to the commodity/ production operations, in order to stand on their feet in the light of strong competition in Palestinian markets.

Table 6-4: Application Degree of Process Innovation

No.	Item	Percent of Frequency					Mean	Application Degree
		Don't apply	Weak	Medium	High	Very high		
1	Improvement of commodity delivery processes through the introduction of new technology (production methods, computerized equipment or software)	11.8	7.4	13.2	35.0	32.6	3.7	High
2	Cancellation of procedures for any activity which does not add value to the commodity/ production operations	19.4	7.4	15.6	31.2	26.5	3.4	Moderate
3	Reduction of costs associated with commodity/ product delivery processes (methods of delivery of the item, equipment or computer software)	26.8	8.2	25.0	25.6	14.4	2.9	Moderate

It can be noticed from the previous table that improvement of commodity delivery processes through the introduction of new technology has a high application degree with a mean of 3.7. Cancellation of procedures for any activities which do not add value has a moderate application degree with a mean of 3.4, and reduction of costs associated with commodity/ product delivery processes has a moderate application degree with a mean of 2.9.

6.3.1.3 Marketing Innovation

This refers to the introduction of new design or sale methods or significant improvements in order to increase the attractiveness of the product offered or that is to enter new markets.

Table (6-5) shows the application degree of marketing innovation following the same criteria applied in the previous tables (see table 6-2, 6-3).

According to table (6-5), more than 50% of respondent establishments applied weak marketing innovation.

Table 6-5: Application Degree of Marketing Innovation

No.	Item	Percent of Frequency					Mean	Application Degree
		Don't apply	Weak	medium	High	Very high		
1	Renewing the service pack by changing offers and attachments	21.2	5.6	50.3	15.6	7.4	2.8	Moderate
2	Renewing marketing channels with the client	23.5	5.6	47.4	17.6	5.9	2.8	Moderate
3	Renewing customer service delivery methods	31.5	5.6	42.6	13.5	6.8	2.6	Low
4	Renewing Marketing Tools (promotion, advertising)	19.4	12.6	44.1	15.9	7.9	2.8	Moderate
5	Renewing pricing mechanisms	25.0	6.5	45.9	16.5	6.2	2.7	Moderate
6	The entity uses a price discrimination policy	25.0	7.6	45.6	14.4	7.4	2.7	Moderate

Table (6-5) shows that renewing the service pack has a moderate application degree with a mean of 2.8. Renewing marketing channels with the client has a moderate application degree with a mean of 2.8. Renewing the customer service delivery methods has a low application degree with a mean of 2.6. Renewing marketing tools has a moderate application degree with a mean of 2.8. Renewing pricing mechanisms and the entity's use of a price discrimination policy both have a moderate application degree with a mean of 2.7.

6.3.1.4 Organizational Innovation

It is a fundamental change in the organization's organizational structure or management methods in order to improve the enterprise's use of the knowledge or quality of the products and services or the efficiency of the work within the enterprise.

Table (6-6) shows the application degree of organizational innovation following the same criteria applied in the previous tables (see 6-2, 6-3).

It shows that more than 50% of respondent establishments have actually applied innovation in administrative and organizational processes.

Table 6-6: Application Degree of Organizational Innovation

No.	Item	Percent of Frequency					Mean	Application Degree
		Don't apply	weak	medium	high	Very high		
1	Renewal of procedures and processes to carry out the activities of the establishment	21.8	2.9	16.8	28.2	30.3	3.4	Moderate
2	Developing the quality system within the establishment	14.7	4.1	13.8	36.8	30.6	3.6	High
3	Renewal of human resources management systems	19.7	4.4	14.7	37.1	24.1	3.4	Moderate
4	Renewal of management information systems within the enterprise	16.5	6.2	16.8	35.3	25.3	3.5	High
5	Modification of organizational structure to facilitate teamwork within the enterprise	20	4.7	14.7	36.5	24.1	3.4	Moderate
6	Development of in-house management systems	17.4	4.1	17.6	36.8	24.1	3.5	High

Table above shows that the renewal of procedures and processes has a moderate application degree with a mean of 3.4. Developing the quality system within the establishment has a high application degree with a 3.6 mean. Renewal of human resources management systems has a moderate application degree with a mean of 3.4. The renewal of management information systems within the enterprise has a high application degree with a mean of 3.5. The modification of organizational structure to facilitate teamwork has a moderate application degree with a mean of 3.4, and the development of in-house management systems has a high application degree with a 3.5 mean.

6.3.6 Triple Helix Model

This section aims at evaluating the role of the partnership between elements of the triple helix model in improving the creative and economic performance of the establishment.

The evaluation of the degree of cooperation was done using the five-point Likert scale: 1. Strongly opposed 2. Opposed 3. I don't know 4. Agree 5. Strongly Agree. Only enterprises that have a partnership with other members of the triple helix model were evaluated.

Table (6-14) shows the evaluation degree of the role of partnership between elements of the triple helix model in improving the creative and economic performance of the establishment. As previous tables, it includes the

percent frequency, mean and application degree which is classified into five degrees, which are related to five intervals as shown in table (6-2).

According to table (6-14), 50% of respondent enterprises that have at least one collaboration with any actors of the triple helix model agree with the importance of the partnership between triple helix actors in all fields.

Table 6-7: Evaluation Degree of Triple Helix Model

Item	Percent of Frequency					Mean	Application Degree
	Strongly opposed	opposed	I don't know	agree	Strongly agree		
Providing the knowledge environment necessary for innovation in Palestine	1.6	9.8	3.3	60.2	25.2	4.0	High
Developing the innovation work of the establishment	2.4	15.4	3.3	54.5	24.4	3.8	High
Providing an appropriate environment for the protection of innovation (intellectual property, product rights, patents)	2.4	19.5	9.8	54.5	13.8	3.6	High
Providing funding to produce knowledge in the process of innovation	2.4	24.4	15.4	46.3	11.4	3.4	Moderate
Increasing research and development in Palestine	2.4	20.3	7.3	53.7	16.3	3.6	High
Knowledge is paid from abroad	1.6	23.6	5.7	51.2	17.9	3.6	High
Contribution to capacity building among workers in the industrial sector in Palestine	1.6	12.2	8.1	61.0	17.1	3.8	High
Facilitating the exchange of knowledge between elements of the tripartite model (government, universities and industry)	0.8	15.4	9.8	61.0	13.0	3.7	High
Increasing confidence among elements of the tripartite model (government, universities, industry)	4.9	12.2	13.0	57.7	12.2	3.6	High
Greater reliance on local experiences of innovation	2.4	13.0	3.3	64.2	17.1	3.8	High
Increasing the physical revenues of the industrial sector	4.1	18.0	28.7	39.3	9.8	3.3	Moderate

in Palestine							
Increasing the proportion of Palestinian exports abroad	4.9	14.6	25.2	43.1	12.2	3.4	Moderate
Improving the skills of Palestinian university graduates	3.3	9.8	4.9	69.1	13.0	3.8	High
Bridging the gap between university outputs and the requirements of the industrial sector in Palestine	3.3	9.8	8.9	66.7	11.4	3.7	High
Increasing the productivity of the private sector	2.4	8.9	3.3	61.0	24.4	3.9	High
Encouraging investment in Palestine	4.9	6.5	4.1	57.7	26.8	3.9	High
Opening new markets for the export of Palestinian industry	4.9	8.1	18.7	47.2	21.1	3.7	High

The table above shows that providing the knowledge environment necessary for innovation in Palestine has a high application degree with a mean of 4.0. Developing innovation work for the establishment has a high application degree with a mean of 3.8. Providing an appropriate environment for the protection of innovation and increasing research and development in Palestine have a high application degree with a mean of 3.6. Providing funding to produce knowledge in the process of innovation has a moderate application degree with a mean of 3.4. Knowledge paid from abroad in Palestine has a high application degree with a mean of 3.6. Contribution to capacity building among workers in the industrial sector has a high application degree with a mean of 3.8. Facilitating the exchange of knowledge between elements of the tripartite model has a high application degree with a mean of 3.7. Increase confidence among elements of the tripartite model has a high application degree with a mean of 3.6. Greater reliance on local experiences of innovation has a high application degree with a mean of 3.8. Increasing the physical revenues of the industrial sector in Palestine has a moderate application degree with a mean of 3.3 while increasing the proportion of Palestinian exports abroad has a moderate application degree with a mean of 3.4. Improving the skills of university graduates has a high application degree with a mean of 3.8. Bridging the gap between university outputs and the requirements of the industrial sector in Palestine has a high application degree with a mean of 3.7. Increasing the productivity of the private sector and encouraging investment in Palestine have a high application degree with a mean of 3.9. Finally, opening new markets for the export of Palestinian industry has a high application degree with a mean of 3.7.

6.3.7 Academia Government Collaboration

This section aims at evaluating the relationship between the government and academia in Palestine, by the industrial sector.

The evaluation of relationship degree was through the application of the five-point Likert scale: 1. do not apply 2. weak 3. medium 4. high 5 very high. The evaluation is just for the enterprises that have partnerships with other members of the triple helix model.

Table (6-15) shows the evaluation degree for academia government collaboration by industrial enterprises, including the percent frequency, mean and application degree which is classified into five degrees, which are related to five intervals as shown in table (6-2).

According to table below, more than 50% of respondent establishments agree that there is a medium partnership between academia and government in Palestine.

Table 6-8: Evaluation Degree of Academia Government Collaboration

Item	Percent of Frequency					Mean	Application Degree
	Don't apply	weak	medium	high	Very high		
The government encourages innovation	22.4	2.4	57.6	15.6	2.1	2.7	Moderate
The government provides an environment for the protection of intellectual and industrial property	18.2	2.9	63.8	13.5	1.5	2.8	Moderate
Encouraging government R&D and R&D projects	23.2	3.2	58.8	12.1	2.6	2.7	Moderate
Providing government training and development projects for students	34.4	3.5	47.4	12.1	2.6	2.5	Low
The government provides financial assistance to creative students	37.9	2.9	45.6	11.5	2.1	2.4	Low
The government adopts the recommendations proposed by university research to develop the Palestinian reality	17.6	5.9	65.0	9.4	2.1	2.7	Moderate
The universities provide research and studies to develop the Palestinian reality that helps the government adopt better policies for the Palestinian reality	21.8	4.4	57.6	13.5	2.6	2.7	Moderate

Table (6-15) shows that the government encourages innovation and encouraging government R&D and R&D projects have a moderate application degree with a mean of 2.7. The government provides an environment for the protection of intellectual and industrial property has a moderate application degree with a mean of 2.8. Providing government training and development projects for students has a low application degree with a mean of 2.5. The government provides financial assistance to creative students has a low application degree with a mean of 2.4. The

government adopts the recommendations proposed by university research to develop the Palestinian reality and the universities provide research and studies to develop the Palestinian reality have a moderate application degree with a mean of 2.7.

Chapter Seven

Results and Discussions

(Econometric Models and Testing Hypothesis)

7.1 Overview

This part of the research is allocated to analyze the data to reach the results and recommendations that will help in answering the questions posed by the research. This will be done through the use of the statistical programs SPSS and E-Views.

The chapter analyzes the research hypotheses which are tested using the Ordinary Least Square OLS regression, Robust Least Square, and Generalized Linear Model GLM.

7.2 The impact of Triple Helix Collaboration on Industrial Sector's Innovation

In this section, the researcher estimates the impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new innovation. New innovation can be in the form of introducing new services or significant improvements to current goods, noting that the new goods are those goods produced for the establishment and not necessarily new for the market (product innovation). This can be in the form of a significant development in service delivery procedures, or activities supporting service delivery (process innovation), or an introduction of new design or sale methods or significant improvements in order to increase the attractiveness of the product offered or to enter new markets (marketing innovation). In addition, innovation can be a fundamental change in the organization's organizational structure or management methods in order to improve the use of the enterprise by the knowledge or quality of the

products and services or the efficiency of the work within the enterprise (organizational innovation).

7.2.1 Product Innovation

In this part, the impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new product innovation is estimated based on the following model:

$$\boldsymbol{Prodinno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i}$$

First, the multiple ordinary least square (OLS) regression was used to estimate the relationships. Table (7-1) below shows the outcome of regression analysis.

Table 7-1: OLS Regression of the Relationship between Collaboration and Product Innovation

Dependent Variable: PRODINNO					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**VIF**
C	3.052***	0.426	7.154	0.000	NA
UNIVCOLL	0.156	0.181	0.860	0.390	2.072
GOVCOLL	-0.104	0.136	-0.758	0.448	1.506
UNIVCOLL*GOVCOLL	0.130	0.275	0.472	0.637	2.611
NGOCOLL	-0.508**	0.239	-2.122	0.034	1.098
ORGBODAY	0.105**	0.053	1.976	0.049	1.528
DEGRRCOL	-0.019	0.097	-0.194	0.845	1.243
INTOBS	-0.062	0.083	-0.746	0.456	1.185
EXTOBS	0.038	0.066	0.578	0.563	1.485
INNOENVI	0.127**	0.056	2.253	0.024	1.335
Localmkt	-0.508***	0.114	-4.433	0.000	1.109
Nationalmkt	0.170	0.110	1.550	0.122	1.251
Israelimkt	-0.133	0.115	-1.155	0.248	1.278
Intnatiomkt	0.204	0.149	1.366	0.172	1.139
R-squared	**0.116**	**Adjusted R-squared**		**0.081**	
S.E. of regression	**0.891**	**Log likelihood**		**-436.345**	
Jarque-Bera	**10.4**	**Breusch-Pagan-Godfrey for heteroscedasticity**		**1.66**	

The use of linear regression models for the purpose of inference or prediction is justified by four principal assumptions: Linearity and additively, statistical independence, homoscedasticity and the normality of the error distribution (u is distributed N $(0,\sigma^2)$). If one of these assumptions is violated, then the forecasts, confidence intervals, and scientific insights yielded by a regression model may be (at best) inefficient or (at worst) seriously biased or misleading.

The probability for Jarque-Bera test for the normality of error is less than the 0.05 level of significance, which means that we reject the null hypothesis at which the error term is normally distributed (H0: u is distributed $N(0,\sigma^2)$).

One way to address the problem is to employ some form of robust regression to handle the model and lead to the best linear unbiased estimator as long as there is a departure from normality. As mentioned in the methodology, the Generalized Linear Model (GLM) is one of these robust OLS estimates that efficiently handle un-normality of error.

Table 7-2: GLM Regression of the Relationship between Collaboration and Product Innovation

Dependent Variable: PRODINNO				
Coefficient covariance computed using observed Hessian				
Variable	**Model 1**		**Model 2**	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	3.051***	0.000	3.002***	0.000
UNIVCOLL	0.156	0.389		
GOVCOLL	-0.103	0.448		
UNIVCOLL*GOVCOLL	0.130	0.636		
NGOCOLL	-0.508**	0.033	-0.397	0.083
ORGBODAY	0.105**	0.048	0.096**	0.031
DEGRRCOL	-0.019	0.845		
INTOBS	-0.062	0.455		
EXTOBS	0.038	0.563		
INNOENVI	0.127**	0.024	0.131***	0.009
Localmkt	-0.508***	0.000	-0.445***	0.000
Nationalmkt	0.170	0.121		
Israelimkt	-0.133	0.247		
Intnatiomkt	0.204	0.171		
LR statistic	**42.931**		**34.101**	
Pearson SSR	**259.253**		**266.287**	
Log likelihood	**-436.493**		**-440.914**	
Prob(LR statistic)	**0.000**		**0.000**	
Pearson statistic	**0.795**		**3.495**	

Table (7-2) above shows the results of two GLM regression models. Model 1 includes all the independent variables that are concerned with

collaboration and also control variables. In model 2, the Wald test was used to investigate the joint significance of several coefficients (see table 7-3 below). In other words, the aim is to find out if two or more variables are jointly significant in a regression. The null hypothesis for the Wald test is:

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_6 = \beta_7 = \beta_8 = \beta_{11} = \beta_{12} = \beta_{13} = 0$

The table below shows that we can accept the null hypothesis for the joint significance of the 9 independent variables, which means that model 2 is more efficient or has more goodness of fit in estimating the relationship between product innovation and its determinants.

Table 7-3: Wald Test for the Joint Significant of 9 Independent Variables/ Collaboration and Product Innovation

Test Statistic	**Value**	**Df**	**Probability**
F-statistic	0.982	(9, 326)	0.454
Chi-square	8.845	9	0.451
Null Hypothesis: $\beta_1 = \beta_2 = \beta_3 = \beta_6 = \beta_7 = \beta_8 = \beta_{11} = \beta_{12} = \beta_{13} = 0$			
Null Hypothesis Summary:			
Normalized Restriction (= 0)	**Value**	**Std. Err.**	
β_1	0.156	0.181	
β_2	-0.103	0.136	
β_3	0.130	0.275	
β_6	-0.019	0.097	
β_7	-0.062	0.083	
β_8	0.038	0.066	
β_{11}	0.170	0.110	
β_{12}	-0.133	0.115	
β_{13}	0.204	0.149	
Restrictions are linear in coefficients.			

Table (7-2) denotes that none of the collaboration indexes has a significant impact on the probability of firms to have product innovation.

7.2.2 Process Innovation

Here, the researcher estimates the impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new process innovation using the following model:

$$Procinno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i$$

First, the multiple ordinary least square (OLS) regression is used to estimate the relationships. Table (7-4) below shows the outcome of regression analysis.

Table 7-4: OLS Regression of the Relationship between Collaboration and Process Innovation

Dependent Variable: PROCINNO					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**VIF**
C	1.130**	0.501	2.253	0.024	NA
UNIVCOLL	0.209	0.213	0.980	0.327	2.072
GOVCOLL	-0.270*	0.160	-1.685	0.092	1.506
UNIVCOLL* GOVCOLL	0.0008	0.323	0.002	0.998	2.611
NGOCOLL	-0.369	0.281	-1.312	0.190	1.098
ORGBODAY	0.223***	0.062	3.568	0.000	1.528
DEGRRCOL	0.129	0.114	1.125	0.261	1.243
INTOBS	0.293***	0.097	3.000	0.002	1.185
EXTOBS	-0.207***	0.078	-2.636	0.008	1.485
INNOENVI	0.265***	0.066	3.979	0.000	1.335
Localmkt	-0.529***	0.134	-3.929	0.000	1.109
Nationalmkt	0.285**	0.129	2.208	0.027	1.251
Israelimkt	0.139	0.136	1.021	0.307	1.278
Intnatiomkt	0.227	0.175	1.296	0.195	1.139
R-squared	**0.171**	**Adjusted R-squared**		**0.138**	
S.E. of regression	**1.048**	**Log likelihood**		**-491.347**	
Jarque Bera	**7.9**	**Breusch-Pagan-Godfrey for heteroscedasticity**		**22.82**	

Again, the use of linear regression models for the purpose of inference or prediction is justified by four principal assumptions: Linearity and additively, statistical independence, homoscedasticity and the normality of the error distribution (u is distributed N $(0,\sigma^2)$). If one of these assumptions is violated, then the forecasts, confidence intervals, and scientific insights yielded by a regression model may be (at best) inefficient or (at worst) seriously biased or misleading.

The probability of Jarque-Bera test for the normality of error is less than the 0.05 level of significance, which means that the null hypothesis at

which the error term is normally distributed (H0: u is distributed $N(0,\sigma^2)$) is rejected.

Again, one way to address the problem is to employ some form of robust regression to handle the model and lead to the best linear unbiased estimator of as long as there is departure from normality. As mentioned in the methodology, the Generalized Linear Model (GLM) is one of these robust OLS estimates that efficiently handle un-normality of error.

Table 7-5: GLM Regression of the Relationship between Collaboration and Process Innovation

Dependent Variable: PROCINNO				
Coefficient covariance computed using observed Hessian				
	Model 1		**Model 2**	
Variable	**Coefficient**	**Prob.**	**Coefficient**	**Prob.**
C	1.130**	0.024	1.437***	0.000
UNIVCOLL	0.209	0.326		
GOVCOLL	-0.270	0.091		
UNIVCOLL*GOVCOLL	0.0008	0.998		
NGOCOLL	-0.369	0.189		
ORGBODAY	0.223***	0.000	0.197***	0.000
DEGRRCOL	0.129	0.260		
INTOBS	0.293***	0.002	0.301***	0.002
EXTOBS	-0.207***	0.008	-0.186**	0.016
INNOENVI	0.265***	0.000	0.271***	0.000
Localmkt	-0.529***	0.000	-0.487***	0.000
Nationalmkt	0.285**	0.027	0.372***	0.002
Israelimkt	0.139	0.307		
Intnatiomkt	0.227	0.194		
LR statistic	**67.469**		**58.609**	
Pearson SSR	**358.291**		**367.723**	
Log likelihood	**-491.495**		**-495.801**	
Prob(LR statistic)	**0.000**		**0.000**	
Pearson statistic	**1.099**		**1.104**	

Table (7-5) above shows the results of two GLM regression models. Model 1 includes all the independent variables that are concerned with collaboration and also control variables. In model 2, the Wald test is used to investigate the joint significance of several coefficients (see table 7-6 below). In other words; the purpose is to find out if two or more variables are jointly significant in a regression. The null hypothesis for the Wald test is:

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_6 = \beta_{12} = \beta_{13} = 0$

The table below shows that the null hypothesis for the joint significance of the 7 independent variables is acceptable, which means that model 2 is more efficient or has more goodness of fit in estimating the relationship between process innovation and its determinants.

Table 7-6: Wald Test of the Joint Significant of 7 Independent Variables/ Collaboration and Process Innovation

Test Statistic	**Value**	**Df**	**Probability**
F-statistic	1.225	(7, 326)	0.287
Chi-square	8.581	7	0.284
Null Hypothesis: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_6 = \beta_{12} = \beta_{13} = 0$			
Null Hypothesis Summary:			
Normalized Restriction (= 0)	**Value**	**Std. Err.**	
β_1	0.209	0.213	
β_2	-0.270	0.160	
β_3	0.000	0.323	
β_4	-0.369	0.281	
β_6	0.129	0.114	
β_{12}	0.139	0.136	
β_{13}	0.227	0.175	
Restrictions are linear in coefficients.			

Table (7-5) above denotes that neither of the collaboration indexes has a significant impact on the probability of firms to have process innovation.

7.2.3 Organizational Innovation

Here, the impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new organizational innovations is estimated as follows:

$$\boldsymbol{Orginno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i}$$

First, the multiple ordinary least square (OLS) regression was used to estimate the relationships. Table (7-7) below shows the outcome of the regression analysis.

Table 7-7: OLS Regression of the Relationship between Collaboration and Organizational Innovation

Dependent Variable: ORGINNO					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**VIF**
C	0.509	0.485	1.048	0.295	NA
UNIVCOLL	-0.108	0.206	-0.523	0.601	2.072
GOVCOLL	-0.019	0.155	-0.126	0.899	1.506
UNIVCOLL* GOVCOLL	-0.116	0.313	-0.372	0.710	2.611
NGOCOLL	0.165	0.272	0.608	0.543	1.098
ORGBODAY	0.116*	0.060	1.919	0.055	1.528
DEGRRCOL	0.088	0.111	0.798	0.424	1.243
INTOBS	0.189**	0.094	1.998	0.046	1.185
EXTOBS	0.250***	0.076	3.283	0.001	1.485
INNOENVI	0.323***	0.064	5.008	0.000	1.335
Localmkt	-0.380***	0.130	-2.915	0.003	1.109
Nationalmkt	-0.013	0.125	-0.108	0.914	1.251
Israelimkt	0.129	0.131	0.984	0.325	1.278
Intnatiomkt	0.323*	0.170	1.898	0.058	1.139
R-squared	**0.263**	**Adjusted R-squared**		**0.234**	
S.E. of regression	**1.015**	**Log likelihood**		**-480.626**	
Jarque-Bera	**11.9**	**Breusch-Pagan-Godfrey for**			**12.97**

The use of linear regression models for the purpose of inference or prediction is justified by the four principal assumptions mentioned earlier in the chapter: Linearity and additively, statistical independence, homoscedasticity and the normality of the error distribution (u is distributed N $(0,\sigma^2)$). If one of these assumptions is violated, then the forecasts, confidence intervals, and scientific insights yielded by a regression model may be (at best) inefficient or (at worst) seriously biased or misleading.

The probability of Jarque-Bera test for the normality of error is less than the 0.05 level of significance, which means that the null hypothesis at

which the error term is normally distributed (H0: u is distributed N (0, σ2)) is rejected.

Again, one way to address the problem is to employ some form of robust regression to handle the model and lead to the best linear unbiased estimator as long as there is departure from normality. As mentioned in the methodology, the Generalized Linear Model (GLM) is one of these robust OLS estimates that efficiently handle un-normality of error.

Table 7-8: GLM Regression of the Relationship between Collaboration and Organizational Innovation

Dependent Variable: ORGINNO				
Coefficient covariance computed using observed Hessian				
Variable	**Model 1**		**Model 2**	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	0.509	0.294	0.733**	0.039
UNIVCOLL	-0.108	0.600		
GOVCOLL	-0.019	0.899		
UNIVCOLL*GOVCOLL	-0.116	0.709		
NGOCOLL	0.165	0.542		
ORGBODAY	0.116*	0.054	0.110**	0.042
DEGRRCOL	0.088	0.424		
INTOBS	0.189**	0.045	0.192**	0.040
EXTOBS	0.250***	0.001	0.259***	0.000
INNOENVI	0.323***	0.000	0.328***	0.000
Localmkt	-0.380***	0.003	-0.374***	0.002
Nationalmkt	-0.013	0.913		
Israelimkt	0.129	0.324		
Intnatiomkt	0.323*	0.057	0.354**	0.028
LR statistic	**116.610**		**114.585**	
Pearson SSR	**336.393**		**339.797**	
Log likelihood	**-480.774**		**-482.374**	
Prob(LR statistic)	**0.000**		**0.000**	
Pearson statistic	**1.031**		**1.020**	

Again, table (7-8) above shows the results of two (GLM) regression models. Model 1 includes all the independent variables concerned with collaboration and also control variables. In model 2, the Wald test was used to investigate the joint significance of several coefficients (see table 6-9 below). In other words, the aim is to find out if two or more variables are jointly significant in a regression. The null hypothesis for the Wald test is:

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_6 = \beta_{11} = \beta_{12} = 0$

Table below shows that the null hypothesis for the joint significance of the 7 independent variables is acceptable, which means that model 2 is more efficient or has more goodness of fit in estimating the relationship between organizational innovation and its determinants.

Table 7-9: Wald Test of the Joint Significant of 7 Independent Variables/ Collaboration and Organizational Innovation

Test Statistic	**Value**	**Df**	**Probability**
F-statistic	0.471	(7, 326)	0.855
Chi-square	3.298	7	0.856
Null Hypothesis: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_6 = \beta_{11} = \beta_{12} = 0$			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
β_1		-0.108	0.206
β_2		-0.019	0.155
β_3		-0.116	0.313
β_4		0.165	0.272
β_6		0.088	0.111
β_{11}		-0.013	0.125
β_{12}		0.129	0.131
Restrictions are linear in coefficients.			

Table (7-8) above denotes that neither of the collaboration indexes has a significant impact on the probability of firms to have organizational innovation.

7.2.4 Marketing Innovation

The impact of collaboration relationships between the helix nodes on the ability of industrial firms to introduce new marketing innovation is estimated as follows:

$$Mrkinno_i = \beta_0 + \beta_1 Univcoll + \beta_2 Govcoll + \beta_3 Univcoll*Govcoll + \beta_4 NGOcoll + \beta_5 Orgbody + \beta_6 Degrrocol + \beta_7 Intobs + \beta_8 Extobs + \beta_9 Innoenvi + \beta_{10} Localmrk + \beta_{11} Nationalmkt + \beta_{12} Israelmkt + \beta_{13} Intnatiomkt + U_i$$

The multiple ordinary least square (OLS) regression is used to estimate the relationships. Table (7-10) below shows the outcome of regression analysis.

Table 7-10: OLS Regression of the Relationship between Collaboration and Marketing Innovation

Dependent Variable: MRKINNO					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**VIF**
C	3.926***	0.414	9.471	0.000	NA
UNIVCOLL	-0.386**	0.176	-2.192	0.029	2.072
GOVCOLL	-0.382***	0.132	-2.883	0.004	1.506
UNIVCOLL* GOVCOLL	0.689**	0.267	2.576	0.010	2.611
NGOCOLL	0.244	0.232	1.053	0.293	1.098
ORGBODAY	-0.018	0.051	-0.350	0.726	1.528
DEGRRCOL	-0.035	0.094	-0.376	0.706	1.243
INTOBS	-0.219***	0.080	-2.709	0.007	1.185
EXTOBS	0.027	0.065	0.422	0.673	1.485
INNOENVI	-0.052	0.055	-0.952	0.341	1.335
Localmkt	-0.481***	0.111	-4.321	0.000	1.109
Nationalmkt	0.224**	0.106	2.101	0.036	1.251
Israelimkt	0.053	0.112	0.476	0.634	1.278
Intnatiomkt	0.136	0.145	0.942	0.346	1.139
R-squared	**0.132**	**Adjusted R-squared**		**0.097**	
S.E. of regression	**0.866**	**Log likelihood**		**-426.619**	
Jarque-Bera	**0.08**	**Breusch-Pagan-Godfrey for heteroscedasticity**			**24.4**

The use of linear regression models for the purpose of inference or prediction is justified by four principal assumptions: Linearity and additively, statistical independence, homoscedasticity and the normality of the error distribution (u is distributed N $(0,\sigma^2)$). If one of these assumptions is violated, then the forecasts, confidence intervals, and scientific insights

yielded by a regression model may be (at best) inefficient or (at worst) seriously biased or misleading.

The probability for Jarque-Bera test for the normality of error is bigger than the 0.05 level of significance, which means that the null hypothesis at which the error term is normally distributed (H0: u is distributed N (0, σ2)) is rejected. But the probability for Breusch-Pagan-Godfrey for heteroscedasticity is lower than the level 0.05 of significance, which means that the variance of residuals increases with fitted values of response variable.

One way to address the problem is to employ the robust least squares regression which provides an alternative to least squares regression by requiring less restrictive assumptions. These methods attempt to dampen the influence of outlying cases in order to provide a better fit to the majority of the data.

Table 7-11: Robust Least Squares Regression of the Relationship between Collaboration and Marketing Innovation

Dependent Variable: MRKINNO				
Variable	**Model 1**		**Model 2**	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	3.995***	0.000	3.716***	0.000
UNIVCOLL	-0.375**	0.038	-0.174	0181
GOVCOLL	-0.321**	0.018	-0.252**	0.027
UNIVCOLL*GOVCOLL	0.374	0.173		
NGOCOLL	0.374	0.116		
ORGBODAY	-0.012	0.809		
DEGRRCOL	-0.104	0.281		
INTOBS	-0.201**	0.015	-0.233***	0.002
EXTOBS	0.008	0.897		
INNOENVI	-0.019	0.725		
Localmkt	-0.519***	0.000	-0.510***	0.000
Nationalmkt	0.287***	0.008	0.267***	0.007
Israelimkt	0.001	0.987		
Intnatiomkt	0.201	0.175		
R-squared	**0.099**		**0.079**	
Adjusted R-squared	**0.063**		**0.065**	
Prob(Rn-squared stat.)	**0.000**		**0.000**	

Table (7-11) above shows the result of two robust least squares regression models. Model 1 includes all the independent variables that are concerned with collaboration and also control variables. In model 2, the Wald test was used to investigate the joint significance of several coefficients (see table 7-12 below). In other words, the aim is to know whether two or more variables are jointly significant in a regression. The null hypothesis for the Wald test is:

$$H_0: \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_8 = \beta_9 = \beta_{12} = \beta_{13} = 0$$

The table below shows that the null hypothesis for the joint significance of the 8 independent variables is accepted, which means that model 2 is more

efficient or has more goodness of fit in estimating the relationship between organizational innovation and its determinants.

Table 7-12: Wald Test of the Joint Significant of 8 Independent Variables/ Collaboration and Marketing Innovation

Test Statistic	**Value**	**Df**	**Probability**
F-statistic	0.978	(8, 326)	0.452
Chi-square	7.831	8	0.450
Null Hypothesis: $\beta_3= \beta_4= \beta_5= \beta_6= \beta_8=\beta_9=\beta_{12}=\beta_{13} = 0$			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
β_3		0.374	0.274
β_4		0.374	0.238
β_5		-0.012	0.053
β_6		-0.104	0.097
β_8		0.008	0.066
β_9		-0.019	0.056
β_{12}		0.001	0.115
β_{13}		0.201	0.149
Restrictions are linear in coefficients.			

In an unexpected result, table (7-11) shows that the industrial firms' collaboration relationships with the government negatively affected the ability of the industrial firms to introduce marketing innovation. And the other collaboration indexes have not significant impact.

7.3 Innovation Obstacles and Probability of Collaboration with Triple Helix Actors

This section estimates the relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with other triple helix actors (government, NGOs, and

university). The obstacles are: the lack of internal funds inside the industrial firms, the lack of qualified skills inside the firm, lacking the need for innovation due to prior innovation products for the firm, the lack of technological knowledge inside the firm, the lack of information on the market, bureaucracy, the lack of clear management systems inside the firm, the lack of external funds, the lack of technological platforms for Palestine, the lack of a knowledge base for Palestine, the difficulty of finding a partner for innovation, the high cost of innovation, weak competition in the market, the uncertainty of the future of innovative products, lacking the need for innovation due to lacking the demand for innovative products in the market, and the weak government role in the innovation process.

7.3.1 Innovation Obstacles and Probability of Collaboration with Governments

This section answers the following question;

What is the impact of innovation obstacles on the industrial firms' probability of collaborating with the government institution?

To answer the question, the relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with the government institution is estimated. The following equation describes the empirical equation:

$$Prob\ (Govcoll) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14} + B_{15}X_{15} + B_{16}X_{16} + ui$$

Table (7-13) below shows the results of two Logit regression models. Model 1 includes all the independent variables that concern obstacles of

innovation. In model 2, the Wald test was used to investigate the joint significance of several coefficients (see table 7-14 below) to show if two or more variables are jointly significant in a regression. The null hypothesis for the Wald test is:

$H_0: \beta_2 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_{11} = \beta_{12} = \beta_{15} = \beta_{16} = 0$

Table 7-13: Logit Model of the Effect of Obstacles of Innovation and Cooperation with Government

Dependent Variable: GOVCOLL				
Variable	**Model 1**		**Model 2**	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	-2.205951***	0.0067	-1.288**	0.041
X1	-0.229124**	0.0263	-0.216**	0.024
X2	-0.103269	0.4719		
X3	-0.352183**	0.0223	-0.204*	0.095
X4	0.104386	0.5094		
X5	0.204267	0.3164		
X6	-0.060939	0.6554		
X7	0.272456	0.0704		
X8	-0.185600	0.1741		
X9	0.575791***	0.0010	0.448**	0.001
X10	-0.446665**	0.0019	-0.418**	0.001
X11	0.169149	0.2145		
X12	-0.064358	0.5960		
X13	0.491140***	0.0052	0.553***	0.001
X14	-0.302	0.051	-0.127	0.347
X15	0.274	0.065		
X16	0.004	0.970		
McFadden R-squared	**0.117**		**0.083**	
LR statistic	**45.030**		**31.966**	
Prob(LR statistic)	**0.000**		**0.000**	
Log likelihood	**-169.769**		**-176.301**	
Obs with Dep=0	**254**			
Obs with Dep=1	**86**			

The table below shows that the null hypothesis for the joint significance of the 10 independent variables is accepted, which means that model 2 is more efficient or has more goodness of fit in estimating the relationship between obstacles of innovation and the propensity of innovative firms to collaborate with one or more of the Palestinian public institutions.

Table 7-14: Wald Test of the Joint Significant of 10 Independent Variables/ Obstacles of Innovation and Cooperation with Government

Wald Test			
Test Statistic	**Value**	**Df**	**Probability**
F-statistic	1.191	(10, 323)	0.295
Chi-square	11.910	10	0.291
Null Hypothesis: $\beta_2 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_{11} = \beta_{12} = \beta_{15} = \beta_{16} = 0$			
Null Hypothesis Summary:			
Normalized Restriction (= 0)	**Value**	**Std. Err.**	
β_2	-0.103	0.143	
β_4	0.104	0.158	
β_5	0.204	0.203	
β_6	-0.060	0.136	
β_7	0.272	0.150	
β_8	-0.185	0.136	
β_{11}	0.169	0.136	
β_{12}	-0.064	0.121	
β_{15}	0.274	0.148	
β_{16}	0.004	0.122	
Restrictions are linear in coefficients.			

The results of Logit model in table (7-13) show that the weak competition in the market between the firms' innovative products motivates the firms to collaborate with public institutions or governments. Also, the lack of technological platforms pushes the industrial firms in Palestine to

collaborate with the government to facilitate the access for external knowledge through agreements between Palestinian and foreign public institutions so as to gain the technological infrastructure needed for innovation through facilitating the ICT infrastructure, intellectual property right for new technologies, etc.

Moreover, the lack of knowledge on innovation decreases the collaboration tendency with public institutions, because of the weak knowledge production or creation in the Palestinian public institutions. Most universities and research centers, which are the main source of knowledge, are classified as NGOs in Palestine. Therefore, it is more important for the industrial firms to collaborate with universities and NGOs rather than the public institutions.

The lack of internal funds for innovation inside the firm, forces it to search for sources of funding sources other than government institutions as NGOs, or other private institutions like banks. In the last decade, Palestine suffered from a sharp financial crisis, and its main concern was the provision of salaries for public employees and not to support science and technology and knowledge production for innovation.

7.3.2 Innovation Obstacles and Probability of Collaboration with Universities

This section answers the following question:

What is the impact of innovation obstacles on the industrial firms' probability of collaborating with universities?

This section estimates the relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with universities. The following equation describes the empirical equation:

$$Prob\ (Univcoll) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14} + B_{15}X_{15} + B_{16}X_{16} + ui$$

Table 7-15: Logit Model of the Effect of Obstacles of Innovation and Cooperation with University

Dependent Variable: UNIVCOLL				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	-2.609***	0.902	-2.893	0.003
X1	-0.088	0.112	-0.784	0.432
X2	-0.066	0.157	-0.420	0.673
X3	0.058	0.175	0.333	0.738
X4	-0.007	0.174	-0.045	0.963
X5	-0.011	0.228	-0.048	0.961
X6	0.251	0.153	1.638	0.101
X7	-0.092	0.152	-0.609	0.542
X8	-0.089	0.145	-0.615	0.538
X9	-0.142	0.170	-0.836	0.402
X10	0.231	0.160	1.447	0.147
X11	0.251*	0.146	1.714	0.086
X12	-0.169	0.130	-1.298	0.194
X13	-0.088	0.174	-0.507	0.611
X14	0.046	0.163	0.285	0.775
X15	0.285*	0.153	1.852	0.063
X16	0.050	0.134	0.374	0.707
McFadden R-squared	**0.054**	**Log likelihood**		**-151.246**
LR statistic	**17.447**	**Prob(LR statistic)**		**0.357**
Obs with Dep=0	**279**	**Obs with Dep=1**		**61**

Table (7-15) denotes that none of the innovation obstacles indexes has a significant impact on the probability of firms to collaborate with universities. This is consistent with previous findings which show that there is no significant relation between firms' collaboration with universities and any type of innovation. This is the result of a number of factors. First, what universities produce is basic research, while industrial firms need applied researches. Second, the industrial sectors do not trust universities; to them, a university is a school of theoretical education, and what they are seeking is practical education.

7.3.3 Innovation Obstacles and Probability of Collaboration with NGOs

This section answers the following question;

What is the impact of innovation obstacles on the industrial firms' probability of collaborating with non-government organizations (NGOs)?

This section estimates the relationship between obstacles of innovation (internal and external) and the tendency of the industrial firms to collaborate with NGOs. The following equation describes the empirical equation:

$$Prob\ (Ngocoll) = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14} + B_{15}X_{15} + B_{16}X_{16} + ui$$

Table (7-16) below shows the result of two Logit regression models. Model 1 includes all the independent variables that concern obstacles of innovation. In model 2, the Wald test was used to investigate the joint

significance of several coefficients (see table 7-17 below) to see if two or more variables are jointly significant in a regression. The null hypothesis for the Wald test is:

$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = \beta_{16} = 0$

Table 7-16: Logit Model of the Effect of Obstacles of Innovation and Cooperation with NGOs

Dependent Variable: NGOCOLL				
Variable	**Model 1**		**Model 2**	
	Coefficient	**Prob.**	**Coefficient**	**Prob.**
C	-8.386***	0.000	-8.889***	0.000
X1	-0.322	0.137		
X2	-0.336	0.317		
X3	0.798	0.073		
X4	0.948**	0.034	0.707***	0.009
X5	-0.413	0.444		
X6	-0.543	0.070		
X7	-0.066	0.821		
X8	-0.340	0.200		
X9	0.321	0.305		
X10	0.043	0.882		
X11	0.384	0.287		
X12	0.029	0.918		
X13	1.091***	0.009	0.976***	0.004
X14	-1.137***	0.001	-0.792***	0.002
X15	1.135***	0.003	0.910***	0.001
X16	-0.106	0.714		
McFadden R-squared	**0.344**		**0.197**	
LR statistic	**44.514**		**25.501**	
Prob(LR statistic)	**0.000**		**0.000**	
Log likelihood	**-42.261**		**-51.768**	
Obs with Dep=0	**324**			
Obs with Dep=1	**16**			

Table (7-17) below shows that the null hypothesis for the joint significance of the 12 independent variables is acceptable, which means that model 2 is

more efficient or has more goodness of fit in estimating the relationship between obstacles of innovation and the propensity of innovative firms to collaborate with one or more of the Palestinian public institutions.

Table 7-17: Wald Test of the Joint Significant of 12 Independent Variables/ Obstacles of Innovation and Cooperation with NGOs

Test Statistic	**Value**	**Df**	**Probability**
F-statistic	1.338	(12, 323)	0.201
Chi-square	14.723	12	0.195
Null Hypothesis: $\beta_1= \beta_2= \beta_3= \beta_5= \beta_6= \beta_7= \beta_8= \beta_9= \beta_{10}=\beta_{11}= \beta_{12}= \beta_{16}=0$			
Null Hypothesis Summary:			
Normalized Restriction (= 0)		**Value**	**Std. Err.**
β_1		-0.322	0.217
β_2		-0.336	0.336
β_3		0.798	0.446
β_5		-0.413	0.539
β_6		-0.543	0.300
β_7		-0.066	0.296
β_8		-0.340	0.266
β_9		0.321	0.313
β_{10}		0.043	0.883
β_{11}		0.384	0.361
β_{12}		0.029	0.285
β_{16}		-0.106	0.289
Restrictions are linear in coefficients.			

The results present in table (7-17) show that the weak competition in the market for the firms' innovative products motivates firms to collaborate with NGOs. Also, the lack of technological knowledge inside the industrial firms pushes them to collaborate with NGOs to facilitate the access to external knowledge. More than 50% of the industrial firms confirm that NGOs facilitate the transfer of knowledge from outside Palestine through experts.

Results also show that the uncertainty of the future of innovative products pushes firms to evade innovation because of its high costs and uncertainty. Firms are afraid of collaborating with NGOs in R&D and training their staff due to the uncertainty of the future of innovative products. However, lacking need for innovation due to lacking demand for innovative products in the market pushes firms to collaborate with NGOs to gain market shares, benefit from experts, and train their employees.

Chapter 8

Discussions and Recommendations

8.1 Research Overview

This work studied the context of the triple helix model in the Palestinian industrial sector. It showed the degree of collaboration between industrial firms, government and universities, and to what extent this collaboration affects the performance of the industrial firms and their ability to achieve new innovations. This required the use of a mixed approach with both descriptive statistics and econometric models. The descriptive statistics section showed that the percentage of collaboration between the industrial firms and the Palestinian universities in order to develop new innovations is 17.94%, while 25.29% of the industrial firms collaborate with the Palestinian government so as to acquire the necessary knowledge to develop the innovation process. In addition, 4.71% of the industrial firms collaborate with NGOs in order to acquire the necessary knowledge needed to develop the process of innovation within the institution. However, the econometric models estimated the effects of collaboration relationships between industrial firms, government and universities on the probability of the industrial firms to have new innovations.

8.2 Results and Discussion

The results in table 8.1 below show that the collaboration for innovation among the triple helix members was not efficient and failed to obtain product innovation. This might be due to the traditional nature of the Palestinian educational system and its inability to produce the proper

knowledge and technologies that the industrial firms need to produce new innovative products (Atalya et al., 2013). According to some literature, most research outputs in the Palestinian universities are for academic upgrading and are not connected with the needs of the private sector for knowledge and technologies (see Freitas et al., 2013). Also, product innovation mainly requires complex knowledge and technologies, which might not be available through the current interactions or knowledge channels between industrial firms, universities and the public sector. Moreover, the degree of collaboration between the industrial firms and government is very weak in regard to product innovation. For example, only 3.5% of the industrial firms confirm that the government introduces tax incentives for the industrial firms which implement R&D, and around 9% only confirm that the government supports the production of new innovative products (product innovation). Similar results were presented by Sutz (2015).

Table 8-1: main research results

Types of innovation	Univcoll.	Govcoll.	Univcoll.* Govcoll.	NGOcoll.	Orgbody
Product	Not sig.	Not sig.	Not sig.	Not sig.	Sig.
Process	Not sig.	Not sig.	Not sig.	Not sig.	Sig.
Organizational	Not sig.	Not sig.	Not sig.	Not sig.	Sig.
Marketing	Not sig.	Sig.	Not sig.	Not sig.	Not sig.

One of the most important factors which positively affect the behaviour of industrial firms towards product innovation is the availability and quality of an innovation environment, where the industrial firms practice their

activities. The proper environment of innovation is based on the quality of educational systems, the research record of the Palestinian universities mainly in applied research, the existence of a knowledge pool, and the availability of innovation infrastructure like innovation networks, science parks, ICT infrastructure, and innovation laws and regulations.

The results also show that the industrial firms which positively evaluate the importance of the existence of an organizational body have more product innovation performance or more tendencies towards product innovation. The existence of an organizational body to organize or coordinate the relationships between the triple helix members increases the degree of confidence and facilitates the exchange of knowledge and competencies among the triple helix partners. It also coordinates the relationship between local and international sources of knowledge and global innovation networks, which will be translated into innovation output by the industrial firms.

Results show that the higher the local demand (the same city or area) for the firm's products, the lower the firm propensity to implement product innovation. This denotes that firms will not innovate if their products are mainly for local markets, which explains the low quality of many Palestinian industrial products in comparison to exported products. Many Palestinian industrial firms think that there is no need for new innovation in local markets because it is not feasible due to the high competition of exported products.

Moreover, the collaboration of innovation among the triple helix members was not efficient and failed to obtain process innovation. Freitas et al. (2013) agree with such a point, while Atalya et al. (2013) do not. Once again, this might be due to the traditional nature of the educational system in Palestine and its inability to produce the proper knowledge and technologies which provide the industrial firms with new innovative processes, because it is related to the firm and its service delivery procedures, and activities supporting service delivery. Also, firms import their machines and equipment from foreign markets. Because universities have oriented academic systems, this delays the firm's ability to patent, thus the industrial sector does not trust universities; rather it relies on external experts. Moreover, the degree of cooperation between the industrial firms and government is very weak in regard to process innovation; the government plays no role in the manufacture of machinery and services. Its role is in facilitating access to machinery and equipment at low customs cost, in addition to facilitating the access to foreign experts. However, only 6% of the industrial firms confirm that the government facilitates the arrival of foreign experts. This result agrees with result from presented by Albydah and Saleh (2016).

Moreover, the degree of cooperation between industrial firms and NGOs is very weak in regard to process innovation. Despite the cooperation between NGOs and the industrial sector in terms of providing infrastructure and foreign experts and providing funds, there has been no significant impact which may be due to it being a modern issue. However, results show that

the existence of an organizational body as (HCIE) regulates the relationship between universities, the private sector and the government. This has a positively significant effect on the behavior of industrial firms towards process innovation.

The results show that internal obstacles positively affect the behavior of industrial firms towards process innovation as they function as a motivation for firms to innovate and to look for new ways to control or get rid of them. However, the external obstacles negatively affect the behavior of industrial firms towards process innovation because firms can't control them.

One of the most important factors which positively affects the behavior of industrial firms towards process innovation is the availability and the quality of an innovation environment where the industrial firms practice their activities. The proper environment of innovation is affected by the quality of educational systems, the research records of the Palestinian universities mainly in applied research, the existence of a knowledge pool, and the availability of innovation infrastructure like innovation networks, science parks, ICT infrastructure, and innovation laws and regulations.

It is also clear in the results of the study that the higher the local demand (the same city or area) for the firm's products, the lower the firm's propensity to implement process innovation, and the higher the national demand (throughout the West Bank) for the firm's products, the higher the firm propensity to implement process innovation. This denotes that firms will not innovate if their processes are mainly for local markets. Many Palestinian industrial firms believe that there is no need for new innovation

in local markets because they have already gained market share from being in the market for a long time.

An additional result is the collaboration for innovation among the triple helix members was not efficient and failed to obtain organizational innovation (Albydah and Saleh, 2016; Atalya et al., 2013). Once again, this might be due to the traditional nature of the educational system in Palestine and its inability to produce the proper knowledge and technologies which provide the industrial firms with new innovative organization. A fundamental change in the organizational structure is needed. Without universities applying change to their academic systems, the industrial sector will continue not to trust universities, but rely on external experts (Supriyadi, 2012). The degree of cooperation between the industrial firms and government is very weak in regard to process innovation. The government plays no role in the organizational innovation; its role is to provide projects to train and develop the staff of the facility. However, only 3.5% of the industrial firms confirm that the government provides projects to train and develop the staff of the facility. In addition, the degree of cooperation between the industrial firms and NGOs is very weak in regard to organizational innovation, despite the cooperation of NGOs with the industrial sector in terms of providing infrastructure and foreign experts, providing funding support, and providing financial assistance for capacity building projects (training and development of employees in the industrial sector). More than 50% of the industrial firms confirm that NGOs provide financial assistance for capacity building

projects, but it has no significant impact which may be that it is considered modern. Results also show that the existence of an organizational body as (HCIE) regulates the relationship between universities, the private sector and the government. This has significant effects on the behavior of industrial firms towards organizational innovation.

Moreover, in agreement with (OECD, 2009), results show that the internal and external innovation obstacles positively affect the behavior of industrial firms towards organizational innovation. The easiest and cheapest way to avoid obstacles is to change the enterprise's staff. This is the case with Jawwal and Wataniya Mobile companies; their staff is constantly changed. Bravo institution, another case, suffers from many problems, so it changes its staff several times within short periods.

One of the most important factors which positively affect the behavior of industrial firms towards organizational innovation is the availability and the quality of the innovation environment where the industrial firm practices its activities (OECD, 2009). The proper environment of innovation is influenced by the quality of the educational system, the research records of the Palestinian universities mainly in applied research; the existence of a knowledge pool, and the availability of innovation infrastructure like innovation networks, science parks, ICT infrastructure, and innovation laws and regulations.

Add to that, the higher the local demand (the same city or area) for the firm’s products, the lower the firm's propensity to implement organizational innovation, and the higher the international demand for the

firm’s products, the higher the firm's propensity to implement organizational innovation. This denotes that firms will not innovate if their production is mainly for local markets. Many of the Palestinian industrial firms think that there is no need for new innovation for local markets; the need is for international markets because of the global competition and the need for strong firms.

Also, the results show that the industrial firms’ collaboration relationships with the government negatively affected the ability of the industrial firms to introduce marketing innovation. And the other collaboration indexes have not significant impact, and this agrees with the work of Atalya et al. (2013). This might show a misallocation of the resources that the governmental sector mobilizes for the benefit of the industrial organizations. It shows that the industrial firms misuse the financial and non-financial resources which come from the government for knowledge creation production resources. Also, this might be due to the government's market power, which facilitates its access to markets without the need to innovate in marketing.

Moreover, results show that the degree of cooperation between the industrial firms and the government is very weak in regard to marketing innovation. Only 9% of the industrial firms confirmed that the government facilitates the export of new products, and just 4.5% of the industrial firms confirmed that the government opened new markets for Palestinian products through agreements with other countries. Also, the degree of cooperation between the industrial firms and NGOs was very weak in

regard to marketing innovation; there is no role for the NGOs in the marketing innovation.

Additionally, there is a negative effect between marketing innovation and internal obstacles; this might be due to financial obstacles. For instance, advertising in television stations is expensive for firms, therefore, they search for cheaper ways as the Internet and social media (Facebook, twitter…etc).

An additional result is the higher the local demand for the firm's products, the lower the firm's propensity to implement marketing innovation; and the higher the national demand (throughout the West Bank) for the firm's products, the higher the firm propensity to implement marketing innovation. This denotes that firms will not innovate if they are marketing for local markets. Many of the Palestinian industrial firms think that there is no need for new innovation for local markets because they have gained market share from being in the market for a long time.

8.3 Strategy of triple helix model collaboration in Palestinian industry

Figure (1-8) below shows the strategy of collaboration relationship between universities, industrial sector, government and NGO's in Palestine.

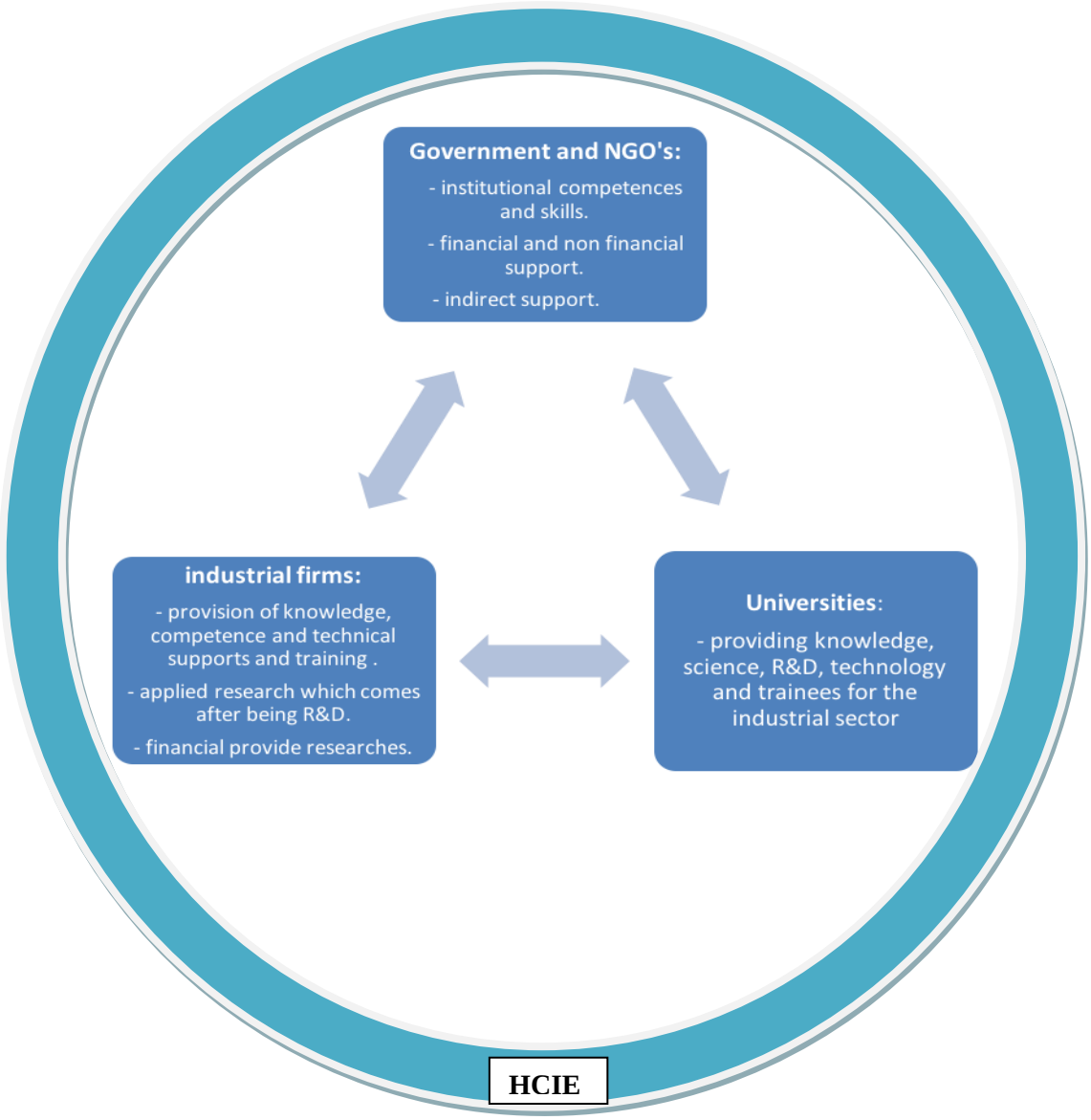


Figure 8-1: The Palestinian triple helix framework

The dynamic of the triple helix strategy is built on the following corner stones or actions (the strategy), and following some main steps:

1. The government. This can be achieved by starting with government laws related to regulations for reducing governmental taxes for companies that do R&D work, providing the necessary environment to

protect innovation (intellectual property, product rights, patent), along with incentives for innovation (tax breaks on innovative products).

The government is recommended to provide financial assistance to develop knowledge and innovation at the establishments, facilitating the export of new facilities, and opening new markets for Palestinian products through agreements with other countries.

In addition, the Palestinian government should encourage innovation, provide an environment for the protection of intellectual and industrial properties, encourage governmental R&D projects, provide the training and development projects for students, provide financial assistance to creative students, and adopt the recommendations proposed by university research to develop the Palestinian reality.

2. The awareness of the Palestinian industrial sector of the importance of the collaboration, also their gains if they do their role. The role of Palestinian industrial sector is summarized in introducing new services or significant improvements to current goods and significant development in service delivery procedures or activities supporting service delivery. Add to that the improvement of commodity delivery processes through the introduction of new technologies; the cancellation of procedures for any activities which do not add value to the commodity/ production operations and introduce new design or sale methods or significant improvements in order to increase the attractiveness of the product offered or about to enter new markets. In addition, the Palestinian industrial sector needs to be more aware of the

importance of being dependent on sources of information such as consulting companies, institutions specialized in R&D, universities and institutions of higher education, governmental research centers, nonprofit organizations, donor institutions, municipalities, chambers of commerce and industrial associations, world experts, scientific journals, conferences and exhibitions.

This is necessary to encourage innovative activities, as cooperation in the field of innovation is based on active participation with other bodies, whether public, private or non-profit institutions. The Palestinian industrial sector should try to control innovation's external obstacle factors through collaborative relationships with the government and nonprofit organizations. It should seek collaboration with donor institutions to find innovative funding, and with universities, nonprofit organizations and world experts to find a technological and knowledge base. The industrial sector need be aware of the importance of collaboration relationships with universities. This can be achieved via a number of channels including: the adoption of projects (graduate, masters or doctorate), scientific research, adopting R&D to develop new products. Moreover, it can be achieved via transfer of knowledge and new technology, using the academic sector to train and qualify employees to suit the output of universities (graduate students) and the requirements of the labor market; using applied research to develop new technology, partnering with universities to advance projects funded by local or external entities (joint projects financed).

3. The universities role is impeded mainly in increasing awareness among their members on the collaboration opportunities with the industrial sector and to how much this can improve the performance of the Palestinian industrial sectors and provide new financial and non-financial resources for the universities. Universities' role starts with improvements and amendments to the educational system to serve the Palestinian labor market and more to the practical side. Universities also should be more collaborative in encouraging projects, scientific research and R&D to help develop new products in Palestine. Also, transferring knowledge and new technologies, and training and qualifying employees to suit the output of universities and the requirements of the labor market are major roles for universities.
4. The existence of an organizational body like the Palestinian Council of Innovation and Excellence (HCIE) to organize and monitor the collaboration strategies among the triple helix actors. HCIE can hold workshops and awareness seminars with the industrial sector and universities. It can bringing them together with the non-governmental organizations NGO’s (such as industrial associations, chambers of commerce, international institutions, etc.), and direct them to becoming more activate in terms of collaborative relationships with the Palestinian industrial sectors on innovation. This is achieved by providing financial assistance to R&D at the facility, providing financial assistance for capacity building projects, and facilitating the

transfer of knowledge from outside Palestine into the country through experts.

8.3 Research Recommendations

This research is expected to introduce a set of policy recommendations for both the government, industrial sector as well as universities in order to strengthen the collaboration process among the triple helix elements. We will divide these recommendations into three groups based on the recipient part:

1. Public bodies or government:

a. It is essential to disseminate the research collaboration and innovation networking culture in the society and among the the different organizations who are involved in the development of new knowledge, inventions and new innovations. The government bodies represented by mainly the higher council for innovation and excellence (HCIE).
b. The Palestinian The Palestinian public sector is required to incite the collaboration attitude and culture among the innovation elements, through supporting research projects which include both governments institutions, universities and the industrial sector. For example, the European Union precondition the research fund in Horizon 2020 by working in though innovation network, i.e. the collaboration between universities, private sector, etc.

c. The institutional framework is very important to motivate the tendency of industrial sector to collaborate, thus the Palestinian government is required to develop the laws and regulations which protect the ideas and inventions like the intellectual property rights, copy rights, etc.

d. One of the main obstacles for research and innovation in Palestine is the availability of fund. It is become known in all countries that the public sector is the main source of fund. So, the Palestinian government should allocate more resources for R&D and innovation, mainly in the projects which have social benefits and the private sector is not willing to invest in.

e. When we talk about government institutions concern with innovation in Palestine, we mainly denote to the the Higher Council for Innovation and Excellence. Its role is impeded mainly in providing an umbrella for innovation and excellence in Palestine, the coordination between the various triple helix elements, to ensure that the efforts of research and innovation are not fragmented and contradicted.

f. Also, a main role of (HCIE) is to regulate the relationship between universities, the private sector and the government, which lead to increasing confidence among elements of the triple helix model, organizing the participatory relationship between elements of the tripartite model, helping to build networks for innovation and knowledge among the elements, facilitating the exchange of

information and experience among them, assisting in the drafting of a modern intellectual property law, adopting successful global models of triangular cooperation, searching for funding for projects to strengthen triangular cooperation, assigning valuable prizes to local success stories in triangular cooperation's, promoting innovation in Palestine, improving the quality of Palestinian products, and promoting R&D projects.

2. The industrial sector

g. The low performance of innovation outcomes in the Palestinian industrial sector requires more efforts from the Palestinian industries in supporting innovation activities (both product, process, marketing and organizational innovation). This requires the introduction of new products or significant improvements to current goods; significant development in service delivery procedures or activities supporting service delivery; the improvement of commodity delivery processes through the introduction of new technologies; the cancellation of procedures for any activities which do not add value to the commodity/ production operations; the introduction of new design or sale methods or significant improvements in order to increase the attractiveness of the product offered or about to enter new markets.

h. R&D activities, inventions and new knowledge are crucial inputs for innovation, therefore, the industrial firms are required to allocate more financial and non-financial resources in order to produce internal knowledge which essential for developing innovation.

i. The high cost of R&D and innovation should push the industrial firms to adopt the innovation networks and triple helix model as a corner stone to mobilize resources for innovation activities. This is essential if we know that the rate of collaboration through triple helix interactions is very low as shown in the results above.

j. The Palestinian industrial sector needs to be more aware of the importance of external linkages to obtain knowledge and information needed for innovation activities such as consulting companies, institutions specialized in R&D, universities and institutions of higher education, governmental research centers, nonprofit organizations, donor institutions, municipalities, chambers of commerce and industrial associations, world experts, scientific journals, conferences and exhibitions.

k. Universities are considered a very important and low cost source of R&D and knowledge. Thus, strengthen the relationships with universities is crucial for the industrial firm in order to develop new innovations. This can be achieved via a number of channels including: the adoption of projects (graduate, master's or doctorate), scientific research, adopting R&D to develop new products, transfer of knowledge and new technology, using the academic sector to train and qualify employees to suit the output of universities (graduate students) and the requirements of the labor market; using applied research to develop new technology, partnering with universities to

advance projects funded by local or external entities (joint projects financed).

3. Universities

l. The Palestinian universities should adopt new strategies or approaches for education and learning build no bridging the gap with the private sector. Projects, R&D activities, graduation projects should be oriented to the private sector mainly the industrial sector.

m. The researchers in the universities should not focus mainly on the basic research which aim to go develop in their scientific degree, but focus on applied research which solve problems in the industrial sectors or help in developing new innovations. This will strengthen the university-industrial part of the triple helix model .

References

- Abu Alqumsan, K., (2005). ***Analytical study of the reality of the Palestinian economy Between investment opportunities and future challenges,*** **To the First Scientific Conference Investment and Finance in Palestine Between development prospects and contemporary challenges.** Islamic University- Gaza, Palestine.
- Abu Hanieha, A., AbdElall, S., Krajnik, P., and Hasan, A., (2015). ***Industry-Academia Partnership for Sustainable Development in Palestine.*** **Procedia CIRP**, pp. 109 – 114.
- Albydah, A., Saleh, Y., (2016). ***Strengthening University – Industry Collaboration in Palestine via Technology and Knowledge Transfer.*** **An-Najah National University.**
- An-Najah National University (2014). About project Tempus Strengthening University-Industry Interaction Conference (STEP). https://www-old.najah.edu.
- An-Najah National University (2016). About Nabic implemented many achievements. https://www.najah.edu/ar/research/news/2016/02/10/an-najah-innovation-centre-agreement.
- Atalya, M., Anafarta, N., Sarvan, F., (2013). ***The relationship between innovation and firm performance: An empirical evidence from Turkish automotive supplier industry.*** **Procedia - Social and Behavioral Sciences**, pp. 226-235.
- BIRZEIT. Edu. About the Palestinian Presidential Decree No. (8) Of 2011 concerning income tax.

http://muqtafi.birzeit.edu/pg/getleg.asp?id=16266

- Business Dictionary. About innovation definition. *http://www.businessdictionary.com/definition/innovation.html*
- *BTSELEM. About Palestinian economic before 1994. http://www.btselem.org/freedom_of_movement/economy_1967_1994.*
- Egorov, N., Babkin, A., Kovrov, G., Muraveva, S., (2015). ***Comparative Assessment of Innovative Activity of Region's Economy Actors on the Basis of the Triple Helix Model.*** **Procedia - Social and Behavioral Sciences,** pp. 816 – 823.
- Etzkowitz, H., (2002). ***The Triple Helix of University - Industry – Government Implications for Policy and Evaluation.*** **Science Policy Institute.**
- Etzkowitz, H., (2007). **University-Industry-Government: The Triple Helix Model of Innovation**. Business School. Newcastle University
- Etzkowitz, H. (2008). ***The Triple Helix: University-Industry-Government Innovation in Action.*** **Routledge, New York**.
- Etzkowitz, H., Dzisah, J., Ranga, M., Zhou, C., (2007). ***The triple helix model of innovation, University-industry-government interaction***. **Tech Monitor.**
- Etzkowitz, H. & Leydesdorff, L. (1995). ***The triple helix-university-industry-government relations: a laboratory for knowledge-based economic development.*** **EASST Review**, pp. 14-19.

- Etzkowitz, H., Leydesdorff, L., (1998). ***Conference Report: The Triple Helix as a model for innovation studies***. **Science and Public Policy**, pp. 195-203.
- Etzkowitz, H., Leydesdorff, L., (1998). ***The Endless Transition: A "Triple Helix" of University-Industry-Government Relations***. **Minerva**, pp. 203-208.
- Etzkowitz, H., Leydesdorff, L., (2000). ***The dynamics of innovation: from National Systems and ‘‘Mode2’’ to a Triple Helix of university–industry–government relations.*** **Research Policy**, pp. 109–123.
- Eviews (2017). About Coefficient Diagnostics. http://www.eviews.com/help/helpintro.html#page/content/testing-Coefficient_Diagnostics.html
- Farrell, S. W. (2012). ***Applying the Principles of Item and Test Analysis. New Orleans:*** **2012 Users Conference**.
- Freitas, I., Marques, R., Silva, E., (2013). ***University–industry collaboration and innovation in emergent and mature industries in new industrialized countries.*** **Research Policy,** pp. 443–453.
- Ghasemi A. and Zahediasl S. (2012). ***Normality Tests for Statistical Analysis: A Guide for Non-Statisticians.*** **PMCID**, pp.486-489
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., Trow, M. (1994). **The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies**. SAGE, London.
- Goktepe, D., (2002). **Triple Helix Model and The Israeli Magnet Program: A comparative Approach to National Innovation**

Programs with Implications for Turkey. Middle East of Technical University.

- Hamza, C., Rehfeld, D., Zee, F., (2015). **Open Innovation in Industry, Including 3D Printing. Directorate General for Internal Polices.** Policy Department A: Economic and Scientific Policy, ITRE.
- HCIE. About Higher Council for Innovation and Excellence. http://www.hcie.ps/ar
- Hongqi, W., Li, T., Jianlong, W., (2014). ***Research on the Radical Technology Innovation Paths of Strategic Emerging Industry, Harbin University of Science and Technology.*** **Journal of Industrial Technological Economics.**
- Hurely, M., Hunter, R., (2013). ***Gateway to growth: innovation in the oil and gas industry.*** **PWC.**
- Khatib, I., Tsipouri, L., Bassiakos, Y., Haj-daoud, A., (2013). ***Innovation in Palestinian Industries: A Necessity for Surviving the Abnormal***. **Journal of the Knowledge Economy,** pp 492–510.
- legal.pipa.ps. About the Palestinian Investment Law No. (1) Of 1998, and its amendments.
- http://legal.pipa.ps/files/server/Law%20on%20the%20Encouragement_ Merged.pdf.
- Leydesdorff, L., (2000). ***The triple helix: an evolutionary model of innovations.*** **Elsevier,** pp. 243-255.

- Leydesdorff, L., (2010). ***The Knowledge-Based Economy and the Triple Helix Model.*** **Annual Review of Information Science and Technology**, pp. 367-417.
- Leydesdorff, L. (2011). ***"Meaning" as a sociological concept: a review of the modeling, mapping, and simulation of the communication of knowledge and meaning.*** **Social Science Information**, pp. 391-413.
- Leydesdorff, L., (2013). ***Triple helix of university-industry-government relations.*** **Springer Link,** pp. 1844-1851
- Martini, L., Tjakraatmadja, J., Anggoro, Y., Pritasari, A., Hutapea, L., (2012). ***Triple Helix Collaboration to Develop Economic Corridors as Knowledge Hub in Indonesia.*** **Procedia - Social and Behavioral Sciences,** pp. 130 – 139.
- Martynovich, M., (2011). ***On the Way to Developing the Triple Helix Indicator Contribution from Quantitative Empirical Studies***. **Lund University School of Economics and Management,** pp. 463-482.
- Metcalfe, A., (2010). ***Examining the trilateral networks of the triple helix: Intermediating organizations and academy-industry-government relations.*** **Crit Sociol** , pp. 503–519.
- Mesthal, B., Eddy, S., (2013). **Rethinking innovation in industrial manufacturing Are you up for the challenge?**. PWC.
- Moeliodihardjoa, B., Soemardib, B., Brodjonegoroc, S., Hatakenaka, S., (2012). ***University, Industry, and Government partnership:its present and future challenges in Indonesia.*** **Procedia - Social and Behavioral Sciences,** pp. 307 – 316.

- Morrar, R., PCBS (2016). **A study on indicators of creativity in Palestine.**
- Nelder J. A. and. Weederburn R. W. M (1972). ***Generalized Liner Model,*** **Journal of the Royal Statistical Society**. Vol. 135, No. 3 (1972), pp. 370-384.
- OECD, (2009). **Eco-Innovation in Industry Enabling Green Grouth.**
- OECD (2013). **Glossary of Statistical Terms. "Statistics Canada Quality Guidelines".** 5th edition**.**
- PCBS (2013). **Research and Development survey**.
- PCBS (2014). **Industrial survey**.
- PCBS (2015). **Industrial survey**.
- PCBS (2016). **Industrial development report**.
- PCBS (2016). **Industrial development organization**.
- PennState Eberly College of Science (2017). About introduction to Generalized linear model. https://onlinecourses.science.psu.edu/stat504/node/216
- PennState Eberly College of Science (2017). About Robust Regression Methods. https://onlinecourses.science.psu.edu/stat501/node/353
- PFIU. About Palestinian Food Industries Union. http://pfiu.org/
- Rosenlund, J., (2015). **An Interactive Research Approach to the Triple Helix Model in Environmental Science**. Linnaeus University.
- Supriyadi R., (2012). ***Local Economic Development And Triple Helix: Lesson Learned From Role of Universities In Higher Education Town***

of Jatinangor, West Java, Indonesia. **Procedia - Social and Behavioral Sciences**, pp. 299 – 306.

- Sutz, J., (2015). **A commented report of the conference, A triple helix of university, industry, government relations: the new location of research?.** Comision Sectorial de Investigation Cientifica (CSIC).
- The Minitab Blog (2013). About What Are the Effects of Multicollinearity and When Can I Ignore Them? http://blog.minitab.com/blog/adventures-in-statistics-2/what-are-the-effects-of-multicollinearity-and-when-can-i-ignore-them
- Viale, R., Ghiglione, B., (1998). **The Triple Helix model: a tool for the study of european regional socio-economic systems**. The IPTS Report, 29.
- Wikipedia (2017). About Generalized linear model. https://en.wikipedia.org/wiki/Generalized_linear_model
- Winger, R., & Wall, G. (2006). **Food product innovation: A background paper. Rome: Food and agriculture organization of the United Nations.**
- Wyman, O., (2015). **Car Innovation, A comprehensive study on innovation in the automotive industry**. Oliver Wyman's automotive consultants.
- XLSTAT (2017). About Heteroscedasticity Test. https://www.xlstat.com/en/solutions/features/heteroscedasticity-tests

Appendixes

Appendix -A-

Questionnaire Experts' Names

The research's questionnaire was distributed to ten experts from different backgrounds. They were asked to provide their comments and feedback to develop the questionnaire. The feedback was taken into consideration in the development of the final version of the questionnaire. Following are the names of the experts:

- Mr. Khaled Qalalwa; Manager of the Higher Council for Innovation and Excellence (HCIE).
- Dr. Nasir Etyane; Head of the Palestinian Food Industries Union.
- Dr. Yahya Saleh; Head of An-Najah Business Innovation and Partnership Center (NaBIC).
- Dr. Hatim Jammali; Lecturer in Economics, Souss University-Tunisia.
- Dr. Shakir Khaleel; Head of economics department, An-Najah National University, Palestine.
- Dr. Imad Ibrik;; Director of the Energy Research Center, An-Najah National University, Palestine
- Dr. Yousef Daoud; Head of Doha Institute for Graduate Studies.
- Dr. Mahmoud Al-jafari; Former dean of the Faculty of Business and Economics, Al- quds University, Palestine.
- Prof. Omar Abd AlRaziq; Lecturer in Economics, Faculty of Economics and Social Sciences, An-Najah National University, Palestine.
- Dr. Mohanad Ismael; Lecturer in Economics, Department of Economics, Birzeit University, Palestine.

Appendix -B-

Questionnaire in English

An-Najah National University
Faculty of Graduates Studies
Master of Management of Economic Policy

Subject: Data Collection for the Purpose of Scientific Research

Dear Respondent,

The researcher is conducting a study on **Building the Innovation Strategy in the Industrial Sector in Palestine Based on the Triple Helix model (Industry, Universities and Government)** in order to prepare a study on the indicators of innovation that help in developing the industrial sector in Palestine in cooperation with universities and the government. This questionnaire is the data collection tool in the study. Your cooperation in filling this questionnaire objectively will reflect positively on the credibility of the results and the extent to which the recommendations of the researcher are accepted in order to apply them.

We believe that the time you invest in answering this questionnaire will yield long-term returns in the form of more rational decisions and policies, which means a better future for us and all our children. We tried to avoid any questions that we thought were particularly sensitive, and we promise that the results will be used for the purpose of scientific research only and will not be shared by non-researchers.

***Thank you* for finding time for filling in this *questionnaire*.**

Researcher: Hana Hajhamad
Supervisor: Dr. Rabeh Morrar

Respondent's job position: _____

Firm's title: _____

The following questions are aimed at determining the type of innovation, creativity, obstacles and cooperation links in the field of innovation. We hope that you will choose the answer that represents your best representation.

A: General information about the firm						
A1	Number of employees in the firm:					
	☐ 0-5	☐ 6-10	☐ 11-20	☐ 20 and more		
A2	Percentage of Female to Male employees in the firm					
	☐ less than 20%	☐ 20%-50%	☐ More than 50%			
A3	Year of firm established: -----\------\------					
A4	Founding Capital value: (optional)					
A5	Current capital value: (optional)					
A6	The amount of annual revenue: (optional)					
	☐ 1-10000	☐ 11000-50000	☐ 50000-200000	More than 200000$		
A7	Legal Status of the firm:					
	☐ Private company	☐ Private joint stock company	☐ NGOs			
	☐ Public sharing company	☐ holding company	☐ Governmental company			
A8	Which Types of Manufacture is Provided by the firm? (can choose more than one)					
	☐ Mining and quarrying	☐ Motor vehicles, trailers	☐ Machinery and equipment	☐ Vehicles with engines		
	☐ Tobacco products	☐ Food	☐ Other transport equipment	☐ Furniture		
	☐ Leather and its related products	☐ Textiles	☐ beverages	☐ Other manufacturing industries		
	☐ Printing and cloning of media	☐ Wood and cork	☐ wearing apparel	☐ Pharmaceutical products		
	☐ Coke and refined petroleum products	☐ Paper and its products	☐ Basic metals	☐ Rubber and plastic products		
	☐ Chemicals and their products	☐ Computers and electronics and optical products	☐ Other than machines and equipment	☐ Nonferrous metal products		
	☐ Electrical, gas, steam and air conditioning supplies					
A9	To whom the firm offers its services?					
	☐ Final consumer	☐ Intermediate consumer	☐ Both			
A10	Target market for the marketing products of the firm:				Yes	NO

	Local (within the same city or governorate)	☐	☐
	National (throughout the West Bank)	☐	☐
	Israeli Market	☐	☐
	International Market	☐	☐

Section One B: Innovation in Industry

This section aims at measuring the extent and type of innovation of industrial establishments during the last three years compared to previous years. Innovation intended here is the introduction of a certain renewal at the level of origin and not necessarily at the market level only

Product/goods Innovation: introduction of new services or significant improvements to existing goods, and here the new goods are for the establishment and not necessarily new for the market

B1 To what extent has development occurred in each of the following areas over the last three years?

	Don't apply	Weak	medium	high	Very high
Quality of current goods					
Reducing the cost of manufacturing current goods					
Improvements to goods, increased ease of use and increased customer satisfaction					
Providing new items for the establishment					
Providing new items for the market					

Process Innovation: It is a significant development in the provision of a service and its mandate or activities supporting the service delivery process for the establishment and not necessarily new for the market.

B2 To what extent has development occurred in each of the following areas over the last three years?

	Don't apply	Weak	medium	high	Very high
Improvement of commodity delivery processes through introduction of new technology (production methods, computerized equipment or software)					
Cancellation of procedures for any activities which do not add value to the commodity / production operations					
Reduction of costs associated with commodity / product delivery processes (methods of delivery of the item, equipment or computer software)					

Marketing Innovation: It is the introduction of new design or sale methods or significant improvements in order to increase the attractiveness of the product offered or to enter new markets.

B3 To what extent has development occurred in each of the following areas over the last three years?

	Don'	Wea	mediu	high	Very

	t appl y	k	m		high
Renewing the service pack by changing offers and attachments					
Renewing in marketing channels with the client					
Renewing the customer service delivery methods					
Renewal in Marketing Tools (Promotion, Advertising)					
Renewal of pricing mechanisms					
The entity uses a price discrimination policy					

Organizational Innovation: It is a fundamental change in the organization's organizational structure or management methods in order to improve the use of the enterprise by the knowledge or quality of the products and services or the efficiency of the work within the enterprise.

B4	To what extent has development occurred in each of the following areas over the last three years?

	Don't apply	Wea k	mediu m	high	Very high
Renewal of procedures and processes to carry out the activities of the establishment					
Developing the quality system within the establishment					
Renewal of human resources management systems					
Renewal of management information systems within the enterprise					
Modification of organizational structure to facilitate teamwork within the enterprise					
Development of in-house management systems					

Section Two C: Information Recourses to encourage innovative activities

Cooperation in the field of innovation's information resources is the active participation with other bodies, whether public, private or non-profit institutions

C1	The degree of cooperation with each source of information regarding the innovative activities applied by the respondent's establishments over the last three years?

	Didn' t use	Fe w	mediu m	hig h	Very high
Consulting companies or institutions specialized in R&D					
Consulting universities and institutions of higher education					
Consulting government research centers					
Consulting nonprofit organizations					
Consulting donor institutions					
Consulting municipalities, chambers of commerce and industrial associations					
Consulting world experts					
Consulting scientific journals					

Conferences and exhibitions					

Section Three D: Innovation Obstacles

How do you evaluate the importance of each of the following factors as obstacles to the innovative activities in the facility during the previous three years?

D1 Internal Obstacles

	Didn't use	few	medium	high	Very high
Lack of competencies within the establishment					
There is no need for innovation because there are sufficient prior innovations in the establishment					
Lack of information on technology					
Lack of market information					
Bureaucracy is applied					
Absence of clear administrative systems					

D2 External Obstacles

	Didn't use	few	medium	high	Very high
Lack of funding from any source from outside the establishment					
The absence of a technological base of the State					
Lack of a knowledge base of the state					
The difficulty of finding a partner to cooperate with in the process of innovation					
High costs of innovation					
Weak competition in the market					
Not sure that there is a demand for innovative goods					
There is no need for innovation because there is no demand for new innovations					
Absence of an active role for the government					
Non-protection of intellectual and industrial properties					

Section Four E: Innovation's External Environment

E1 How do you evaluate the importance of each of the following factors in influencing the building of the innovation culture in the enterprise during the previous three years

	Didn't use	few	medium	high	Very high
The existence of universities with a distinguished educational level					
The existence of universities with a high level of research capabilities					
The existence of human resources with a high degree of experience and efficiency					
The existence of a local knowledge base					
The existence of an innovation infrastructure (ICT)					
There are channels for sharing knowledge and information between different institutions					

The existence of legislations and laws to protect innovation (special laws for the protection of intellectual property and patents)					

Section Five F: Evaluate collaboration relationships between triple helix model actors

Partnership between industrial enterprises and universities

This section measures the importance of partnership between industrial enterprises and universities in the development of new innovations during the past three years

F1	Has there been cooperation between your firm and one of the Palestinian universities during the last three years? ***If you answer no please go to question (F3)***	1.Yes	2.No

F2	What is the format of cooperation with universities in terms of acquiring the necessary knowledge to develop the process of innovation within the institution?					
		Don't apply	weak	medium	high	Very high
	Adopting projects (graduate, master's and doctorate) and scientific research through universities					
	Adopting R&D to develop new products					
	Teaching methods in universities serve the labor market					
	Transfer of knowledge and new technology					
	The institution uses the academic sector to train and qualify its employees to suit the output of universities (graduate students) and the requirements of the labor market					
	The facility uses applied research to develop new technology					
	Partnering with universities to advance projects funded by local or external entities (joint projects financed)					
	Universities train students in factories and companies					
	The industrial sector of universities resorts to solving some technical problems in the industry					

Partnership between industrial enterprises and government

This section measures the importance of partnership between industrial enterprises and government in the development of new innovations during the past three years

F3	Has there been cooperation between your firm and one of the government's institutions during the last three years? ***If you answer no please go to question (F5)***	1.Yes	2.No

F4	What is the format of cooperation with government in terms of acquiring the necessary knowledge to develop the process of innovation within the institution?					
		Don't apply	weak	medium	high	Very high
	Providing government financial assistance to develop knowledge and innovation at the establishment					
	Reducing government taxes for companies that do R&D work					

The government facilitate the export of new facilities					
The government opened new markets for Palestinian products through agreements with other countries					
Providing government projects to train and develop the staff of the facility					
Providing the government with the necessary environment to protect innovation (intellectual property, product rights, patent)					
The government provides incentives for innovation (tax breaks on innovative products)					

Partnership between industrial enterprises and Non-governmental organizations NGOs

This section measures the importance of partnership between industrial enterprises and non-governmental organizations NGOs in the development of new innovations during the past three years

F5	Has there been cooperation between your firm and one of the NGOs during the last three years? ***If you answer no please go to question (F5)***	1.Yes	2.No

F6	What is the format of cooperation with NGOs (such as industrial associations, chambers of commerce, international institutions, etc.) in terms of acquiring the necessary knowledge to develop the process of innovation within the institution?					
		Don't apply	weak	medium	high	Very high
None of the NGOs provide financial assistance for R&D at the facility						
None of NGOs provide financial assistance for capacity building projects (training and developing employees in the industrial sector)						
NGOs facilitate the transfer of knowledge from outside Palestine into the country through experts						

Section Six G: The role of partnership between elements of the triple helix model in improving the creative and economic performance of the establishment?

(Answering this question only indicates a collaboration with one of the elements of the triple helix model, that's answered yes to any of F1, F3, F5)

G1	What is the degree of evaluation of the establishment of the importance of partnership between the private sector, government and universities?					
		Strongly opposed	opposed	I don't know	agree	Strongly agree
Providing the knowledge environment is necessary for innovation in Palestine						
Developing the innovation work of the establishment						
Providing an appropriate environment for the protection of innovation (intellectual property, product rights, patents)						
Provide funding to produce knowledge in the process of innovation						
Increasing research and development in Palestine						
Knowledge is paid from abroad						

Contributing to capacity building among workers in the industrial sector in Palestine					
Facilitating the exchange of knowledge between elements of the tripartite model (government, universities and industry)					
Increasing confidence among elements of the tripartite model (government, universities, industry)					
Greater reliance on local experiences of innovation					
Increasing the physical revenues of the industrial sector in Palestine					
Increasing the proportion of Palestinian exports abroad					
Improving the skills of Palestinian university graduates					
Bridging the gap between university outputs and the requirements of the industrial sector in Palestine					
Increasing the productivity of the private sector					
Encouraging investment in Palestine					
Opening new markets for the export of Palestinian industry					

Section Seven H: Evaluating the relationship between government and academia in Palestine, by the industrial sector

H1	What is your evaluation of the relationship between universities and the government over the past three years in the following areas?

	Don't apply	weak	medium	high	Very high
The government encourages innovation					
The government provides an environment for the protection of intellectual and industrial property					
The government encourages R&D and R&D projects					
The government provides training and development projects for students					
The government provides financial assistance to creative students					
The government adopts the recommendations proposed by university research to develop the Palestinian reality					
The universities provide research and studies to develop the Palestinian reality that helps the government adopt better policies for the Palestinian reality					

Section Eight I: the importance of the existence of an organizational body (for example; the Higher Council for Innovation and Excellence, HCIE) regulates the relationship between universities, the private sector and the government, by industrial enterprises.

I1	What is your evaluation of the importance of an organizational body that regulates the relationship between universities, the private sector and the government?

	Strongly opposed	opposed	I don't know	agree	Strongly agree
Increasing confidence among elements of the triple					

helix model					
Organizing the participatory relationship between elements of the tripartite model					
Help in building networks for innovation and knowledge among themselves					
Facilitate the exchange of information and experience among them					
Assisting the drafting of a modern intellectual property law					
Adopting successful global models of triangular cooperation					
Searching for funding for projects to strengthen triangular cooperation					
Assigning valuable prizes to local success stories in triangular cooperation					
Promoting innovation in Palestine					
Improving the quality of Palestinian products					
Promoting R&D and R&D projects					

Appendix -C-

Questionnaire in Arabic

جامعة النجاح الوطنية

كلية الدراسات العليا

برنامج ماجستير ادارة السياسات الاقتصادية

السيد/ة المحترم/ة

الموضوع: جمع بيانات لغرض البحث العلمي

تحية وبعد؛

يقوم الباحثون بدراسة حول **بناء استراتيجية الابتكار في قطاع الصناعة في فلسطين بالاعتماد على النموذج الثلاثي اللولبي (الصناعة، الجامعات والحكومة)**، بهدف اعداد دراسة عن مؤشرات الابتكار التي تساعد في تطوير قطاع الصناعة في فلسطين بالتعاون مع الجامعات والحكومة في فلسطين، والإستبانة التي بين يديكم هي أداة جمع البيانات في هذه الدراسة، إن تعاونكم مشكورين بتعبئة هذه الإستبانة بموضوعية سينعكس ايجاباً على صدقية النتائج ومدى قبول توصيات الباحثين بهدف تطبيقها.

نحن نؤمن أن الوقت الذي ستستثمرونه في تعبئة هذه الإستبانة سيحقق مردوداً على المدى الطويل على شكل قرارت وسياسات أكثر رشداً، مما يعني مستقبل أفضل لنا ولأبنائنا جميعاً، لقد حاولنا في

هذه الإستبانة تجنب أية أسئلة إعتقدنا ان لها حساسية خاصة، ومع ذلك نعدكم أن كافة البيانات ستستخدم لغرض البحث العلمي فقط ولن يطلع عليها غير الباحثين.

وتفضلوا بقبول فائق الإحترام

الباحثة: هنا حج حمد

المشرف: د. رابح مرار

الموقع الوظيفي للمستجيب:_____

اسم المنشأة\ الشركة: _____

<u>تهدف الأسئلة التالية إلى تحديد نوع الإبتكار، الأبداع، المعيقات وصلات التعاون فى مجال الإبتكار، نأمل منكم اختيار الإجابة التى تمثل منشأتكم أفضل تمثيل.</u>

معلومات عامة حول المنشأة				
A1	عدد العاملين في المنشأة			
	☐ 0-5	☐6-10	☐11-20	☐20 فأعلى
A2	نسبة الاناث للذكور بالمنشأة			
	☐أقل من 20%	☐ 20%-50%	☐ أكثر من 50%	
A3	سنة تأسيس المنشأة: _________________			
A4	قيمة رأس المال التأسيسي : (اختياري)			
A5	قيمة رأس المال الحالي : (اختياري)			
A6	مقدار الإيراد السنوي: (اختياري)			
	☐1$- 10,000$	☐11,000$- 50,000$	☐51,000$- 200,000$	☐200,000$- أعلى
A7	ما هي طبيعة المنشأة القانونية:			
	☐ شركة خاصة	☐ شركة مساهمة خاصة	☐ موسسة غير حكومية	
	☐ شركة مساهمة عامة	☐ شركة قابضة	☐مؤسسة حكومية	
A8	اي من الصناعات التالية يتم تقديمها من قبل منشأتكم؟(بامكانك اختيار أكثر من اجابة)			
	☐تعدين واستغلال المحاجر	☐مركبات مقطورة ونصف مقطورة	☐الات ومعدات	☐مركبات ذات محركات
	☐منتجات التبغ	☐المنتجات الغذائية	☐معدات النقل الاخرى	☐الاثاث

	☐صناعة الجلد وما له صلة به	☐المنسوجات	☐المشروبات	☐صناعات تحويلية اخرى
	☐الطباعة واستنساخ وسائل الاعلام	☐الخشب والفلين	☐الملابس	
	☐المنتجات الصيدلانية ومستحضراتها	☐فحم الكوك ومنتجات نفطية مكررة	☐الورق ومنتجاته	
	☐الفلزات الاساسية	☐منتجات المطاط واللدائن	☐الكيماويات ومنتجاتها	
	☐حواسيب ومنتجات الكترونية وبصرية	☐المعادن المشكلة عدا الماكنات والمعدات	☐منتجات المعادن اللافلزية	

A9	لمن تقدم المنشاه منتجاتها؟		
	☐ للمستخدم النهائي	☐ للمستهلك الوسيط	☐ الاثنين معا

A10	السوق المستهدف: أين قامت المنشأة بعرض منتجاتها خلال الثلاث سنوات الماضية؟	**نعم**	**لا**
	محلي (داخل نفس المدينة أو المحافظة)	☐	☐
	وطني (في كافة انحاء الضفة الغربية)	☐	☐
	السوق الإسرائيلي	☐	☐
	التصدير للخارج	☐	☐

B: القسم الاول: الابتكار في الصناعة

يهدف هذا القسم الى قياس مدى ونوع الإبتكار في منشأتكم خلال آخر ثلاث سنوات مقارنة بالسنوات التي سبقتها. الإبتكار المقصود هو ادخال تجديد معين على مستوى المنشأه وليس بالضرورة على مستوى السوق فقط.

الابتكار في السلع (المنتجات) (Product/goods innovation)

هو إدخال خدمات جديدة او ادخال تحسينات كبيرة على السلع الحالية، اما السلع الجديدة فهي تلك السلع الجديدة بالنسبة للمنشأة وليس بالضرورة جديدة بالنسبة للسوق.

B1 الى اي مدى حدث تطوير في كل من المجالات الآتية خلال الثلاث سنوات الماضية؟

	كبير جداً	**كبير**	**متوسط**	**ضعيف**	**لا ينطبق**
جودة السلع الحالية	☐	☐	☐	☐	☐
تخفيض تكلفة تصنيع السلع الحالية	☐	☐	☐	☐	☐
ادخال تحسينات على السلع، زيادة سهولة الاستخدام وزيادة رضا العملاء	☐	☐	☐	☐	☐
تقديم سلع جديدة بالنسبة للمنشأة	☐	☐	☐	☐	☐
تقديم سلع جديدة بالنسبة للسوق	☐	☐	☐	☐	☐

الابتكار في عمليات تقديم السلعة/ الإنتاج (Process innovation)

هو تطوير كبير في اجراءات تقديم الخدمة والياتها أاو الأنشطة المساندة لعملية تقديم الخدمات

B2 الى أي مدى ساهمت الأنشطة التالية في تطوير عمليات تقديم السلعة/الإنتاج في منشأتكم خلال الثلاث سنوات الماضية؟

	كبير جداً	**كبير**	**متوسط**	**ضعيف**	**لا ينطبق**
تحسين بعمليات تقديم السلعة من خلال ادخال تكنولوجيا جديدة (أساليب الإنتاج، المعدات او البرامج المحوسبة)	☐	☐	☐	☐	☐

الغاء الاجراءات لأية أنشطة لا تضيف قيمة إلى عمليات تقديم السلعة/الانتاج	☐	☐	☐	☐	☐
تخفيض التكاليف المرتبطة بعمليات تقديم السلعة/الانتاج (أساليب تقديم السلعة، المعدات او البرامج المحوسبة)	☐	☐	☐	☐	☐

الابتكار في عملية التسويق (marketing innovation)

هو إدخال تصميمات او طرق بيع جديدة أو ادخال تحسينات كبيرة من اجل زيادة جاذبية السلعة المقدمة او من اجل الدخول الى اسواق جديدة

B3	الى اي مدى تم تطبيق الانواع التالية من الابتكار في مجال التسويق في منشأتكم خلال الثلاث سنوات الماضية؟

	كبير جداً	**كبير**	**متوسط**	**ضعيف**	**لا ينطبق**
تجديد حزمة الخدمة من خلال تغيير العروض والمرفقات	☐	☐	☐	☐	☐
تجديد في قنوات التسويق مع العميل	☐	☐	☐	☐	☐
تجديد في طرق توصيل الخدمات للعميل	☐	☐	☐	☐	☐
تجديد في أدوات التسويق(الترويج، الدعاية)	☐	☐	☐	☐	☐
تجديد في اليات التسعير	☐	☐	☐	☐	☐
تستخدم المنشأة سياسة التمييز السعري	☐	☐	☐	☐	☐

الابتكار في العمليات الادارية والتنظيمية (Organizational innovation)

هو تغيير جوهري في الهيكل التنظيمي للمنشاة او طرق الاداره بهدف تحسين استخدام المنشأة للمعرفة او جودة المنتجات والخدمات او كفاءة العمل داخل المنشأة

B4	**هل طبقت المنشأة احد التغييرات الادارية التالية خلال السنوات الثلاث الماضية؟**

	كبير جداً	كبير	متوسط	بسيط	لا ينطبق
تجديد في الإجراءات والعمليات لتنفيذ أنشطة المنشأة	☐	☐	☐	☐	☐
تطوير نظام الجودة داخل المنشاة	☐	☐	☐	☐	☐
تجديد على انظمة ادارة الموارد البشرية	☐	☐	☐	☐	☐
تجديد على انظمة المعلومات الادارية داخل المنشأة	☐	☐	☐	☐	☐
تعديل على الهيكلية التنظيمية لتسهيل العمل الجماعي داخل المنشأة	☐	☐	☐	☐	☐
تطوير أنظمة الادارة داخل المنشأة	☐	☐	☐	☐	☐

C: القسم الثاني: مصادر المعلومات لتشجيع الأنشطة الإبتكارية

التعاون في مجال الإبتكار هو المشاركة الفاعلة في مجال الأنشطة الإبتكارية مع جهات اخرى سواء كانت مؤسسات عامة او خاصة او غير هادفة للربح

C1	**الرجاء تحديد درجة التعاون مع كل مصدر من مصادر المعلومات التالية فيما يخص الأنشطة الإبتكارية التي طبقتها المنشأة خلال آخر ثلاث سنوات؟**

	عالي جدا	**عالي**	**متوسط**	**قليل**	**لم يستخدم**
شركات استشارية أو مؤسسات متخصصة في البحث والتطوير	☐	☐	☐	☐	☐
الجامعات ومؤسسات التعليم العالي	☐	☐	☐	☐	☐
مراكز الابحاث الحكومية	☐	☐	☐	☐	☐
المؤسسات غير الربحية	☐	☐	☐	☐	☐
المؤسسات المانحة	☐	☐	☐	☐	☐
البلديات والغرف التجارية والاتحادات الصناعية	☐	☐	☐	☐	☐
خبراء عالمين	☐	☐	☐	☐	☐
المجلات العلمية	☐	☐	☐	☐	☐
المؤتمرات والمعارض	☐	☐	☐	☐	☐

D: القسم الثالث: معوقات الابتكار					
كيف تقيم اهمية كل من العوامل التالية كمعيقات للأنشطة الإبتكارية في المنشأة خلال الثلاث سنوات السابقة؟					
D1	المعيقات الداخلية				
	عالي جدا	**عالي**	**متوسط**	**قليل**	**لم يستخدم**
عدم توفر الكفاءات داخل المنشاة	☐	☐	☐	☐	☐
لا يوجد حاجة للإبتكار بسبب وجود ابتكارات سابقة كافية لدى المنشأة	☐	☐	☐	☐	☐
نقص المعلومات حول التكنولوجيا	☐	☐	☐	☐	☐
نقص المعلومات عن السوق	☐	☐	☐	☐	☐
يتم تطبيق البيروقراطية	☐	☐	☐	☐	☐
غياب الانظمة الادارية الواضحة	☐	☐	☐	☐	☐
D2	**المعيقات الخارجية**				
عدم توفر التمويل من أي مصدر من خارج المنشأة	☐	☐	☐	☐	☐
عدم وجود قاعدة تكنلوجية للدولة	☐	☐	☐	☐	☐
عدم وجود قاعدة معرفية للدولة	☐	☐	☐	☐	☐
صعوبة ايجاد شريك للتعاون معه في عملية الابتكار	☐	☐	☐	☐	☐
التكاليف العالية للابتكار	☐	☐	☐	☐	☐
ضعف المنافسة في السوق	☐	☐	☐	☐	☐
عدم التاكد من وجود طلب على السلع المبتكرة	☐	☐	☐	☐	☐
لا يوجد حاجة للإبتكار بسبب عدم وجود طلب على الإبتكارات الجديدة	☐	☐	☐	☐	☐
غياب دور فاعل للحكومة	☐	☐	☐	☐	☐
عدم حماية الملكية الفكرية والصناعية	☐	☐	☐	☐	☐

E: القسم الرابع: البيئة الخارجية للابتكار بالنسبة للمنشاة					
E1	كيف تقيم اهمية كل من العوامل التالية في التأثير في بناء ثقافة الابتكار في المنشأة خلال الثلاث سنوات السابقة				
	عالي جدا	عالي	متوسط	قليل	لم يستخدم
وجود جامعات ذات مستوى تعليمي متميز	☐	☐	☐	☐	☐
وجود جامعات ذات مستوى قدرات بحثية عالية	☐	☐	☐	☐	☐
وجود موادر بشرية على درجة عالية من الخبرة والكفاءة	☐	☐	☐	☐	☐
وجود قاعدة معرفة محلية	☐	☐	☐	☐	☐
وجود بنية تحتية خاصة بالابتكار (شبكات المعلومات والاتصالات والتكنولوجيا)	☐	☐	☐	☐	☐
وجود قنوات لمشاركة المعرفة والمعلومات بين المؤسسات المختلفة	☐	☐	☐	☐	☐
وجود تشريعات وقوانين لحماية الابتكار (قوانين خاصة لحماية الملكية الفكرية وبراءة الاختراع)	☐	☐	☐	☐	☐

F: القسم الخامس: تقييم الشراكة بين عناصر نموذج الابتكار الثلاثي

نموذج الابتكار الثلاثي وهو نموذج يصف العلاقة التعاونية بين كل من الصناعة والجامعات والحكومة من اجل تطوير ابتكارات جديدة في القطاع الصناعي

الشراكة بين المنشآت الصناعية والجامعات

هذا القسم يقيس اهمية الشراكة بين المنشآت الصناعية والجامعات في سبيل تطوير ابتكارات جديدة خلال الثلاث سنوات الماضية

F1	هل كان هناك تعاون بين منشأتكم وأحد الجامعات الفلسطينية خلال السنوات الثلاث الاخيرة؟ **(اذا كان الجواب لا الرجاء الانتقال الى السؤال F3)**	1. نعم	2. لا
F2	ما هو شكل التعاون مع الجامعات في ما يخص الحصول على المعرفة اللازمة لتطوير عملية الابتكار داخل المنشأه؟		

	مرتفع جدا	**مرتفع**	**متوسط**	**ضعيف \ لا تغير**	**لا ينطبق**
تبني مشاريع (تخرج او رسائل ماجستير ودكتوراة) وأبحاث علمية من خلال الجامعات	☐	☐	☐	☐	☐
تبني البحث والتطوير لتطوير منتجات جديدة	☐	☐	☐	☐	☐
طرق التعليم في الجامعات تخدم سوق العمل	☐	☐	☐	☐	☐
نقل معرفة وتكنولجيا جديدة	☐	☐	☐	☐	☐
تلجأ المنشاة الى القطاع الاكاديمي من اجل تدريب وتأهيل موظفيها بما تتناسب مخرجات الجامعات (الطلبة الخريجين) ومتطلبات سوق العمل	☐ ☐	☐ ☐	☐ ☐	☐ ☐	☐ ☐
تستخدم المنشأة ابحاث تطبيقية لتطوير تكنولوجيا جديدة	☐	☐	☐	☐	☐

الشراكة مع الجامعات بالتقدم بمشاريع ممولة من جهات محلية او خارجية (مشاريع مشتركة ممولة)	☐	☐	☐	☐	☐
تقوم الجامعات بتدريب الطلبة في المصانع والشركات	☐	☐	☐	☐	☐
يلجأ القطاع الصناعي للجامعات لحل بعض المشاكل الفنية والتقنية في الصناعة	☐	☐	☐	☐	☐

الشراكة بين المنشآت الصناعية والمؤسسات الحكومية

هذا القسم يقيس اهمية الشراكة بين المنشآت الصناعية والمؤسسات الحكومية في سبيل تطوير ابتكارات جديدة خلال الثلاث سنوات الماضية

F3	هل كان هناك تعاون بين منشأتكم وأي من المؤسسات الحكومية خلال السنوات الثلاث الاخيرة؟ **(اذا كان الجواب لا الرجاء الانتقال الى السؤال F5)**	1. نعم	2. لا
F4	ما هو شكل التعاون مع المؤسسات الحكومية في ما يخص الحصول على المعرفة اللازمة لتطوير عملية الابتكار داخل المنشأه؟		

	مرتفع جدا	**مرتفع**	**متوسط**	**ضعيف \ لا تغير**	**لا ينطبق**
تقديم الحكومة مساعدات مالية لتطوير المعرفة والابتكار لدى المنشأة	☐	☐	☐	☐	☐
تخفيض الحكومة الضرائب للشركات التي تقوم بعمل البحث والتطوير	☐	☐	☐	☐	☐
تسهيل الحكومة تصدير سلع المنشأة الجديدة	☐	☐	☐	☐	☐
فتح الحكومة اسواق جديدة للمنتجات الفلسطينية عن طريق اتفاقيات مع دول اخرى	☐	☐	☐	☐	☐
تقديم الحكومة مشاريع لتدريب وتطوير موظفي	☐	☐	☐	☐	☐

المنشأة					
توفير الحكومة البيئة اللازمة لحماية الابتكار (الملكية الفكرية، حقوق المنتج، براءة الاختراع)	☐	☐	☐	☐	☐
تقدم الحكومة حوافز لعملية الابتكار (اعفاءات ضريبية على المنتجات الابتكارية)	☐	☐	☐	☐	☐

الشراكة بين المنشآت الصناعية والمؤسسات غير الحكومية (NGOs)

هذا القسم يقيس اهمية الشراكة بين المنشآت الصناعية والمؤسسات غير الحكومية في سبيل تطوير ابتكارات جديدة خلال الثلاث سنوات الماضية

F5	هل كان هناك تعاون بين منشأتكم وأي من المؤسسات غير الحكومية خلال السنوات الثلاث الاخيرة؟ **(اذا كان الجواب لا الرجاء الانتقال الى السؤال G1)**	1. نعم	2. لا
F6	ما هو شكل التعاون مع المؤسسات غير الحكومية (كالاتحادات الصناعية والغرف التجارية والمؤسسات الدولية وغيرها) في ما يخص الحصول على المعرفة اللازمة لتطوير عملية الابتكار داخل المنشأه؟		

دور المؤسسات غير الحكومية (NGOs) في تطوير عملية الابتكار لدى منشاتكم خلال السنوات الثلاث الماضية:	**مرتفع جدا**	**مرتفع**	**متوسط**	**ضعيف \ لا تغير**	**لا ينطبق**
تقوم أي من مؤسسات الـNGOs بتقديم مساعدات مالية من اجل البحث والتطوير لدى المنشأة	☐	☐	☐	☐	☐
تقوم أي من مؤسسات الـNGOs بتقديم مساعدات مالية لمشاريع بناء قدرات المنشأة (تدريب وتطوير الموظفين في القطاع الصناعي)	☐	☐	☐	☐	☐
تقوم أي من مؤسسات الـNGOs بتسهيل نقل المعرفه من خارج فلسطين الى داخلها عن طريق الخبراء	☐	☐	☐	☐	☐

G: القسم السادس: دور الشراكة بين عناصر النموذج الثلاثي في تحسين الاداء الابتكاري والاقتصادي للمنشأه؟

(يجيب على هذا السؤال فقط من اشار الى وجود تعاون مع احد عناصر النموذج الثلاثي، اي من اجاب نعم على اي من F1، F3، F5)

G1	**ما درجة تقييم المنشأة لأهمية الشراكة بين القطاع الخاص، الحكومة والجامعات؟**

	موافق بشدة	موافق	لا أعرف	معارض	معارض بشدة
توفير بيئة المعرفة اللازمة للابتكار في فلسطين	☐	☐	☐	☐	☐
تطوير عمل الابتكار لدى منشأتكم	☐	☐	☐	☐	☐
توفر بيئة مناسبة لحماية الابتكار(الملكية الفكرية، حقوق المنتج، براءة الاختراع)	☐	☐	☐	☐	☐
توفر التمويل اللازم لانتاج المعرفة بعملية الابتكار	☐	☐	☐	☐	☐
زيادة عمليات البحث والتطوير في فلسطين	☐	☐	☐	☐	☐
تدفع المعرفة من الخارج االى داخل فلسطين	☐	☐	☐	☐	☐
المساهمة في بناء القدرات لدى العاملين في القطاع الصناعي في فلسطين	☐	☐	☐	☐	☐
تسهيل عملية تبادل المعرفة بين عناصر النموذج الثلاثي (الحكومة والجامعات والصناعة)	☐	☐	☐	☐	☐
زيادة درجة الثقة بين عناصر النموذج الثلاثي (الحكومة والجامعات والصناعة)	☐	☐	☐	☐	☐
زيادة الاعتماد على الخبرات المحلية لعملية الابتكار	☐	☐	☐	☐	☐

زيادة العائدات المادية لقطاع الصناعة في فلسطين	☐	☐	☐	☐	☐
زيادة نسبة الصادرات الفلسطينية الى الخارج	☐	☐	☐	☐	☐
تحسين مهارة خريجي الجامعات الفلسطينية	☐	☐	☐	☐	☐
جسر الهوة بين مخرجات الجامعات ومتطلبات القطاع الصناعي في فلسطين	☐	☐	☐	☐	☐
زيادة انتاجية القطاع الخاص	☐	☐	☐	☐	☐
تشجيع الاستثمار في فلسطين	☐	☐	☐	☐	☐
فتح اسواق جديدة لتصدير الصناعة الفلسطينية	☐	☐	☐	☐	☐

H: القسم السابع: تقييم القطاع الصناعي للشراكة بين الجامعات والحكومة						
H1	**ما درجة تقييمك للعلاقة بين الجامعات والحكومة خلال الثلاث سنوات الماضية في المجالات التالية؟**					
	مرتفع جدا	**مرتفع**	**متوسط**	**ضعيف \ لا تغير**	**لا ينطبق**
تقوم الحكومة بتشجيع الابتكار	☐	☐	☐	☐	☐
توفر الحكومة بيئة لحماية الملكية الفكرية والصناعية	☐	☐	☐	☐	☐
تشجيع الحكومة لمشاريع البحث والتطوير R&D	☐	☐	☐	☐	☐
تقديم الحكومة لمشاريع تدريب ةتطوير للطلاب	☐	☐	☐	☐	☐
تقديم الحكومة مساعدات مالية للطلاب المبدعين	☐	☐	☐	☐	☐
تتبنى الحكومة التوصيات المقترحة من الابحاث الجامعية لتطوير الواقع الفلسطيني	☐	☐	☐	☐	☐
تقدم الجامعات ابحاث ودراسات لتطوير الواقع الفلسطيني تساعد الحكومة على تبني سياسات افضل للواقع الفلسطيني	☐	☐	☐	☐	☐
I: القسم الثامن: أهمية وجود جسم تنظيمي (المجلس الاعلى للابداع و التميز مثلا) ينظم العلاقة ما بين الجامعات، القطاع الخاص والحكومة					
I1	**ما درجة تقييمك لاهمية وجود جسم تنظيمي (المجلس الاعلى للابداع و التميز مثلا) ينظم العلاقة ما بين الجامعات، القطاع الخاص والحكومة؟**				

	موافق بشدة	موافق	لا أعرف	معارض	معارض بشدة
زيادة درجة الثقة بين عناصر النموذج الثلاثي	☐	☐	☐	☐	☐
تنظيم العلاقة التشاركية ما بين عناصر النموذج الثلاثي	☐	☐	☐	☐	☐
المساعدة في بناء شبكات للابتكار والمعرفة فيما بينهم	☐	☐	☐	☐	☐
تسهيل عملية تبادل المعلومات والخبرات فيما بينهم	☐	☐	☐	☐	☐
المساعدة في صياغة قانون حديث للملكية الفكرية	☐	☐	☐	☐	☐
تبني نماذج عالمية ناجحة للتعاون الثلاثي	☐	☐	☐	☐	☐
البحث عن تمويل لمشاريع لتعزيز التعاون الثلاثي	☐	☐	☐	☐	☐
تخصيص جوائز قيمة لقصص نجاح محلية في التعاون الثلاثي	☐	☐	☐	☐	☐
تشجيع الابتكار في فلسطين	☐	☐	☐	☐	☐
تطوير جودة المنتجات الفلسطينية	☐	☐	☐	☐	☐
تشجيع مشاريع البحث والتطوير R&D	☐	☐	☐	☐	☐

جامعة النجاح الوطنية

كلية الدراسات العليا

بناء استراتيجية الابتكار في قطاع الصناعة في فلسطين بالاعتماد على النموذج الثلاثي اللولبي (الصناعة، والجامعات والحكومة)

إعداد

هنا حج حمد

إشراف

د. رابح مرار

قدمت هذه الأطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير إدارة السياسة الإقتصادية، بكلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس، فلسطين.

2017

بناء استراتيجية الابتكار في قطاع الصناعة في فلسطين بالاعتماد على النموذج الثلاثي اللولبي (الصناعة، والجامعات والحكومة)

إعداد

هنا حج حمد

إشراف

د. رابح مرار

الملخص

يعد النموذج الثلاثي اللولبي نموذج يوضح العلاقات بين الجامعة والصناعة والحكومة. علماً ان مساهمة القطاع الصناعي في الناتج المحلي الإجمالي في فلسطين تبلغ 13.4٪ فقط (BCPS,2015)، ويعزى ذلك إلى نقص البحث والتطوير وعدم وجود ابتكارات تكنولوجية؛ وقد أدى ذلك إلى قيام الشركات الصناعية الفلسطينية بإيجاد حلول مبتكرة لسد الفجوة المعرفية لتحسين تطوير المنتجات. وعلاوة على ذلك، فإن الشركات الصناعية، بقدراتها الخاصة، غير قادرة على تلبية احتياجاتها من المعرفة والتكنولوجيا؛ لذلك، يعتبر النموذج الثلاثي اللولبي واحدا من أهم الحلول حيث يمكن للجامعات - كمركز للتميز والمعرفة - تزويد الشركات الصناعية بالمعرفة المطلوبة والكفاءات التكنولوجية والبحث والتطوير، وسيتم دعم ذلك وتيسيره من خلال الكفاءات المؤسسية للهيئات الحكومية بما في ذلك القوانين والأنظمة والبنية التحتية التكنولوجية والإعانات المالية وغير المالية والاستثمار البيئي. كما سيوفر النموذج الثلاثي اللولبي إطارا مفاهيميا لاستكشاف ديناميات الابتكار، بالاضافة الى رسم السياسات الوطنية للابتكار والتنمية في القطاع الصناعي.

وتعمل هذه الدراسة على تحديد درجة التفاعل بين عناصر النموذج الثلاثي اللولبي (الصناعة والجامعة والقطاع العام) وتأثيرها على أداء الشركات الصناعية الفلسطينية وقدرتها على تطوير ابتكارات جديدة. وفي هذا الصدد، تم جمع مجموعة من البيانات الأولية من عينة ل 340 شركة صناعية في الضفة الغربية. ثم تم تطبيق مجموعة من المقاييس الكمية والنماذج الاقتصادية للرد على أسئلة البحث في ضوء البيانات التي تم جمعها. وقد استند تحليل البيانات على عدد من

الأساليب بما في ذلك الانحدار العادي المربعات الصغرى (OLS)، Robust Least Square ، النموذج الخطي العام (GLM)، و نموذج Logit.

وتظهر الإحصاءات الوصفية للدراسة أن 17.94٪ من الشركات الصناعية تتعاون مع الجامعات الفلسطينية من أجل تطوير ابتكارات جديدة، وان 25.29٪ من الشركات الصناعية تتعاون مع الحكومة الفلسطينية من أجل اكتساب المعرفة اللازمة لتطوير عملية الابتكار. وبالإضافة إلى ذلك، فان 4.71 % من الشركات الصناعية تتعاون مع المنظمات غير الحكومية. كما وجدت الدراسة من خلال التحليل الكمي لعلاقة التعاون بين أعضاء النموذج الثلاثي اللولبي وابتكار المنتجات أن وجود هيئة تنظيمية كالمجلس الأعلى للابتكار والتميز (HCIE) تقوم بتنظيم علاقات التعاون بين أطراف النموذج الثلاثي اللولبي يعد امر ضروري لنجاح النموذج، كحل غير تقليدي لعدم وجود المعرفة والتكنولوجيات؛ التي قد تكون مهمة للشركات الصناعية للنمو والتنافس في اقتصاد دولي مفتوح.