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Strengthening University – Industry Collaboration in Palestine via Technology and Knowledge Transfer

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Acknowledgment

Thank you

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الإقرار

أنا الموقع أدناه، مقدم الرسالة التي تحمل العنوان:

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Strengthening University – Industry Collaboration in Palestine via

Technology and Knowledge Transfer

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أقر بأن ما شملت عليه هذه الرسالة إنّما هو نتاج جهدي الخاص، باستثناء ما تمّت الإشارة إليه حيثما ورد، وأنّ هذه الرسالة ككل، أو أيّ جزء منها لم يقدّم من قبل لنيل أيّ درجة أو لقب علميّ لدى أيّ مؤسسة تعليمية أو بحثية أخرى.

</div>

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 الطالب:

Signature: التوقيع:

Date: التاريخ:

Table of Contents

List of Abbreviations

Abbreviation	Description
UIC	University-Industry Collaboration
K&TTC	Knowledge and Technology Transfer Center
K&TTO	Knowledge andTechnology Transfer Office
K&TT	Knowledge and Technology Transfer
ICT	Information and Communication Technology
UITT	University-Industry Technology Transfer
K&TTP	KnowledgeandTechnology Transfer Programs
IJV	International Joint Venture
IP	Intellectual Property
IPR	Intellectual Property Rights
BDA	Bayh Dole Act
HEIs	Higher Education Institutions
MONE	Ministry Of National Economy

List of Tables

List of Figures

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Abstract

Collaboration between universities and industry is critical to create a win-win communications through research projects that provide the two parties with the necessary knowledge and technology for developing them and the whole socio-economic system by providing innovations that support and develop individuals, companies, higher education institutions, and have the impact on society, too.

This thesis was conducted to understand the whole knowledge and technology transfer process by identifying the factors that affect the K&TT collaboration, determining the stakeholders of these collaborations and evaluating the current states of these factors according to each participant role in the K&TT collaborations.

These factors were determined and evaluated through literature review, experts interviews, and data analysis procedures.

This thesis will also provide the necessary information, identifying concepts that help universities and industry for better understanding of the K&TT collaborations, providing a framework that helps universities and industry collaborate smoothly and clearly.

After determining the participants of the K&TT process , the factors that affect the K&TT process were determined, then designing tools for collecting data from the participants for studing the current status to apply these factors practically, and the participants were the universities, the industry sector, the government as well as the the students and the researchers associated to the universities.

The companies were chosen from the industrial sector on which the researcher can do interviews with them concerning the K&TT related factors, according to recommendations of the industrial sub uonions, and the number of candidates companies was 85, those who responded in the interview were 64 which is equivalent to 54.1% from the companies, the questions of the interviews were designed according to the affecting factors in the process of K&TT and it's determinants which were concluded from the literature review.

These interviews were designed to be suitable for both of the main participants associated in the K&TT process, and they are the industrial sector and the universities, as for the government a special interview was made for studying the intellectual properties and the roles concerned.

The students and the researchers inside the university are the main source producing knowledge and technology which can be transferred to the industrial sectors, the factors that motivates producing transferable research projects have been determined, and a questionnaire was conducted to

determine their readinessto produce research and graduation projects that are suitable for transfer to the industrial sectors .

The results of the questinniare and interviews have showen many Informations and results which help to promote the awareness, there understanding for such processes, and there benefits. the universities were pioneers and showed a good level in dealing with such programs, while the industrial sector was in a low level in dealing with K&TT programs for many resons, the most important one is the finacial view and the ignorance of social dimension and community responsibility.

The results of the questionnaire showed that the students and researchers inside the aimed facultiesinside the universities were having a very good level for providing suitable transferable research projects, but they lack the stimulus and the confidence in universities and the industrial sectors in particular to support them in these projects.

Chapter One

Introduction

1.1. Background

The concept of innovation has become the obsession of the new world, and an arena for competition between companies and industries. Innovation as a concept was provided and developed by researchers who were related strongly to universities which produced the basic knowledge and skills to them. So the pure source of innovation and its related concepts like technology and technology transfer were the universities at the first place. companies seeking for innovation and new knowledge and technologies were aware of this source and they are trying to exploit knowledge and technology in the form of partnerships, linkages, joint venture, technology and knowledge transfer and other forms of collaborations to achieve common interests of both partners (universities and companies) (Vorbach et al., 2014).

In this thesis, I introduce the concepts and models of Technology and knowledge Transfer programs and the differences among these models. Then, based on the special requirement of the Palestinian economy and market, I study which model is mostly appropriate and what is the impact of adopting such a model on the Palestinian economy. The main objective of the study is to evaluate the applicability of Technology and knowledge Transfer models in Palestine. The study will focus on the motivation and incentive of the main stakeholders of the Knowledge and Technology

Transfer (KK&TT), namely, the researcher, the university, the government and the industry sector. Understanding the main advantages and how to overcome the obstacles of this process will help policy makers in their decision making.

1.2. Knowledge Based Societies

Knowledge-based societies are well-educated societies and they understand their needs well for developing the best economy, relying on innovation and entrepreneurial to compete in the globalized world (OAS, 2014).

It is hard to satisfy these societies because of the too many alternatives in the globalized markets and they are more demanding too, this makes it difficult for the local and global industry to satisfy these needs, in addition to the severe competition and the lack of sources of new ideas with appropriate costs.

During the search for the source of new ideas, industry went to the source of knowledge and the provider of the human capital to the community and that have the needed skills, personnel, labs and the infrastructure needed without costing it a single dollar, So there is no need to build or recruit employees with the aim of finding new ideas that worth the risk of money for that, this source is the university, industry needs to make a strong linkage with the university to help the industry in developing and achieving goals to satisfy the demand of their customers. (Barton, 2014).

1.3. Problem of the Study

Knowledge, technology, innovation and R&D are strong concepts in the world of strong socio-economic systems. To develop these systems there is a need to strengthen university – industry relationships to create strong local economy and to provide the necessary fund for the university to develop their research systems and to produce a strong market oriented R&D. Palestine is late in the field of technology and innovation, however, there is a high level of creativity in a shape of graduate projects, theses, papers made by under-graduates, graduates, PhD students and researchers. This source of ideas which is untapped correctly needs to be utilized well.

Moreover, Palestinian economy is weak and needs any source of financial support in a form of money, products and knowledge as well .Transforming the documented knowledge in the universities has to be innovated and marketed as a form of products, software, books and in a form of ideas will bring to Palestine such support and encourage new ideas and encourage students to be creative. The lack of knowledge and technology transfer programs (K&TTP) in Palestine results in a loss of many opportunities to develop our economy and encourage our student to be creative.

To overcome this dilemma, this research tries to build a strong operational framework to create, develop, protect, organize, manage, and encourage the university –industry collaborations. This model will be as a technology and knowledge transfer model from the universities to the industry including public and private sectors.

1.4. Research Questions

1. What are the factors that affect K&TT collaboration process?

2. What is the current status of these factors?

3. What are the obstacles that prevent or hinder the application of K&TT collaboration programs?

4. What are the procedures that can be done to mitigate these obstacles?

5. What are the incentives that encourage the participants in the K&TT Collaboration programs?

6. What is the role of each participant to mitigate these barriers ?

1.5. Research Objectives

This research aims to achieve the following objectives:

1. Studying the current status of Palestinian university-industry knowledge and technology transfer collaborations.

2. Identify the factors that affect these collaborations.

3. Investigating the factors that affect the university–industry K&TT Collaboration.

4. Creating an operational framework that helps to strengthen the university-industry partnerships via Technology and knowledge transfer process.

1.6. Significance of the Research

As shown previously, Palestine needs to develop a partnership between the various society components, to develop the socio-economic system and create a strong economy. This need must encourage the strongest components of the country, university which has the needed knowledge and skills and human capital and the industry which has the capital, partnerships or collaborations will not only provide the fund needed to the university to develop its own R&D system, It will also provide a pure source of innovation, creativity and efficiency to the industry. The social impact will grow to provide a local financial impact in form of money, careers and knowledge.

The operational framework (Model) which will be developed will be the Roadmap to each participant in the K&TT process. It will also sensitize them into the points that participants have concealed. And will provide a strong base for Self-development to catch up with the modern world and to be more scientific and market-oriented at the same time.

1.7. Research Structure

This thesis consists of four chapters, the first chapter is the introduction to this research, and it includes general information about the UIC and K&TT process and its related concepts and importance, the second chapter draws the theoretical part of the K&TT process and its related concepts, the third chapter is a methodology part that discusses research data collection techniques, building and analysis procedures in more depth, the last chapter

analyzes and discusses the results of research, rounds out this research by concluding and providing recommendations, this chapter also includes the framework design and its related procedures.

Chapter Two

Literature Review

2.1. University-Industry Collaboration (UIC)

University-Industry (U-I) relationships have been the focus of a growing number of studies, particularly since the 1990s.(Texerira & Mota, 2012), The relevance of cooperation between University and Industry has been highlighted by several authors (e.g., Agrawal, 2001, (Bekkers & Freitas, 2008)) who stress, for instance, that universities can contribute to regional development through the production and transfer of (Colombo, et al., 2009); (Bergman, 2010)

One of the first policies adopted in the wide world is the Bayh -Dole Act (BDA) in the United States, this law is economically drives a policy for encouraging collaborations and IPR protection, considered by a lot of authors as the first law that US universities, small business and non-profit organizations began to control of the intellectual property of their inventions (Aldridge & Audretsch, 2011).The BDA is considered an example for commercially focused innovation (Gibson & Naquin, 2011)

A lot of countries follow the US by developing national policies that encourage the IPR protection to encourage people, companies and industry to control their IPR and to gain the maximum benefits from it, France, UK, Sweden, and Italy is an example of the countries that follow the steps of the US in the IPR policies (Gibson & Naquin, 2011)

Partnership, linkage and collaboration refer to the same concept of university-industry relationship which aims to create a win-win situation that provides the university with the needed fund to provide a source of new innovative ideas to the industry.

The concept of UIC is not new, the world has an experience of 20 years (Lee, 2000). Now in 2015 we have a 35- year experience and a lot of failure and success stories in the wide world.

Globalization and rapid ICT development made a high competitive environment to the organizations forcing them to look for new ideas for the innovation and productivity and other factors that provide a competitive advantage to have a share in the local and global markets, Partnerships are the solution to generate researches that help to achieve the goal, partnership with customers, suppliers even competitors, but partnership with universities was the strongest one because of the university experience in the field of research and development and the availability of capabilities and competences . (Autio, E, et al., 1996), (Thorgren, S, et al., 2009), (Plewa, C, et al., 2013).

There are many studies about UIC and each country has its own special situation and characteristics, what has been applied in one country is not necessarily to be successful in another country (Shahin, M & Thiruchelvam,K, 2012).

2.1.1. University Role and Motivations in the UIC

If we look inside any dictionary, we will find a clear definition of university as follows :"*A high-level educational institution in which students study for degrees and academic research is done* " (Oxford, 2014)), so the main mission of the university is teaching and most importantly the academic research, this academic research has two types, basic and applied.

Research is made by students who are forced to do to complete graduation requirements, the students have a choice in which subject they want to do their research, but most students are looking for the easiest and cheapest way. Because of that one finds a lot of imitation and incremental researches, but still if students find the guidance and the fund they will be encouraged to do more effort in their research. The university plays this role to encourage them specially if this will bring more financial returns, university plays a major role in the UIC process and it is a key element in the innovation systems by providing the human capital and a seed-bed of new firms, (Etzkowitz, H, et al., 2000).

To play this role successfully, the university must transform from traditional teaching and research form to an entrepreneurial form that guides the researchers to be market oriented. Entrepreneurial university is a knowledge producer and disseminating institution and a survivor in the competitive environment with common strategies oriented to be the best in all their activities. It is not only a promoter but it is also a developer for the

administrative techniques, strategies or competitive postures. Based on this, entrepreneurial universities are involved in partnerships, networks and other relationships with public and private organizations that are an umbrella for interaction, collaboration, co-operation and among the core elements of a national innovation system many different interactions may exist (Guerrero,M & Urbano,D, 2010).

Academic engagement in the UIC projects will stimulate the researchers to have an insight on which kind of ideas will be more commercially valuable .In that case they can develop or co-develop inventions that can be patented, licensed or to enable a new start-ups, especially, when these new start-ups will work collaboratively with the university labs they originated from (Meyer, 2003).

So, the university will provide this process with new ideas that can be commercialized in a form of new technologies, processes, knowledge and services that can be produced to industry.

The question now will be why do universities need collaboration?

(Lee, 2000) mentioned eight reasons that motivate the university to be a part of UIC as follows:

1. To supplement funds for one's own academic research.
2. To test the practical application of one's own research and theory.
3. To gain insights in the area of one's own research.
4. To further the university's outreach mission.

5. To look for business opportunity.

6. To gain knowledge about practical problems useful for teaching.

7. To create student internships and job placement opportunities.

8. To secure funding for research assistants and lab equipment.

A number of existing articles mention the motivations for university to collaborate. For example (Siegel et al. 2003) found that one main motivation for the university scientists is that they gain recognition from fellow scientists by publishing articles in some of the top journals, by having new and valid research results to present to their fellow scientists during conferences, and receiving research grants through the collaboration with an industrial partner.

(Valentin, 2000)has also found that publications and citations are motivational factors. Valentin has also found that some scientists see the opportunity to gain financial revenue for themselves as a motivation to join in collaboration (Lee, 2000) has found the main motivation for scientists to engage in collaboration centres was to gain additional funding for assistants and laboratory equipment.

(Valentin, 2000) Has found that for university scientists, one of the main motivations was related to the university's social contribution in society, as the university also sees the development of its reputation as a motivational factor to commit in collaborations. Another motivation for university is the possibility to test the existing theories in practice and the creating of new hypotheses and paradigms (Valentin, 2000)

2.1.1.1. Knowledge and Technology Transfer Centres (Offices) (K and K&TTC or K and K&TTO)

Knowledge and Technology Transfer centres (K&TTC), Knowledge and Technology transfer Offices (K&TTO) have the responsibility inside the university over the UIK&TT collaboration process.

K&TTO is an institution set up by the university in order to do the following responsibilities:

1. Discover the potentials for commercialization.
2. Evaluate the potentials.
3. Provide sufficient justifications to fill a patent for the domestic or global protection.
4. Make prior judgment to interests being expressed by industry.
5. Negotiations with the private firms or entrepreneurs for licensing agreements for intellectual property.

And other responsibilities and tasks that may (K&TTO) do according to the type and size of the university and the type of the innovation process (Siegel, et al., 2003)

Another definition by another author (Zawad, 2010) is:

K&TTO is an institution set up by the university in order to do the following responsibilities:

1. Manage the expectations of faculty inventors by providing the principal investigator with a summary of the prerogatives and responsibilities of each partner.

2. Exercise due diligence in evaluating each technology for protect ability and commercial potential.

3. Keep the principal investigator fully informed of the status of evaluation, patenting and licensing activities; and Maintain momentum throughout the process.

And there are other responsibilities and tasks that may (K&TTO) work according to the type and size of the university and the type of the innovation process (Zawad, 2010).

2.1.2. Industry Role and motivations in the UIC

As mentioned previously, industry has its own reasons to collaborate with universities, according to (Lee, 2000) the following is a list of the reasons for the firms to be a part of the UIC process:

1. To solve specific technical or design problems

2. To develop new products and processes

3. To conduct research leading to new patents

4. To improve product quality

5. To reorient Research and Development agenda

6. To have access to new research _via seminars and workshops.

7. To maintain an ongoing relationship and network with the university

8. To conduct ''blue sky'' research in search of new technology

9. To conduct fundamental research with no specific applications in mind, and

10. To recruit university graduates.

(Valentin, 2000)and (Lai, 2011) both found that industry's motivation to engage in collaboration with universities, includes the possibility to enhance the organizations' reputation, a motivation also found among the university's motivations to collaboration. (Siegel et al.,2003) found that the absolute main motivation for industry to join in collaboration with university is to gain financial value, by commercialization of the technologies developed by scientists. (Siegel et al,2003) found that to obtain the highest value of the new technologies the collaborating industry often tries to gain full control of the technology so that competitors do not have easy access to the technologies, this tells us that UIC is a fertile soil to gain competitive advantage.

A part of this is also seen in (Valentin, 2000)where it was found that the industry's motivations include the possibility to increase the competitiveness of the organization (Lee, 2000) as shown in above found that the primary motive for the industry's technology managers to engage in collaboration with university is to get help of product development

research, and secondary motive was research into new technological areas. While the secondary motive is to participate in seminars about new research, only 7.1 per cent of the managers had this as a primary motive.(Lee, 2000)

From (Lai, 2011) it is also seen that the industry's motivation include the possibility to find new products or technologies, as well as, knowledge transfer from university to industry. (Lee, 2000)has also found that the primary motive for collaboration was the industry's need to help design of prototypes and technical problem solving. (Valentin, 2000)has found that one of the main motivations for industry to engage in collaboration is that they need help to carry out technological research, for which they do not have the competences in-house, and therefore it is a motivation to be able to access the university laboratories, staff and their new knowledge and skills.

As we have seen, several motivations for both industry and university to engage in collaboration as shown above. Among the most important for the university was the possibility to gain additional funding for laboratory equipment and research assistants, as well as, the possibility to test existing theory in practice and get insight and clarification into the scientists own research. From the industry's side, it was the possibility to gain access to the university's laboratories and scientists' knowledge, and the possibility to receive help on research.

2.1.3. Government Role in the UIC

It is clearly that the government which controls each legal action in the country and manages the citizens, companies and every component of the society has a set of regulations that control and protect common interests in the UIC process.

Moreover, some of the output from the UIC process could be transferred to the public sector which is controlled by the government itself.

2.2. UIC Via knowledge and Technology transfer

Technology and innovation were popular concepts in the 20th century, they are important for the development of economy and provide the basis for superiority among organizations around the world. The use of the term technology is not limited only to refer to a technological instrument (e.g., computer, mobile phone), but rather it is used to refer to wider meanings. It can refer to a form of knowledge such as a software platform technology, or some medicine production techniques. Similarly, the concept of innovation has a broad meaning in the literature depending on the perspective of the involved organization or institution in the process. Generally, innovation can be defined as the process of generating an idea, transforming it into a product, and commercializing the product. However, different organizations see it differently. (Buys, A & Oosthuizen, R, 2003)

The competitive search for new technologies and new innovations among companies and industrial firms naturally led to the birth of knowledge and Technology Transfer (K&TT) programs in several countries years ago. This concept is particularly important for the development and competitiveness of economy. The term K&TT is used to refer to a subset of different kinds of knowledge and innovation dissemination. However, it is broadly defined as the process of transferring knowledge, innovation and technology from one form into another. (Bozeman, 2000)

Knowledge and Technology transfer is a complicated and hard process which is not productive and worthy without planning and realization, and the result may cause a loss in money, time and generate weak technology or knowledge.(Asghari & Pakhshanikia, 2013).

2.2.1. Definition of Knowledge and Technology Transfer

In literature, there are several definitions of K&TT depending on the form of transfer and the entities involved. The term can refer to the transformation of innovation and knowledge from research laboratories in a university to a commercial product in industry (Young, 2005), another definition focuses on the transfer through licenses and patents forms, (AUTM, 2013): "*The process whereby inventions or intellectual property from academic research is licensed or conveyed through use rights to industry*". The name is also used to refer to the transfer of technology from a developed country to a developing country, in a clear and simple words, K&TT is the process by which the maker of technology makes his/her

technology available to commercialization by a partner that will exploit it (Sajid, et al., 2012)

In the context of this Thesis, I adopt the definition, which refers to transferring university research projects to the industry sector for commercialization.

2.2.2. The world's attention to Knowledge and technology transfer

In order to show the world's attention to technology transfer, we will look at some countries such as the United States, Malaysia, and Brazil.

Universities and their K&TTO play important roles in managing the IP (intellectual property) produced by intellectuals; innovation created becomes meaningless if commercialization is not done properly. Funding and investment pump in to the universities will stop at one point. Commercialization will ensure the continuous flow of income for the future of a nation.

Developing countries are learning from the past experience of the developed ones to create a financial and innovative resource, by adopting technology and knowledge transfer programs such as China and Turkey, (Abd Rahman,S, et al., 2011)

K&TTP have existed in the United States since 1983 or before that because of industrial strength of it. These projects have been very successful and developed the basic principles for technology transfer since that time, especially, from universities to local industry, in 1998 Trine and Gosling

made a profit-loss analysis in the US On 168 universities, hospitals and research centres and they found that $434 Million was the community benefit of technology transfer programs (Turne,L & Golson,L, 1998).

With the passage of years and the expansion of industries and the expansion of markets and the large number of competitors in all kinds of industry, an urgent need to source of innovation has appeared, In these days universities plays a major role in the technology and knowledge transfer .

In Brazil as a country which evolved significantly K&TT collaborations was a part of the evolution of the innovation concept in it, Rozana Giorgio discusses how Brazil has dramatically increased knowledge and technology transfer through the State University of Campinas, the leader in patenting and licensing activities in Brazil and Latin America. She talked about the increasing number of patenting activates in the Brazilian universities which have an impact on the level of innovation in the Brazilian quality of life. (Giorgio, 2007)

In 2010 (Póvoa,C & Rapini,M, 2010)talked about the general characteristics of technology transfer in Brazil, and showed a remarkable results, they said that there are several channels of technology transfer patents and licensing is one of them. About 45% of interactions refer to the transfer of new processes and techniques, while new product transfers account for 29.4% of total interactions. This information demonstrates that

universities generate technologies that are used to prepare products, instead of being sources of new products ready to commercialization.

(Póvoa,C & Rapini,M, 2010).

In 2010, Malaysia has announced New Economic Transformation Program. This increase of income from USD6, 700 or RM 23,700 in 2009 to more than USD15, 000 or RM48, 000 in 2020, Innovation is the drivers for the nation wealth creation, Government has Announced 2012 as Malaysia innovation year.(Ismail, 2011).

Dr. Kamariah reviewed the background of Malaysian universities and the number of patents that registered during 2005 to 2011 and noticed the large increase of them. He took a UTM (university of technology Malaysia) as a success case study. (Ismail, 2011).

In the Arab world there is a gap between the current status of the Arabic states and the world in the field of R&D and K&TT.

Despite the deep gap between the Arab countries and the world in the field of research and development, there is strong awareness to develop and establish the infrastructure and skills that lead to develop strong R&D and K&TT systems, and the need to invest more on R&D. Abu Dhabi, Qatar, Jordan, Morocco and Tunisia witnessed increasing trends in the innovation concept in several fields. (Sasson, 2007).

2.2.3. Knowledge and Technology Transfer in Palestine

In Palestine, there are so many challenges which face the implementation of the university technology transfer. One of them is that universities of Palestine still haven't the resources needed for the implementation of these programs such as, staff, money, space and other things. The other challenge will be the industry willingness to adopt such programs, According to the website of the Palestinian Ministry of National Economy, the contribution of the industrial sector in the GDP does not exceed 16% .

A project called STEP project funded by TEMPUS a European Commission for strengthening universities-enterprises linkage in Palestine has shown that 67% of the universities in Palestine consulted in the project do not have any kind of university liaison offices at all. Almost none of the universities consulted in the project take into account intellectual property (IP) issues in the R&D process with other entities. Most of them leave the concept of the technology transfer to the individuals and they do not have a specific unit for that purpose. Only 17 % are depending on analysing technology demand and need of the organizations for coordinating research activities. (Step, 2014)

This leads us to the conclusion that, technology transfer in Palestine suffers from a weakness because of the so many reasons, one of them is the weak industry and the other to the Israeli occupation and collectively this causes the delay in the development of the industrial sector and economy in Palestine.

2.2.4. Forms of Knowledge and Technology Transfer

According to (Schnaars, 1989), in general there are two major types of technology transfer, horizontal and vertical transfer of technology:

1. Horizontal transfer of technology refers to the transfer of the technology in the form of idea, innovation, and the exact technology from a country, organization, to another.

2. Vertical transfer refers to the transfer of the technology among the process of the R & D department to the manufacturing process of the same organization.

Vertical or horizontal technology transfer can occur in many forms or types.

(Uchida, 1990)classified the forms of technology transfer into eleven types depending on the capacity and policies of the parties involved in the size of the technological gap, the amount and quality of the technical information available, the degree of supplier intervention and the initiative shown by the recipient, starting with the types of transfer where the recipient exhibits a high degree of dependence on the supplier country to types where the recipient exercises a high degree of independence.

The various forms of technology transfer can be classified as follows:

1. Overseas factories founded through direct investment by suppliers
2. Businesses established by migrants from the supplier country

3. Joint ventures

4. Management contracts with suppliers

5. Turnkey contracts, where suppliers guarantee the transfer of technology when they construct a factory

6. The employment of engineers and skilled workers provided by the suppliers or by businesses owned by the receivers

7. Purchase contracts for machinery and know-how

8. Technology transfer as an integral part of the machinery imported by the recipient

9. Patent license agreements

10. Production of imitations

11. In-house development of a technology

Other types of technology transfer depend on the cases that are taken from the technology transfer from the west to Japan (Uchida, 1990).

(Manolea, 2012)Divided the technology transfer into three types:

1. Transfer of technology from the basic research form to the applicative form.

2. The transfer of technology from the applicative form to the industry.

3. A transfer from creative-innovative activities carried out by individuals (Ph.D. students, inventors, creators) to applicative activity (we have to mention that sometimes it is necessary to have an intermediate stage of applicative research or technological adaptation.

2.2.5. Knowledge and Technology Transfer Models

There is no specified model or framework for the process of technology transfer or which is called sometimes innovation to commercialization process some describe it as a black box because each university has its own model for K&T. (Bradley,S, et al., 2013).

Table (1) will summarize the most famous models since 1945 until 1990

According to (Gibson & Smilor, 1991).

Table 2- 1: Summary of most famous models 1945-1990

	Model	**Year**
1	The Appropriability Model	1945-1950
2	The Dissemination Model	1960-170
3	The Knowledge Utilization Model	Late 1980's
4	The Communication Model	1990's

These models are called traditional models, in those years the markets were empty and the technology push was the adopted method, these models focused on two major concepts:

1) The promotion, adoption and diffusion of new innovations and technologies to potential users

 2) K&TT processes.

The early K&TT models were developed to govern the implementation of K&TT activities and their application to market place.

After the 1990s, the models had been changed to focused on other factors, these were the most famous models until 2000 according to (Sung & Gibson, 2000)

Table 2- 2: Summary of most famous models 1991-2000

Model	Year
Gibson and Slimmer's Model	1991
Rebentisch and Ferret's Model	1995
Sung and Gibson's Model	2000

The models after the 1990s had developed to address the weaknesses and limitations that happened in the traditional K&TT models, by focusing on

1. Level of K&TT.
2. Communication between participants.
3. Factors that influence K&TT. (Haslinda, A, et al., 2009).

In 2012, Lane proposed an operational framework (model) for technology and knowledge transfer:
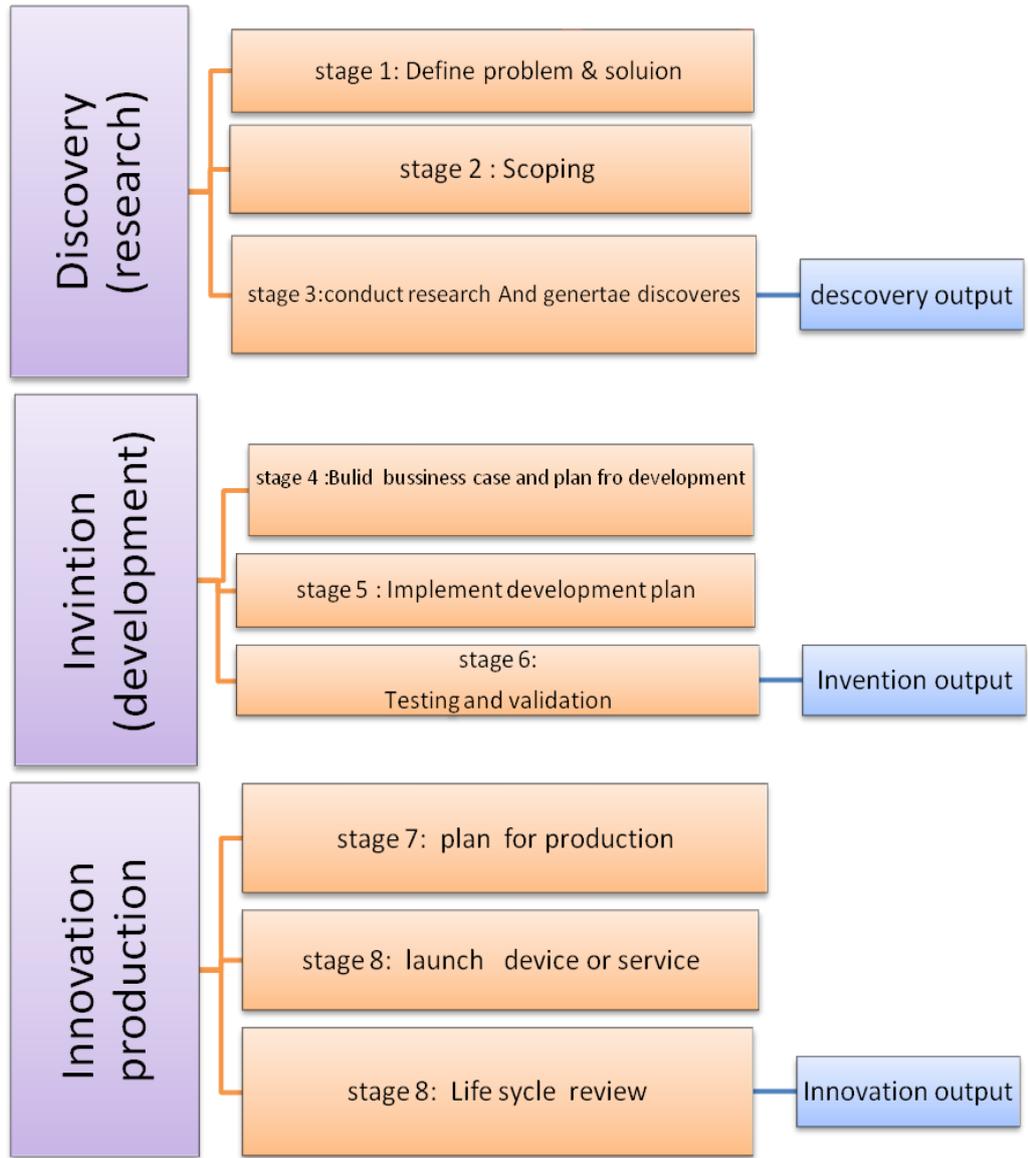
Figure 2- 1 : outline of need to knowledge model (lane 2012).

Manolea also proposed a model for K&TT showing the stakeholders in the holeprocess
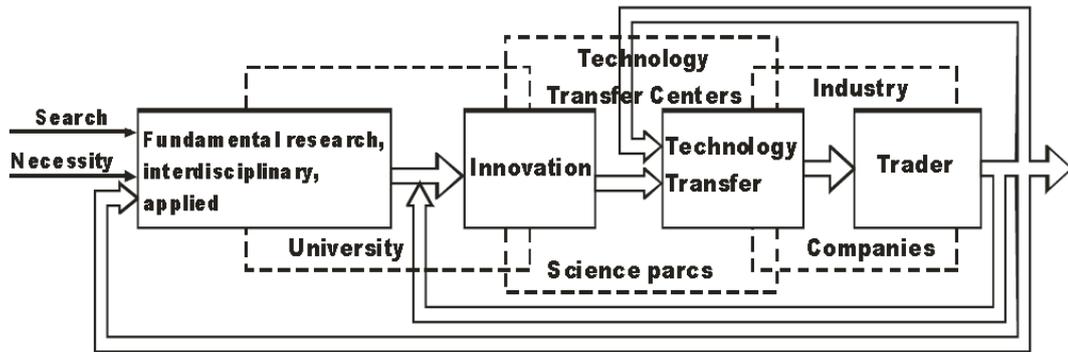
Figure 2- 2: MANOLEA model for K&TT regarding innovation concept (Manoela,2012).

In 2013, a literature study was conducted to show the traditional and non-traditional models of K&TT and they showed the following models:

   a. Traditional Model of University Technology Transfer :
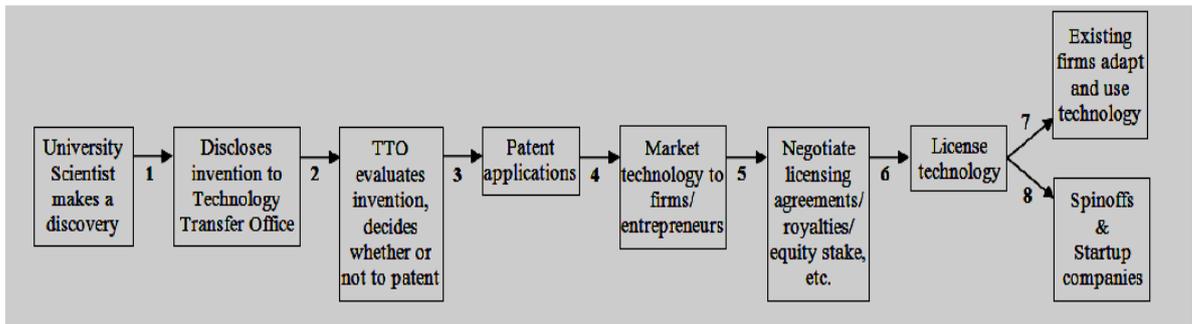
Figure 2- 3: Traditional Model of University Technology Transfer (Siegel et al,2003).

   b. Non-traditional models of University Technology Transfer :

In the study they found that the traditional liner model of K&TT cannot be used in all universities, especially, that the knowledge flow cannot be simple to be represented by a liner flow. So they said each university must create its own model and they performed an alternative model of K&TT as shown in figure (2-4)
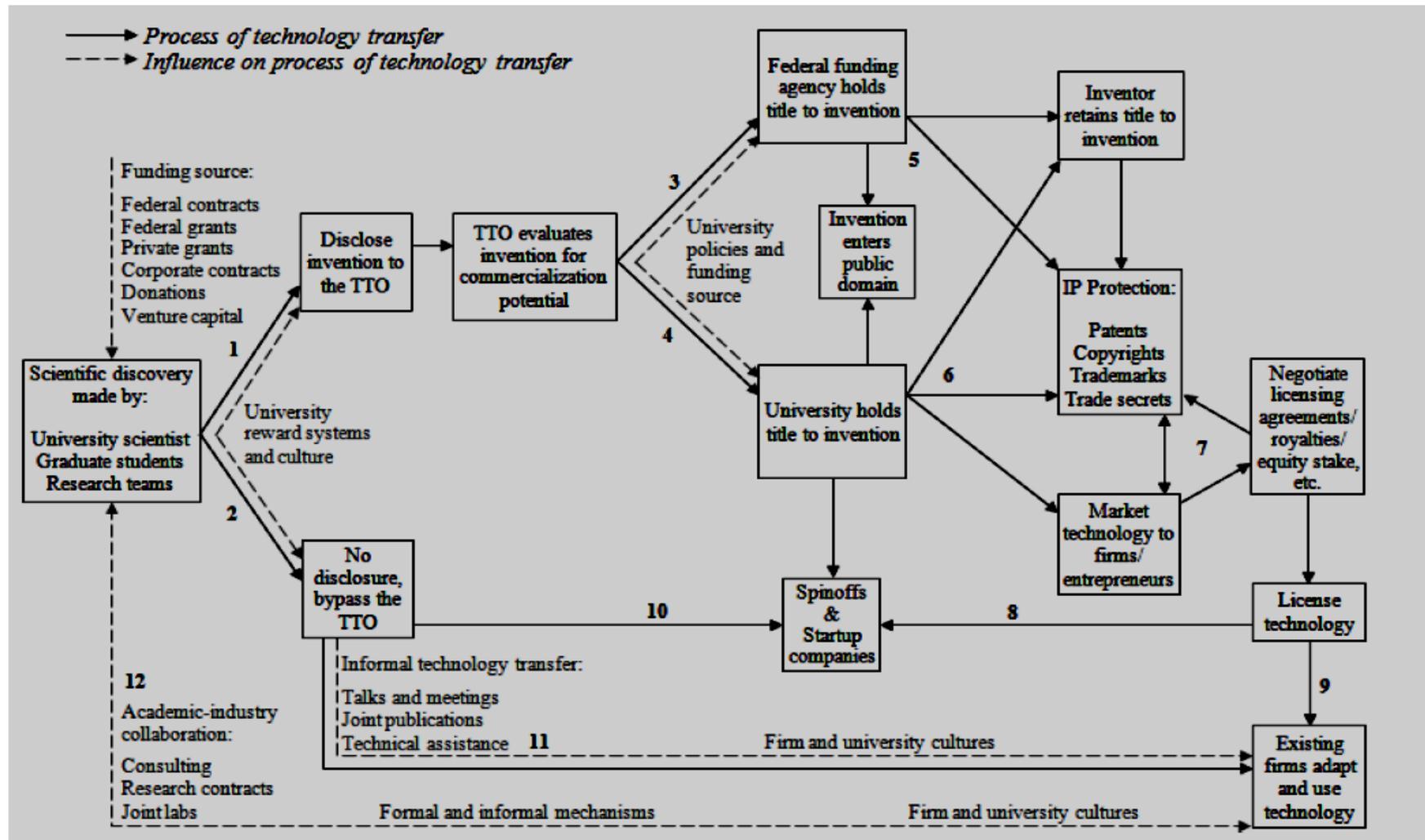
Figure 2- 4: Alternative Model of University Technology Transfer (Bradley,2013).

In this model they put all operations that could be done in the K&TT process according to the study they made, it could be modified to be convenient with any university K&TT process.

2.2.6. Knowledge and Technology Transfer Stakeholders

According to what was said previously, we can find that there are three major stake holders in K&TT process:

1. **The university** which has :

a. Responsibility for creating and building the K&TT office or other mechanisms of K&TT.

b. The Scholars, Scientists :including

  1. under graduate students.

  2. Graduate students

  3. PhD students.

  4. Teachers in the university.

 5. Anyone in the university who has the ability to provide a new and innovative idea.

2. **The industry**: which includes any organization related to the idea that the K&TT generate for commercialization it could be private or governmental organization or another research organization.

3. **The government**: which is responsible for regulations that control and protect the process and its entities including Intellectual property (IPR) protection process.

2.2.7. Factors influencing K&TT process

Factors Classified into three related factors

1. **Participant's related factors**: These factors are related to the three Participants University, Industry and government in these factors the participants have the strongest effect according to the literature.

2. **Content related factors**: These factors are related to the type of knowledge or technology which is transferred.

3. **Transfer method related factors**: These factors are related to the type of transfer channel used to transfer the knowledge or technology.

2.2.8. Participant's related factors

1. Absorptive capacity

Cohen and Levinthal (1989, 1990, 1994) introduced The term of absorptive capacity to describe organization necessary capabilities to innovate. (Cohen & Levinthal, 1990)absorptive capacity define as "*a firm's ability to recognize the value of new external knowledge, assimilate it and apply it to commercial ends*", in general the concept of absorptive capacity appears to be applicable to the K&TT field, its processes and parameters (Kodama, 2008), and has been identified to be one of the most important determinants in knowledge and technology transfer (Frank Lerch, 2010).

(Goh, 2002)Stated that when encouraging the transfer of knowledge, an organization has to ensure that both participants in the transfer process have the necessary knowledge base (absorptive capacity) to learn, and to understand each other. Therefore, leaders within the organization are important as they have the ability to identify, gather and absorb knowledge and spread it to those in the organization that need it or to use it externally A positive relationship between participants and ease of communication between them eases the absorptive capacity ability of both parties, Organizations absorptive capacity will depend on the absorptive capacities of its individual members; therefore, in order to increase an organization's absorptive capacity, investment must be made in the individual employee(Goh, 2002).

There are four dimensions of absorptive capacity. These have been defined by (Fosfuri & Tribo, 2008) as:

- **Acquisition**: *"A firm's capability to identify relevant external or internal information over the total amount of information that surrounds the firm. That is, the initial step is for a firm to know where the sources of information are"*.
- **Assimilation**: *"A firm's routines and processes that allow it to analyze, process, interpret and understand the information obtained from sources"*.

- **Transformation**: "*A firm's ability to modify and adapt external knowledge and combine it with existing and internally generated knowledg*e".

- **Exploitation**: "*A firm's ability to transform this knowledge into competitive advantage*".

2. Leadership

According to (Kotter, 1990)the elements of successful leadership in an organization require the alignment of people, creation of teams and the motivation and inspiration of people to overcome barriers. According to (Goh, 2002), based on research into the critical success factors for implementing knowledge management in small and medium enterprises, leaders within an organization have a major influence on the organizational culture and support structures needed to engage people in sharing their knowledge. Moreover, leaders have an important role in establishing some key conditions required to facilitate knowledge and technology transfer (Goh, 2002) ."*For example, effective leadership within an organization can encourage collaboration and sharing of knowledge and information*". More importantly effective leadership can increase the propensity of employees to participate in the transfer of knowledge (Goh, 2002).

(Owens , 2012)Showed that active leaders in technology transfer send signals that the process is a valid activity and therefore, encourage others to participate through their leadership skills (Owens , 2012). (Maak & Pless, 2006),in a research into responsible leadership in an organizational setting,

agreed with the importance of the role of leadership in knowledge transfer and stated that it was crucial in order to build, cultivate and sustain relationships both inside and outside the organization.

(Zheng, 2007) Said that in order to remain competitive in the global marketplace, an organization must make efforts to monitor and influence the flow of knowledge internally, as well as to other organizations.

Leadership is developing a vision for the future and strategies for producing the changes needed to achieve that vision (Kotter, 1990). Said that leadership helps bridge the communication gap or information barrier that often is associated with obstacles to the dissemination of knowledge in an organization. However, a high level of trust is needed between leaders and work groups in the organization for people to follow their example and engage in technology transfer, leadership in an organization results in the widespread sharing of and ready access to information and is also one of the key components of successful technology and knowledge transfer (Owens , 2012).

3. Trust

Trust is a very complex concept and has many definitions (Rousseau, et al., 1998). In an analysis of trust across specialties such as economics, psychologists and sociologists, were the opinion of them that there is no globally definition of trust. However, an agreement did exist as to its importance in the enabling of collaborative behavior(Gambetta, 1998)promoting adaptive organizational forms such as networking (Miles

& Snow, 1992) and (Meyerson, et al., 1996) reducing conflict and facilitating the formation of work groups (Meyerson, et al., 1996). (Rousseau, et al., 1998), defined trust as follows: "*Trust is a psychological state comprising the intention to accept vulnerability based on positive expectations of the intentions or behavior of another*"

(Hong-Park, 2006), in his research into the role of trust in a virtual environment in the ICT sector, stated that while trust is a complex concept, it is also important to note that there is a clear difference between interpersonal and organizational trust. Interpersonal trust is where the trustee is another individual. The target of interpersonal trust is the person, thus it is not based on their position, title, or because they represent an organization. In contrast, organizational trust is when the trustee is an organization not an individual. A key characteristic of trust is that without trust, knowledge and technology transfer is difficult, since the risk and uncertainty is high for the exchange of intellectual capital (Boon & Holmes, 1991); (Handy, 1995); (Gambetta, 1998). (Hong-Park, 2006), also proposed that trust can be increased through socially communication links, where a group of people combine and exchange their knowledge, which as a result generates new knowledge, these socially communication links could be conducted between the participants in the knowledge transfer process to raise the level of confidence between them .

According to (Goh, 2002)a high level of trust is required between individuals and work groups in an organization for new knowledge to be shared. Trust is also a relevant factor in the area of leadership as the leaders need to be open in order for individuals within the organization to confide and trust in them and vice versa. Within knowledge-intensive environments knowledge creation is a source of sustainable competitive advantage among practitioners as well as researchers.

However, there is caution of sharing knowledge especially when there is a probable threat that others may take advantage of their information. This is particularly relevant to a HEI's perspective where technology transfer will only occur when academic faculty and representatives from business and industry work together to share their knowledge (Cunningham & Harvey, 2004).

Trust between academic faculty and industry is needed to find mechanisms to manage the inherent conflict between openness, the features of the world of academia and the privacy problem that belongs to the industrial sector. However, because of the contrasting missions and cultures of industry and HIEs, they tend not to work together as collaboration partners. (Sanchez & Tejedor, 1995), following research into university-industry relationships in Spain, it found that industry managers rated their relationship with HEIs of little benefit due to the hinder impact of the cultural barrier and the distrust between the two parties. (Lambert, 2003).

Trust between the two parties therefore, is hard to implement as HEIs and industry often operate on different timescales, have different objectives to achieve and have a different approaches.

(Elmuti, et al., 2005)Said that finding the suitable balance for satisfying both universities and industrial sector is a significant challenge, And trust is essential for technology and knowledge to be effectively transferred between organizations and also facilitates collaborations.

As mentioned before by (Goh, 2002), an organization that has a culture that promotes trust amongst its employees will find it easier to transfer knowledge Furthermore, leaders within an organization and who are trusted possess the ability to spread knowledge to organizational employees and engage them in knowledge and technology transfer activities(Owens , 2012).

4. Collaboration

Research has shown that industry-university collaboration usually takes place within four important components: research support, cooperative research, knowledge transfer and technology transfer, with the two most important components being knowledge and technology transfer (Santoro, 2000)Knowledge transfer activities are usually seen as a good foundation for future collaborations between organizations. Technology transfer aims to integrate university-driven research into applied research initiatives for the development and commercialization of new processes and products.

(Goh, 2002)Stressed that a strong culture of collaboration had to exist in an organization, in order for technology and knowledge to be transferred effectively. Moreover confirm that organizations that promoted active collaboration amongst its employees with external parties, shows that was a vital action for other employees of the organizationto encourage those individuals to participate in the collaboration process, trust amongst individuals is essential for collaboration to happen. As it will increase the tendency to collaborate and share relevant knowledge and technology. (Goh, 2002).

However, establishing a collaborative environment in an organization will not improve knowledge and technology transfer only, it is also a need to encourage a culture of problem seeking and problem solving. (Goh, 2002)

A strong culture with high trust and a collaborative environment will have a positive influence on knowledge and technology transfer activities amongst organizations. This culture can significantly increase the tendency of an organization to share knowledge and technology, freely with each other (Goh, 2002).

Based on research by (Schartinger, et al., 2001), into the relationships between universities and firms in Austria, it was found that organizations follow policies that encourage collaboration with HEIs. A possible motivation for collaborating with universities is the access to knowledge and technological capabilities, and also argued that access to state of the art

science and complementary know how, outsourcing of R&D and cost reduction as well as access to research networks were motivators for firms to engage in collaborations with universities. Universities, on the other hand collaborate with industry for various different reasons which include access to scientific resources, the exposure of students to practical problems and the potential employment opportunities for graduates (Schartinger et al., 2001).

5. Support Structure

Organizational capability refers to innovating and reshaping internal resources (Hawawini, 2004),Structural organization of the university is a factor affecting new technology designing. Generally, organizational structure of a university should be homogeneous to new technology and respond its needs (Trafdar, 2006). To facilitate knowledge flow, research centers should design structures and systems by which one can generate, aggregate, integrate, disseminate, and manage the knowledge effectively. (Chen & Huang, 2007)and (Pertusa-Ortega, et al., 2010)have determined   the   organizational   structure   as   the   critical   factor   in affecting knowledge transfer process and innovation in companies. Most researches on organizational theory confirm that organizational structure plays a vital role in the capability of an organization to adapt,   create   and integrate   knowledge   and   innovation   in   the organization(Chen & Huang, 2007). Some authors claim that adaptation

between organizational knowledge and structure can achieve flexibility and efficiency of competitive environments is very vital (Liao & And Wu, 2010).

(Goh, 2002)found that the appropriate infrastructure of the organization as an important factor in effective knowledge transfer to reinforce and provide support structure. According to (Szulanski, 2000) knowledge can become sticky in organizations that do not have proper support structures to ensure its dissemination.

Even if knowledge is freely available and disseminated within the organization, the employees must have the necessary skills to be able to apply the information to avoid the presence of knowledge stickiness (Szulanski, 1996). A solution to this would be to increase horizontal communication flows. This can take many forms and may take time to accomplish, one approach is to encourage cross functional teams and teamwork in an organization. Therefore, leaders within the organization should facilitate the introduction of networking and teamwork amongst the employees in the organization and encourage the effective transfer of knowledge. This encourages individuals to begin learning and communicating horizontally to create a support culture for knowledge transfer, in research into the ability of an organization to manage knowledge through the utilization of knowledge generation and transfer,

measurement and reward systems can play a critical role in encouraging knowledge transfer.(Goh, 2002).

(Siegel, et al., 2003) believe that academic executives in US universities should focus on five organizational and managerial factors in order to grow an entrepreneurship and commercialization climate, They include developing an awarding system to expand technology transfer cooperation, modifying the ways of employing personnel in technology transfer offices, devising flexible academic policies to facilitate academic technology transfer, devoting more resources to technology transfer, and removing cultural and informational barriers that prevent knowledge and technology transfer. (JAFARI, et al., 2014)

6. Motivation

Motivation include the incentives that enable the individuals and the organizations to recognize the importance of the knowledge and technology transfer activities. The level of participation in knowledge and technology depending on these motivations and could be ranged from high to low. Moreover, this participation could be affected by factors such as the reward system in the culture of the organization. This motivation factor becomes critical as we move up in knowledge and technology transfer modes (from Level I to Level IV), Sung and Gibson divided the knowledge and technology transfer process into four levels Creation, Sharing, Implementation and Commercialization.(Sung & Gibson , 2010).

In sections 2.1.1 and 2.1.2, the several motivations for both industry and university to engage in collaboration was shown, to sum up these motivations, among the most important for the university was the possibility to gain additional funding for laboratory equipment and research assistants, as well as, the possibility to test existing theory in practice and get insight and clarification into the scientists own research.

From the industry's side, it was the possibility to gain access to the university's laboratories and scientists' knowledge, and the possibility to receive help on research in technological areas for which the organization does not possess the necessary in-house competences in the aim of rise the revenue, increase the reputation, market share and among other reasons to enhance the organization position.

(Poyago-Theotoky, et al., 2002)In a research into the potential disadvantages to the rise in university-industry partnerships, added that collaboration between university- industry depends on the motivations of both parties

7. Distance

Some authors call it *"Norm distance "*, distance here means the physical and cultural closeness, because of the IC Trepid development cultural differences take a place between parties, and it's more important than the geographical separation between the parties, cultural similarity/ dissimilarity is an important indicator that could facilitate or discourage the

K&TT collaboration process, the more parties understand the values, attitudes, and ways of doing things with each other, the greater the chance of successful transfer of knowledge and technology.

This distance factor becomes critical as we move up in knowledge and technology transfer from the creation to commercialization. (Sung & Gibson , 2010).

(Sanchez & Tejedor, 1995) Stated the different cultural missions of industry and academia equated to academics valuing their freedom. This incongruence was given further credence by (Graff, Heiman, Zilberman, Castillo and Parker, 2002) who stated that HEIs faculty value academic freedom and publication of their research.

 The industrial sectors are motivated by a clear product driven focus and a culture that ensure secrecy and protection through the application of patents (Nelson, 2001).

8. Knowledge and Technology capabilities

In the literature, many authors considered the existence of technology-related basic knowledge (technological knowledge, technical and organizational   skills   and parties tacit knowledge) is important for successful technology and knowledge transfer such as (Bishop, et al., 2011),(Mu, et al., 2010),(Pertusa-Ortega, et al., 2010), and (Kodama, 2008).

It's essential to minimize the cultural differences and the knowledge gab between the university as a knowledge and technology generator and the industry as a knowledge and technology manufacturer through interactions and knowledge sharing, to achieve that both industry and universities must have the necessary knowledge and technological capabilities. (Wang & Lu, 2007).

(Walsh, 2002) defined technological capability as "*technological inventions and being aware of technological future needs*". (Santoro & Bierly, 2006) agreed that technology transfer would be increased if the technological capabilities of both sender and receiver are correlating . Some authors believe that organizational technological and knowledge capabilities will be increased by learning methods like internal R&D, and technical training(Santoro & Bierly, 2006).

(Wang, 2004), made another research about technological and knowledge capabilities and found that high technological and knowledge capability generate high capacity to utilize experts by organization, high capacity to predict technological changes, the capability of utilizing new technologies in resolving internal problems and improving new technological standards to measure technological capability, this will increase the ability and confidence to share these technology and knowledge . (Wang, 2004).

Knowledge capability is an important factor in knowledge and technology transfer, Knowledge capability is "*the ability of a company to recognize the value of new external information and to integrate it with internal organizational knowledge*" (Bishop, et al., 2011).

Knowledge capability includes the abilities of acquiring and merging the knowledge and utilizing it in an organization, and To generate new knowledge in the innovation process, Many authors believe that a company's innovation capability has a close relationship with its ability in gaining benefits from technology and knowledge transfer, and in combine it with other elements of internal knowledge.(Herrera, et al., 2010).

Such indicators are used to have the ability to conceive the value of new knowledge and information, to attract new knowledge in organizational current knowledge treasure, to integrate new knowledge with existing organizational knowledge, to use organizational knowledge for business purposes, to convert internal accumulated experience into applied business knowledge, to convert implicit and explicit knowledge into job procedures and norms, and to use current organizational knowledge to generate new knowledge to measure firms' learning and knowledge (Chen & Huang, 2009).

Moreover, the form of the knowledge and technology which transferring is important,(Cummings & Teng, 2003), found that the form of the

knowledge to be transferred, play a critical role in its transferability. (Cummings & Teng, 2003).

9. Openness

Present studies have confirmed that adoption of open innovation principles minimize the time and cost to develop and initiate innovations, and improves the innovativeness of the end solution and organizational transfer of technology and knowledge (Gassmann, et al., 2010).

The measures of openness among current studies are based on standards such as partner characteristics, permeability of limits, and extent of usage of external sources of knowledge (extent of exploitation of external sources by acquisitions and extent of internal technology licensing)   (Gianiodis, et al., 2010).

(Lazzarotti, et al., 2010) use two variables for representing the degree of openness, the number and type of partners (partner variety), and the number and type of phases of the innovation process open to external contributions (innovation phase variety).

(Laursen & Salter, 2006) Usedan additional measure   intensity   of collaboration to measure openness. Intensity of collaboration is defined as *"the extent of usage of an external knowledge source by the focal*

firm" and is measured in terms of the contributions provided by that external source. They measure the 'depth' of the collaboration intensity.

10. Intellectual property

A property can be defined as "*a resource with some form of assigned ownership, and an intellectual property is then a property of intellectual or intangible character"*, An intellectual property rights (IPR) is a legally placed rights created and used to appoint ownership to intellectual resources such as knowledge, technologies, brand names, and other types of intellectuals, The IPRs includes patent rights, copyrights, design rights, trademark rights, trade secret rights, and some other types of ancillary rights. IPRs are granted mainly to stimulate investment in invention and commercialization of new intellectual resources in order to improve the innovations of various kinds to the benefit of consumer and society in general. However, IPRs have received criticism not only for creating monopoly, but more recently also for decreases innovativeness due to their increasingly more exclusivist function, nevertheless various IPRs laws have become adopted more in world-wide. (Granstrand & Holgersson, 2015).

Strong IPRs protection may encourage firms to produce and sell technologically advanced goods. Surveys of multinational managers suggest that technology transfer is sensitive to the strength of IPRs protection, a stronger IPR environment with good patent protection, the

Companies can prevent the competition Companies from using the patented ingredients of its knowledge and technology. (Lee & E, 1996).

2.2.9. Content related factors:

1. Innovation

Technology or knowledge only has value when it is commercialized. There are prolific innovations with relatively few business models that could capture potential value of the new knowledge or technology.

A firm can capture value from innovation in the following ways: using technology or knowledge in its existing business, transfer the technology or knowledge to other organizations, and launching a new ventures that uses the knowledge or technology. (Chesbrough, 2003)

In the historical integrated researches, new technologies were not explored beyond implementation in the firm's core business. Whereas open innovation model offered a new concept of applying it to different markets and therefore, optimizing it for the betterment.

The benefits of open innovation is firstly, the ownership of the IP is kept by the innovator generatingextra revenue by licensing it to other organizations for their use, and secondly, other firms can access the IP at a cost lower than they would otherwise have afford had they acquired full ownership of it. (Chesbrough, 2003).

2.2.10. Transfer method related factors

1. Communication

Communication refers to "*the degree to which a medium is able to efficiently and accurately transfer task-relevant information*", negative communications have the capacity to target many receptors while interactive communications encourage interpersonal communication in terms of fast, focused feedback, better chance of knowledge and technology transfer (Gibson & Smilor , 1991), passive links have the capacity to target many receptors at low cost, but the sender is often unaware of whether and how the receptors receive and utilize the transferred knowledge or technology. Such passive linkages are representative of creation mode of knowledge and technology transfer . Interactive transfer links are defined as being person-to-person media-rich interactions. This mode of transfer relates to levels implementation and commercialization. (Sung & Gibson , 2010).

Some authors like to call it "Relational Capability" which indicates organization ability to communicate with others such as customers, supportive organizations and scientific centers, suppliers and rivals (Fontana et al, 2006).

Chapter Three
Methodology

3.1   Introduction

This chapter is the methodology part that discusses research data collection techniques, building, and analysis procedures in more depth.

This research doesn't aim to find the relationships or correlations between a set of factors that have a statistical data or historical data to be analyzed, itq1 is designed to explore and investigate the factors that affect the K&TT process and to assess the extent of the use of these factors in Palestine, so this research belongs to the Exploratory Research type.

Exploratory Research: conducted when not much information is available about the situation or about how the same problem were solved in the past (Sekaran & Bougie, 2010). Furthermore, this type of research undertaken when the problem is complex or not well known. In such cases, researches needs to do extensive preliminary work to define, understand, or gain familiarity with the phenomena before designing or developing a comprehensive model to investigate and assess this phenomena. Extensive interviews with many expert people in the field of the study might have to be performed(Yin, 1994), (Sekaran & Bougie, 2010).

Exploratory research usually generate a qualitative data in from of words not numbers as in the quantitative data which generate a statistical data,

this research will adopt the qualitative approach in data collection and analysis .

Qualitative research: is best applicable to explore the research problem and developing an understanding of the circumstantial of a central phenomenon (Creswell, 2012). According to (Rajasekar, et al., 2013), the characteristics of qualitative approach are marked as follows: descriptive, non-numerical, cannot be graphed, investigates the how and why of decision making, and explanatory research. So, the qualitative research conducted to find out the opinion, attitude, feeling, and behaviour of individual toward an institution or toward a particular subject by using such diverse techniques as: in depth interviews, sentence completion test, story completion test, word associated test, case study, focus groups, structured observation and etc. (Greener, 2008).

To capture all data needed to understand the problem well and extract what needed to answer the research questions we must include all participants in the Technology and transfer process according to their role in the process.
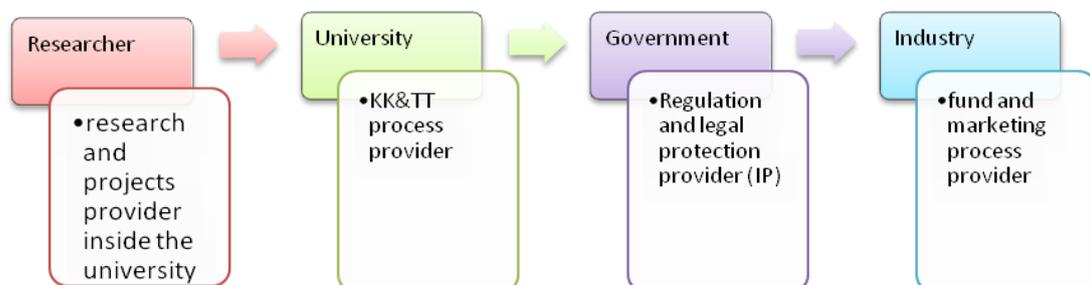
Figure 3- 1: diagram shows each participant and its role.

3.2   Data collection methods

Each participant has its own method of data collection according to what does the research want to test and the role of the participant in the K&TT process Table (3-1)summarizes the data collection method for each participant, the explination of each method comes later.

Table 3- 1 : data collection method for each participant in the K&TT collaboration process

Participant	Researcher	University	Industry	Government
Data collection method	Questionnaire	Interview	Interview	Interview

3.2.1   University and industry Interviews

As a main participants in the K&TT process Interviews selected for better understanding the problem and because K&TT collaborations need specialists in field, more information can be obtained, resistance to provide information will be limited, there is greater flexibility under this method as the opportunity to restructure questions is always there, observation method can be applied to recording verbal answers to various questions, samples can be controlled more effectively, non-response generally remains very low (Kothari, 2004)

Semi-structured open ended interviews are designed to let the interviewee have the chance to express them self and will explain the answer and more information could be gathered.

3.2.2 Sample size of universities:

All systematic universities in the west bank will be included and they are .

Table 3- 2 : Universities included in the study

1. An-Najah National University
2. Birzeit University
3. Palestine Polytechnic University
4. Hebron University
5. Al-Quds University
6. The Arab American University
7. Bethlehem University
8. Palestine Technical University-Kadoori

3.2.3. Sample size of the Industry

Not any company could be included in the research because not all companies have the financial position required toengagein the K&TT process as mentioned in previous the role of the industry is to provide the necessary fund to gain the benefits later.

how to determine the companies with the right financial position that is a hard task because you need to contact each company and ask them and not all companies will do so because of the confidentiality of such information and it is hard to read all companies Annual Financial Reportfor each company and determine wither its match or not .

Palestinian Industry is divided into industrial unionseach union includes most of the industrial sector companies and industrial unionsare:

1. Union of Agricultural Societies

2. Union of Chemical Industries

3. Union of Food Industry

4. Union of Leather Industries

5. Union of wood and furniture industries

6. Union of metal and engineering industries

7. Union of Paper Industries

8. Union of Pharmaceutical Industries

9. Union of Plastic Industries

10. Union of Stone and Marble Industry

11. Union of Textile Industries

12. Union of communications and information technology companies

13. Logistic industry.

These Unions were contacted and asked to nominatethe companies which have the financial position that enable it to engage in the K&TT collaboration process and the result is shown in table (3-3).

Table 3- 3 : companies nominated by the unions of industries

industry	number of companies registered in General Union of PalestinianIndustries	Companies nominated by the union
Agricultural Industry	46	3
Chemical Industry	60	12
Food Industry	224	15
Leather Industries	246	8
wood and furniture industries	65	6
metal and engineering industries	120	6
Paper Industries	140	5
Pharmaceutical Industries	19	4
Plastic Industries	105	3
Stone and Marble Industry	56	8
Textile Industries	700	3
communication and information technology companies	88	9
Logistic industry	16	3
	1885	**85**

85 companies were selected to interview, this number of companies is a sign for us to understand that from 1885 company registered only 85 company are nominated as a qualified one to engage in the K&TT collaboration process, this indicate that the Palestinian industry in weak situation to support the socio-economic system .

3.2.4. University and Industry Interview design

Interview is one of methods used for collecting data, through conducting a purposeful discussion between the researcher and others, So, when researcher exchange views with one or more participants by asking them general open or ended questions and then recording their answers, this

termed a qualitative interview,(Creswell, 2012) that can be carried out face-to-face, via telephone, via the medium of the computer, or online (Sekaran & Bougie, 2010).

Interviews have three main types, it may be categorized as follows:

- **Unstructured interviews**: Are informal interviews, usually carried out to get on definite ideas, that may or not important and relevant to particular problem situations (Sekaran & Bougie, 2010)

- **Semi-structured interviews**: This kind of interviews are non-standardized, in which the researcher will have some questions and themes listed to be covered, beside that researcher may omit or add additional questions to explore the research objectives.(Saunders, et al., 2009).

Structured interviews: In which, participants are asked clear questions in a consistent way (Greener, 2008)in order to explore more in-depth information about the specific problem of interest (Sekaran & Bougie, 2010) .

In this research, we used semi-structured interview as an exploratory tool, in order to answer the first question. So, we conducted face-to-face and telephone interviews with the K&TT specialist or his/her represent or in targeted universities and companies in the industry, conducted telephone interviews in some cases because these universities and companies are

sited away from each other, in addition to being distributed in the West Bank and there was a need for additional information besides the research time was limited.

As the primary tool to collect the data from the most important parties which are the industry and universities the interview must cover all factors that mentioned in the theoretical part of the study Table (3- 4) summarize the factor and its determinants, the source of these determinants and the number of question related to it .

Table 3- 4 : The factors and its determinants and which question designed to measure it

	Factor	Determined by	Source	Questions
A	Absorptive capacity	Acquisition	(Fosfuri & Tribo, 2008)	1
		Assimilation		2
		Transformation		3+4
		Exploitation		5
B	Leadership	Initiative	(Kotter, 1990)	6
		Leading projects to success		7+8+9
C	Trust	Direct questions		10
				11 + 12
D	Collaboration	Number of collaborations	(Goh, 2002)	14+ 13
		Collaborative environment		15
		Knowledge sharing		16
E	Support structure	Internal trend to K&TT	(JAFARI, et al., 2014)	18+17
		Needed infrastructure	(Goh, 2002)	19
		employees necessary skills	(Szulanski, 1996)	20
		Respond to K&TT	(Trafdar, 2006)	21
F	Motivation	Incentives	(Sung & Gibson , 2010)	22 + 23
G	Communication	Links	(Sung & Gibson)	24+25
H	Distance	Physical distance	(Sung & Gibson , 2010)	26

		Cultural distance	(Sung & Gibson , 2010)	27+28
I	Knowledge and technological capability	Internal R&D	(Santoro & Bierly, 2006)	29
		Skills	(Barton,2008)	30 +31 +32
		Training	(Santoro & Bierly, 2006)	33 +34
		Ability to transfer	(Santoro & Bierly, 2006)	35
J	Openness	partner variety	(Lazzarotti, et al., 2010)	36+37+38
		innovation phase variety	(Lazzarotti, et al., 2010)	39
		Intensity of collaboration	(Laursen & Salter, 2006)	40
K	Obstacles	Direct questions		41+42

3.2.5. Quality of the Research Tool

To ensure the Interview quality, we conduct several procedures to test the interview questions:

1. **Supervisor discussion**

   After designing the questions, the questions discussed with Dr. Yahiya Saleh the supervisor of this research, also the coordinator of the step project for UIC in Palestine, we reviewed the English Version of the Questionnaire to ensure it would achieve the goals of the research, Adjustments were made.

2. **Experts in filed review :**

The questions were send to four experts in the field of UIC and K&TT, notes took into account their comments on the interview contents, format,

and structure that have contributed in establishing content validity and enabling us made necessary amendments earlier to pilot testing, adjustments were made.

3. **Pilot study :**

Before using the interview to collect data, pilot test was conducted to refine and improve the in terviewquestions. In this case, respondents answering the questions without facing any problems in understanding and recording data correctly. (Saunders, et al., 2009)Argued that pilot test will enable researcher to obtain some assessment of the validity and suitability of the questions, and the reliability of the collected data.

Moreover, pilot test as (Bell, 2005) suggested has enabled us to find out: the time that the interview took to complete, the clarity of all instructions, the questions that were unclear or ambiguous, the clarity and the attractiveness of the interview layout, and if there were any other comments.

The number of participants I could choose for a pilot test should be at least 10 to be sufficient to include any significant differences in research population that may affect responses (Saunders, et al., 2009).

After that, I refined the interview, then I chose ten participant from different universities and companies to review the interview with them.

Participants made comments on the contents and statements' number of the questions.

The comments from all experts, and pilot test participants were discussed with my supervisor. Then adjustment were made and the interview was refined again to be ready for distribution.

3.2.6. Distribution of the interviews:

1. **Universities:** six universities out of eight universities in West Bank responded to the interview after being contacted and determined a face to face interview, three of them were made on phone, the interview questions were sent before and discussed briefly on phone and a full discussion were made in the meeting, experts left to talk freely and express themselves to formulate the answers in a good way.

2. **Industry :** as shown in table (3-5) 85 company in deferent types of industry nominated to have the necessary competences and capabilities to engage in the K&TT process table (3-5) shows the responses summary :

Table 3- 5 : Summary of companies' number and responses

industry	Companies nominated by the union	Companies respond to the interview	Response Rate (%)
Agricultural Industry	3	2	66.6
Chemical Industry	12	7	58.3
Food Industry	15	9	60
Leather Industries	8	4	50
wood and furniture industries	6	3	50
metal and engineering industries	6	3	50
Paper Industries	5	3	60
Pharmaceutical Industries	4	2	50
Plastic Industries	3	1	33.3
Stone and Marble Industry	8	4	50
Textile Industries	3	2	66.6
communication and information technology companies	9	5	55.5
Logistic industry	3	1	33.3
	85	46	54.1

From the above table, it is obvious that the overall response rate in all types of industry 54.1% the reason of this response rate is the lack of interest among the companies which have a resistance to change their culture or to engage in any outside activities as the researcher understand from the answers of the companies representatives when the researcher contacted them.

3.2.7. Researchers Questionnaire

Survey Questionnaire is simple, rapid; and the most widely used for collecting data from a large sample (Saunders, et al., 2009)with less effort and time. So, it's considered as an efficient tool to collect data when the

61

researcher exactly knows what is required and how to test the variables of interest (Sekaran & Bougie, 2010), by using this tool each anonymous respondent must be asked the same set of questions prior to quantitative analysis.

The researcher use it as a second tool to evaluate the factors that make the researcher produce a transferable research or project, now after reviewing the theoretical part, it is clear that the researcher must have the necessary technological and knowledge capabilities in the field of K&TT according to (Bishop, et al., 2011), more importantly must have the motivation to produce such type of research according to(Sung & Gibson , 2010), and at last must have the confidence in his/her university and industry to be encouraged and to be confident that he will get the support to achieve success in his/her project or research and to get benefit from it according to (Cunningham and Harvey, 2004).

According to that, the researchers asked to evaluate themselves in these factors :

1. **Knowledge and technological capabilities** : in this part the researcher asked to evaluate him/herself in three important concepts which are the most important concept in the K&TT process, commercialization, Innovation and technology and knowledge transfer, they asked to evaluate the ability to produce a project or research that could be adopted

from the industry, also the ability of the research for patent or publication and the relation between the research and the local market.

1.   **Confidence:** two direct questions about the abilities of the universities and industry to support them to achieve success in the research or project

2.   **Motivation:** directly the researchers asked to choose the main motivation of the research that they want to make.

Questionnaire was designed with closed questions which allowed respondents to make quick choices among a set of alternatives based on Likert scale, that has helped us in achieving the objectives of this research by providing us with accurate data and results without ambiguous despite the large size of the research population. (Sekaran & Bougie, 2010)Considered all the items in a questionnaire that based on Likert scale.

The Questionnaire of this research ended with an open-ended question to invite respondents to comment on topics that might not have been covered adequately, as (Sekaran & Bougie, 2010) suggestedclosed.

The first draft of the Questionnaire was designed as the following:

- The researcher designed Questionnaire cover, which began with an introduction that consists of: the logo of the researcher university, the title of the research, the purpose of the Questionnaire, the comprehensive definition of K&TT, the promise to participants not to

share their information with a third party in order to motivate them to respond to the questions, and then ended the introduction with courteous note that thanking the respondent for spending time in respond to the survey, we cover all of these cover contents according to (Dillman, 2007)suggestions.

- Beside the introduction, the first page consists of the first part of questions that related to personal information which elicited such information as gender, the university and faculty that they study or instruct in and the academic stage.

- Then we asked the researcher about the main motivation for his/her research or graduate project.

- In the third part of the Questionnaire, we set eight questions that evaluate the factors mentioned previously.

- We chose odd number (five) of points on the rating scale, which called five Likert-style rating scale to measure the statements in the third part of the Questionnaire with the following anchors: "1" very weak, "2" weak, "3" good, "4" very good, "5" excellent. This rating scale allows respondents to choose the middle phrase "good", when considering an implicitly negative statement about the current situation, which is considered less of a threat than the recognition they do not know (Saunders, et al., 2009). I chose at least two or three statements to cover the meaning of each factor. In addition, the statements did not go beyond

the three questions, because more than three statements would be impractical and long.

- I took into account, that the statements of the Questionnaire won't exceed 10 words, or not to exceed one full line in print as Horst (1968), and Oppenheim (1986) preferred.

- We discussed the first draft of the research Questionnaire with research supervisor Dr. Yhia Saleh. After that, we reviewed the English Version of the Questionnaire to ensure that it would achieve the goals of the research. Adjustments were made.

- Then I translated the Questioner's title, introduction, and all parts statements into Arabic Language because it's the mother language in Palestine. The translation process also reviewed by a translation expert to make sure that the sentences' grammar and syntax in Arabic Version were correctly formulated.

- And then, I reviewed again with research supervisor to ensure that the lexical, idiomatic and experiential meaning of all statements in Arabic corresponds to the meaning in English as (Usunier, 1998) also suggested to be taken into account, and to ensure that the translation of the instrument to the local language accurately matches the original language.

- A sample of 20 questionnaires were distributed and answered by the researcher and were asked to evaluate the questionnaire in term of

language to understand and time to finish, notes from researcher is take into account and modification were made.

3.2.8. Sample size of the researchers inside the university

At first we must define the meaning of researchers inside the university again to view how they will selected, the researchers inside the university are:

1. Under graduate students.

2. Graduate students including Master and PhD

3. Academics inside the university.

Including all students and academics will take a lot of time in collecting and analyzing the data, this research will focus on the faculties that the output of the research will be closer to the demand of the industry and could produce tangible and intangible products, these faculties are:

1. Faculty of pharmacy.

2. Faculty of science.

3. Faculty of Engineering and Information technology.

4. Faculty of Agriculture and veterinary.

5. Faculty of graduate students.

And also academics inside the universities.

There is no report that determined the exact number of students will graduate, there is a report that indicates the number of students graduated last year, this report conducted by the ministry of higher Education, table (3-6) summaries these numbers and the sample size needed to gain valid and reliable result from the study:

Table 3- 6 : Sample size needed for each category of the researchers

	Universities	UNI 1	UNI 2	UNI 3	UNI 4	UNI 5	UNI 6	UNI 7	UNI 8	Sum
Faculty of pharmacy	Number	239	0	0	0	122	0	0	0	361
	% from population	3.4	0	0	0	2	0	0	0	5
	Sample	13	0	0	0	6	0	0	0	19
Faculty of science	Number	452	123	84	89	441	94	103	19	1405
	% from population	6.5	1.7	1	1	6	1	1	0	20
	Sample	24	7	4	5	23	5	5	1	74
Faculty of Eng. And IT	Number	1219	443	422	73	139	166	0	348	2810
	% from population	18	6	6	1	2	2	0	5	41
	Sample	65	23	22	4	7	9	0	18	149
Faculty of Agri. and vete.	Number	71	0	0	138	0	0	0	0	209
	% from population	1	0	0	2	0	0	0	0	3
	Sample	4	0	0	7	0	0	0	0	11
Faculty of grad. Stud.	Number	105	54	18	0	42	0	11	0	230
	% from population	2	1	0	0	1	0	0	0	3
	Sample	6	3	1	0	2	0	1	0	12
Academics	Number	552	340	84	166	398	152	102	63	1857
	% from population	8	5	1	2	6	2	1	1	27
	Sample	29	18	4	9	21	8	5	3	98
	Sum	**140**	**51**	**32**	**25**	**60**	**22**	**11**	**23**	**364**

Table 3- 7 : sample size needed

Population	6872
Confidence Level	0.95
Confidence Interval	5
Sample size needed	364

In surveys' situation and other statistical methods, it is necessary for researchers to determine the minimum sample size required to generalize the results on the population based on three main elements according to (Saunders, et al., 2009) they are as follows:

1- **The confidence level**: which represent the certainty level in which the characteristics of data collected by researchers will represent the characteristics of whole population. Confidence denotes how the researchers are certain that their estimates will really hold true for the targeted population (Sekaran & Bougie, 2010).

2- **The margin of error to be tolerated (confidence interval)**: It represents the accuracy required for any researchers' estimation from their sample.

3- **The population size**: which represents the size of whole targeted population from which researchers' samples were being drawn.

To calculate the sample size that is fit with appropriate confidence level, and appropriate margin of error that the researcher used are based on (Daniel, 2009) the following simple formula:

$$n = \frac{z^2\, pq}{d^2}$$

Equation 1 : sample size

Where:

z= statistic for a confidence level (The researcher worked with 95 percent level of certainty, so *z* = 1.96 for 95% confidence level used in this research).

p = percentage picking a choice (The researcher used *p* = 0.5 for a sample size needed). *P* = 0.5 yield a maximum value of n when used in the formula.

Additionally, this procedure should be used when the researcher is unable to reach the best estimation of *p*(Daniel, 2009)

q = (1 − q). This implies that *q = 0.5*

d = confidence interval, expressed as decimal (The researcher used *d* = 0.05 = ± 5).

n = sample size that is (*n/N* ≤ 0.05), where *N* = the whole population (Daniel, 2009)But, in this research *n* = 364, and (*n/N* = 0.05). So, the finite population correction has been used in this research.

The researcher used the formula with finite population correction (Daniel, 2009)as follows:

$$n = \frac{Nz^2pq}{d^2(N-1)+z^2pq}$$

Equation 2 : sample size needed with finite population correction

The population size of this study is 6872 extracted from the ministry of higher education report for the academic year (2014/2015), (MOHE, 2015) so the sample size of this research is 364 samples with 95% confidence level based on the above equations.

3.2.9. Distribution of Researchers Questionnaire

The researcher adopted the stratified random sampling, as we mentioned previously, to collect the data from the systematic universities branches that spread out in all West Bank areas and governorates.

The Questionnaire was distributed in all stratums, in which each university is considered to be one stratum or subgroup from the research population.

The table (3-6) shows how three hundred sixty four Questionnaires were distributed throughout all systematic universities that spread out in all West Bank areas. As well as, it shows all details about data collection and the percentage of response rate. The number of researchers in each university retrieved from the annual statistical guide 2014/2015 for

Palestinian higher education institutions, which published by the Ministry of Education and Higher Education (2015) (MOHE, 2015).

From the table (3-6), it is obvious that the overall response rate in all universities is 100%, this high response rate is as a result of the high number of researchers in the universities the short questionnaire encourage them to answer in short time, the easy to access the universities is also causes this high response rate .

3.2.10. Government interview

As mentioned previously the government is responsible for the protection of intellectual property by the regulations and laws that protect each participant and the transferred content of the K&TT process from imitation and other illegal actions as these things minimize the benefits from the process .

An open interview was conducted with the IP office general manager in the Ministry of National Economy to determine the current status of the IP process and its laws and regulations. The importance of this interview is to evaluate, in a simple way, the laws of IP in Palestine and does it match the international laws and cover all types of IP.

The government responded very well to the researcher and invited the researcher to a lecture which was made inside Al-Nnajah National University by the general manager of the IP in the Ministry of National

Economy .This lecture is very important because the university invited two other experts in the local and international IP laws, the experts comments were very important to this research.

Chapter Four

Data Results and analysis

4.1. University-Industry interview result and analysis

- **Quantitative data analysis :** quantitative data research techniques generate a mass of numbers that need to be summarized, described and analyzed. Characteristics of the data may be described and explored by drawing graphs and charts, doing cross tabulations and calculating means and standard deviations. Further analysis would build on these initial findings, seeking patterns and relationships in the data by performing multiple regression, or an analysis of variance perhaps. Advanced modelling techniques may eventually be used to build sophisticated explanations of how the data addresses the original question. But many quantitative research projects would never need to go that far; the question would be answered by simple descriptive statistics.

- **Qualitative data analysis**: The mass of words generated by interviews or observational data needs to be described and summarized. The question may require the researchers to seek relationships between various themes that have been identified, or to relate behavior or ideas to biographical characteristics of respondents such as age or gender. Implications for policy or practice may be derived from the data, or interpretation sought of puzzling findings from previous studies.

Ultimately theory could be developed and tested using advanced analytical techniques.

There are no 'quick fix' techniques in qualitative analysis. Just as a software package such as the Statistical Package for the Social Sciences (SPSS) won't tell you which of the myriad statistical tests available to use to analyses numerical data, so there are probably as many different ways of analyzing qualitative data as there are qualitative researchers doing it! Many would argue that this is the way it should be – qualitative research is an interpretative and subjective exercise, and the researcher is intimately involved in the process, not aloof from it (pope & mays, 2006)

In this research qualitative data analysis will be applied for the interviews and quantitative data for the questionnaire.

4.1.1. Industry interview results and analysis

For qualitative data analysis a clear procedure must be undertaken to gain a valid and reliable results, the researcher developed a four steps data analysis procedure to analyze the data:
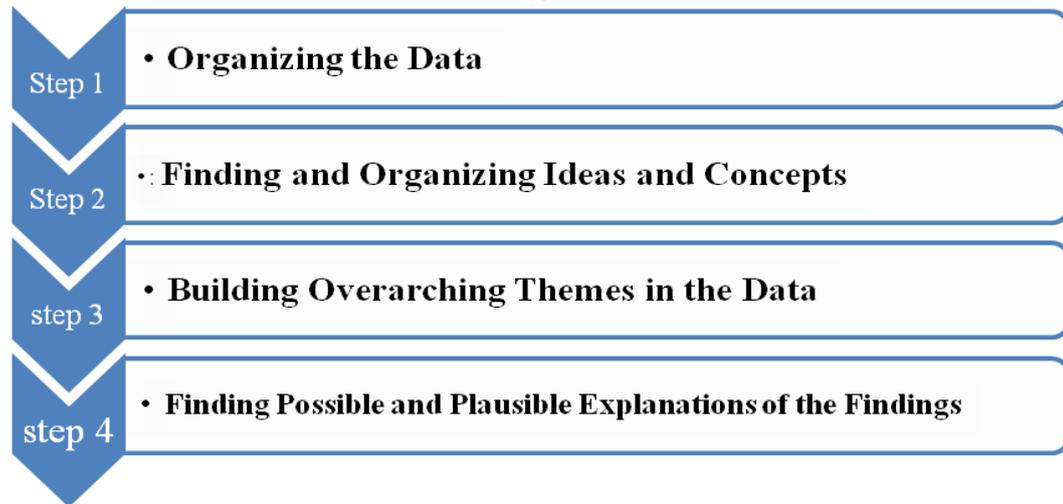
Figure 4- 1 Procedure researcher developed for data analysis

"*Valid analysis is immensely aided by data displays that are focused enough to permit viewing of a full data set in one location and are systematically arranged to answer the research question at hand.*" (miles & Huberman, 1994)

According to (Creswell, 1998), qualitative data generates a mass of information that may not matter the research, so when the researcher analyzes the data, the researcher must look for the information that answers the research questions.

In this research, after organizing the data in a matrix view style unwanted data is excluded.

"*Identifying salient themes, recurring ideas or language, and patterns of belief that link people and settings together is the most intellectually challenging phase of the analysis and one that can integrate the entire endeavor.*" (Marshall & Rossman, 1995).

For organizing the large amount of words that the interviews generate, in a way that serves the research questions, the answers are divided into three themes:

1. **High level answers theme**: These answers show that the firm inside the industry or universities have a high skill or response which is required inside the question.

2. **Medium level answers theme**: these answers show that the firm inside the industry or universities have a medium skill or response which is required inside the question.

3. **Low level answers theme**: these answers show that the firm inside the industry or universities have a low skill or response which is required inside the question.

After organizing the data as shown in table(A-1) in the appendix, in order to determine the level of each factor that influence K&TT collaborations, a simple average calculations were made to simplify the understanding of the output from the interviews, by dividing the number of the companies that show a high skill, or a medium skill or a response with the ability to develop this skill or a response in the future to the questions they asked to answer , over the number of the total sum of companies in the sample, in this way we could determine the level of the determinants related to the factors that affect the K&TT process .

After this calculations that determined the level of the factor itself, the average of all determinants related to the same factor are calculated.

Table 4- 1 : Factors and its determinants evaluation for industry

No .	Factor	Determinant	Level of Determinant
1	Absorptive capacity	Acquisition	39.1 %
		Assimilation	39.1 %
		Transformation	23.9 %
		Exploitation	60 %
		Average	40.5 %
2	Leadership	Initiative	32.6 %
		Leading projects to success	16.6 %
		Average	24.6 %
3	Trust	Direct questions	34.8 %
4	Collaboration	Number of collaborations	23.9 %
		Collaborative environment	23.9 %
		Knowledge sharing	28.3 %
		Average	25.4 %
5	Support structure	Internal trend to K&TT	52.1 %
		Needed infrastructure	41.3 %
		Employees necessary skills	15.2 %
		Respond to K&TT collaborations	45.6 %
		Average	38.6 %
6	Communication	Links	42.4 %
7	Distance	Physical distance	78.3 %
		Cultural distance	8.6 %
8	Knowledge and Technological Capability	Internal R&D	36.9 %
		Skills	17.4 %
		Training	21.7 %
		Ability to transfer	21.7 %
		Average	24.4 %
9	Openness	partner variety	17.4 %
		innovation phase variety	36.9 %
		Intensity of collaboration	30.4 %
		Average	28.3 %

Important notes the researcher identified through the interviews of the industry before going to the next step:

1. Most of the firms are Family business, that means the firms are running by family members who are not necessarily qualified and understand the business development in the field of technological knowledge or other concepts, they also showed resistance to respond and change to the modern form of business, collaboration with the university is a waste of time, money and efforts according to their opinion.

2. A lot of firms have been transformed from the manufacturing form of the industry into the import and trade form because the manufacturing is more expensive, the import and trade are more profitable for them because the Chinese goods are cheaper.

3. A large number of firms are small firms in which the number of workers doesn't exceed ten.

These reasons and others were the reason of the low response of the interview numbers (54.1% response rate).

4.1.2. Universities interview results

The same process for the industry calculations of the determinants and factors is made for the universities to determine the level of each determinant and factor, the results are shown in details in table (A-2) in the appendix

Table (4-2) shows the results after calculations were made

Table 4- 2 : Factors and its determinants evaluation for universities

No.	Factor	Determinant	Level of Determinant
1	Absorptive capacity	Acquisition	100 %
		Assimilation	100 %
		Transformation	100%
		Exploitation	100%
		Average	100%
2	Leadership	Initiative	100 %
		Leading projects to success	50%
		Average	75 %
3	Trust	Direct questions	38.9 %
4	Collaboration	Number of collaborations	83.3 %
		Collaborative environment	80 %
		Knowledge sharing	100 %
		Average	87.7 %
5	Support structure	Internal trend to K&TT	83.3 %
		Needed infrastructure	83.3 %
		Employees necessary skills	33.3 %
		Respond to K&TT collaborations	33.3 %
		Average	58.3 %
6	Communication	Links	83.3 %
7	Distance	Physical distance	33.3 %
		Cultural distance	100%
8	Knowledge and Technological Capability	Internal R&D	83.3 %
		Skills	72.2 %
		Training	74.9%
		Ability to transfer	83.3%
		Average	78.4 %
9	Openness	partner variety	100%
		innovation phase variety	100%
		Intensity of collaboration	100 %
		Average	100%

This is an example to understand the above tables well:

For Absorptive capacity factor 39.1 of the companies inside the industry, shows a high response to the Acquisition determinant, 39.1 for the Assimilation, 23.9 % for the Transformation and 60 % for the Exploitation determinant, that means the average of the companies that have high skills or response to the Absorptive capacity factor is 40.5 %, this average indicates that the industry have a low level usageof Absorptive capacity throug industry.

That doesn't include the distance factor because the physical distance doesn't affect the cultural distance according to (Sung & Gibson , 2010), because of the ICT revolution, the physical distance could be reduced.

4.1.3. Status of the factors that affect K&TT Collaboration in Palestine

To answer the research question that is related to the current statues of the factors that affecting the K&TT collaboration,not only the usage of the related factor in needed also the efficiency of usage is imporntant too to determine the level of the factor.

Additional information were extracted from the interviews to evaluate the level of efficiency of each factor.

To compare the results between university and the industry, and to find possible and plausible explanations of the findings as mentioned in figure

(4-1), this is the forth step of the procedure that we adopt to analyze the data.

Result will be shown in tables to facilitate the explanation and comparison process according to each factor.

Table 4- 3 : level of Factors efficiency and its explanations

1. Absorptive capacity

No.	Factor	University status	Explanation	Industry status	Explanation
1	Absorptive capacity	Medium level of absorptive capacity	Although most universities are searching for innovative projects inside them, and many innovative graduate and research projects diagnosis, but the mechanism is still unclear and not in the required efficiency .	Very low level of Absorptive capacity	Over than 60 % doesn't search for innovative projects, most of the other 40 % doesn't find anything useful, they depend on the outside technologies and knowledge, but not form the universities

2. Leadership

No.	Factor	University status	Explanation	Industry status	Explanation
2	Leadership	Medium level of leadership	All the universities are providing an entrepreneurial projects may not cover all industries as industry mentioned, an average of 38% of these projects are in the leading of the universities.	Low level of leadership	More than 67% of the industry doesn't offer any entrepreneurial projects, leading of the other 33% of the projects doesn't exceed 25% of the projects, the effect was to the universities as most of them answers.

3. Trust

No.	Factor	University status	Explanation	Industry status	Explanation
3	Trust	Low level of trust in the industry	Most of the universities according to their experience the industry cannot provide good solutions, having the power of just 40% of executing the internal and external projects, doesn't provide a stable environment to execute the projects	Low level of trust in the universities.	Over than 63% of the firms interviewed the universities cannot provide good solutions, having a power of 51% executing the internal and external projects, doesn't provide a stable environment to execute the projects

5. Collaboration

4	Collaboration	Low level of collaboration	Only an average of 19% of the projects researches are provided to the industry, with the rate of 41% of satisfaction of both sides, high level of knowledge sharing but doesn't cover a large number of firms, with non-comfortable collaboration environment according to the industry evaluation	Low level of collaboration	over than 76.1 of the firms doesn't provide collaborative projects to the industry the other 23.9 doesn't exceed the projects provided more than 17% of the external projects that the firm provide, with the rate of 42.3 satisfaction, low level of knowledge sharing, with non-comfortable collaboration environment according to the universities evaluation

6. Support structure

5	Support structure	Medium level of support structure	Most of the universities have a strong trend in the K&TT Collaborations, but the infrastructure and experiences not as required, the response rate to the K&TT collaborations is medium too.	low level of support structure	With the weak trend to the K&TT Collaborations, lack of infrastructure, experiences and the low response to the K&TT collaborations

7. Communication

6	Communication	Medium level of communication	Althoughthe universities provide a lot of communication channels to their partners but still these communication channels doesn't cover a large sample of the industry according to the industry.	Low level of communications	Industry doesn't create a communication channels it depend on the communication channels that the university provide, although they realize that there is communication

					channels that the university provide and a lot of them participate in one of them at least one time, the industry doesn't keen to sustain these channels.

8. Knowledge and technological capabilities

7	Knowledge and technological capabilities	High level of knowledge and technological capabilities	With the strong internal R&D, knowledge and technology producing, the effort to introduce the concepts of innovation, commercialization, technology transfer, providing the researchers with the requirements of the industry sector and the high response to K&TT process	Low level of knowledge and technological capabilities	Only 36.7% of the firms tested are making internal R&D, 17.3 of them have a full time R&D experts, 21.7 have partial time R&D experts, with the low level of producing knowledge and technology, the low effort of introducing the K&TT concepts inside the universities, with the low response and transfer of the K&T

9. Openness

8	Openness	Medium level of openness	With the average number of partners (11) which form only 23.9% from the research sample, the slow expanding of partners numbers, with the slow coverage of all industry sectors, with strategic planning to expand the collaborations, allowing the partners to interfere in the	Low level of openness	69.6 of the firms doesn't have any university partners, the other 30.4 the partner average of them is 1.7 partner from 8 universities exists in the west bank, slowly expanded, planning to increase these collaborations nor in short time, with low trend to

			innovation process without affecting privacy of the university.		expand the strategic planning to expand them, with the allowing of universities to interfere in the innovation process without affecting privacy of the

10. Distance

9	Distance	The physical distance affect there communications with the partners	Political and occupation problems, most of the firms are in the middle and south of Palestine	The physical distance affect there communications with the partners	Political and occupation problems, the non-partners of the universities doesn't see that the physical distance affect the communications
		There is cultural deference between the universities and the industry	The university : research concerns, academic language, long research time frame The industry : economic concerns, financial language, request for short time frame for research	There is cultural deference between the universities and the industry	The university : research concerns, academic language, long research time frame The industry : economic concerns, financial language, request for short time frame for research

11. Motivations

| 10 | Motivations | Community service, reputation, publications, knowledge and technological development, patenting, ern the fund for further researches | | Profit, reputation, technological development, low trend for community services. | |

12. Obstacles

| 11 | Obstacles | **K&TT obstacles:**
1. Lack of entrepreneurial culture in universities and the industrial sector
2. Lack of funding and support by the government and the industrial sector for such operations
3. Lack of experts.
Relationships obstacles :
1. Lack of government encouragement for these | | **K&TT obstacles:**
1. the industry cannot carry the support of such operations
2. The absence or weakness of culture within the industrial sector to go for such operations
3. the output from the university doesn't match with the industry needs
4. Lack of the match trends in research between universities and the industrial sector | |

| | | collaborations
2. Lack of trust between the industry and the university
3. Profitability culture for the industry.
4. the inability of the universities to communicate effectively with all companies in all industrial sectors | | 5. There is no clear mechanism for the K&TT process.
Relationships obstacles :
1. The inability of universities to communicate with the industrial sector effectively
2. The negligence of some industrial sectors in these relations
3. The lack of a clear mechanism for cooperation between the industrial sector and universities
4. The lack governmental support and laws to protect such relationships. | |

- **Summary of status of the factors affecting K&TT collaborations:**

The final result of the tables above is shown in the table below.

Table 4- 4 : Summary of Factors levels

	Factor	Universities	Industry
1	Absorptive capacity	Medium level	Low level
2	Leadership	Medium level	Low level
3	Trust	Low level	Low level
4	Collaboration	Low level	Low level
5	Support structure	Medium level	Low level
6	Communications	Medium level	Low level
7	Knowledge and technological capabilities	High level	Low level
8	Openness	Medium level	Low level

4.1.4. Discussion of the universities and industry interview:

1. Each one of the parties needs to be developed in the low and the medium levels of the factors that affect the K&TT collaboration, to get the benefits that are related to the K&TT process,

2. The trends of both parties must be approached to be more close to the other partner, the universities must be more entrepreneurial and the industry must play its role in community services.

3. Both parties agreed that there is a gap that must be reduced, that is good indicator that both side agreed, but they still need to take actions.

4. The obstacles mentioned have an evidence from the data in the above tables.

5. These obstacles are not a major problem that cannot be solved, solutions exist in the experience of the world-wide in the K&TT collaboration.

6. Universities have more capabilities and experience to lead, develop and manage these collaborations, so the responsibility rests on the universities to do the best to spread the K&TT collaboration culture among participants.

7. There is a great disparity between the industrial sectors in terms of capacity and the ability to engage in technology and knowledge transfer programs, while the ICT sector expressed high levels of K&TT collaboration related factors the textile, leather and agriculture sectors have low levels, the chemical and sectors pharmaceutical sectors showed a high level of internal R&D with low levels of collaboration and communications with universities, some of them attributed this to the privacy and secrecy of the R&D process.

4.2. Researcher Questionnaire results and analysis:

As mentioned previously, the questionnaire was designed depending on a five-point Likert-type scale, this research is aimed to evaluate the readiness of the researchers inside the universities to produce a transferable research or projects, to evaluate the ability in related subjects as mentioned, the

alternatives are (1 : very weak, 2: weak, 3: good, 4 : very good, 5 : excellent), These alternatives were placed in a way that responses could easily be coded into a five-point Likert-type where 1 indicates the lowest readiness while 5 indicates the highest, On the Likert –type scale, the readiness level was benchmarked as: 'not ready, lot of work is to be done' for items between 1 and 2.6, 'not ready, some work is to be done' for items between 2.6 and 3.4, 'ready but needs some improvements' for items between 3.4 and 4.2 and 'ready to go' for items between 4.2 and 5,. (Aydın & Tasci, 2005)

Mean and standard deviation were computed to determine the trends in the responses and compared to the generic scale below:

Table 4- 5: The Scale and Indication of Means

Means	Scale
0 - 2.6	not ready, needs a lot of work
2.6 - 3.4	not ready needs some work
3.4 - 4.2	Ready but needs a few improvements
4.2 - 5	Ready to go a head

Table 4- 6: Shows the results of the Questionnaire responses:

No.	Statements	Mean	SD	CI
1	My ability to use the concept of commercialization in my project/ research	3.40	1.01	±0.11
2	My ability to use the concept of innovation in my project/ research	3.50	1.07	±0.11
3	My ability to use the concept of knowledge and technology transfer in my project/ research	3.60	0.95	±0.10
4	My ability to provide a research project can be adopted by the industrial sector?	3.40	0.90	±0.09
5	the ability of my research project for publication or patent	3.20	1.03	±0.11
6	the relationship between my project and the market needs	3.50	0.96	±0.10
7	The ability of the universities to support research projects until it is commercialized	2.60	1.07	±0.11
8	the ability of the industrial sector in Palestine to support research projects	2.34	1.00	±0.11

Calculation of the standard deviation indicates that the values not wide spread around the mean.

Table 4- 7: Readiness level of researchers to produce a transferable research projects

Factor	Mean	Readiness
Knowledge and technological capabilities	3.43	Ready but needs a few improvements
Confidence	2.47	not ready, needs a lot of work

Table 4- 8: Motivations that encourage researchers to produce research projects:

Motivation	Percentage
Graduation only	31.32%
Commercialize the research or project	14.56%
The development of the scientific base	23.08%
Publishing or patent	19.23%
solving a local problem	11.81%

4.2.4. Discussion of researcher's questionnaire results:

1. It seems that the universities are making a very good effort in the term of educating the students and academics about the basics of the K&TT collaboration related concepts such as commercialization, innovation, and technology transfer.

2. The major problemis the lack of student's confidence in universities and the industrial sector, this problem is generated by the lack of success stories that the students hear about through the lack of collaboration, lack of trust between universities and industry as shown in the universities and industry interview results.

3. Related to the previous problem the students don't have the right motivation to produce a transferable research projects, 54.4% of the students and academics are looking for graduating and development of their knowledge base.

4. Only 11.81 % of them are looking for solving the problems of their societies, the others may produce good work without any impact on

the local community which includes the university and the industry, too.

4.3. Government Interview results

As mentioned previously, the researcher was invited to An-Najah University hosting experts lecture, the researcher attended the lecture which was made by three experts in intellectual property and International IP protection laws, the researcher wrote notes, after the end of the lecture, the researcher interviewed the experts, and they are:

E. Mazen Abu shre'aa, the general manager of general department of Intellectual Property in the Ministry Of National Economy, Dr. Rasim Swan, the manager of Ibdaa institution and Dr. Naeem Salameh, specialist In IP international laws and instructor at An-Najah University.

The interview was an open discussion form about the IP protection law in Palestine, and its compatibility with the international laws which have a strong protection and it was developed over years to insure the maximum partner's benefits.

The expert ensures that the Palestinian law for IPR is the same law of the Jordanian law which was released in 1959, and it did not change until now, the patents law is the same law of the Jordanian law which was released in 1953, and it did not change until now, the IPR and patenting process itself is easy, as the researcher or the person concerned to protect his/her IP must follow the following steps:

1. Apply and fill the necessary forms in the MONE.

2. The form will be audited and examine by experts in two steps:

   A. the first step is inside Palestine by checking the data base of patents and IP.

   B. the second step is outside Palestinein coordination with international institutions like WIPO.

3. Publishing the IP or Patent for 3 months.

4. If there are no objections, the application is approved and is given the certificate.

The experts said that the law includes all types of intellectual property rights such as:

1. Patent rights

2. Copyrights

3. Design rights

4. Trademark rights

5. Ancillary rights.

The experts agreed with the viewpoint that the industry and universities interviews show, which is related to the weakness of government support for the UIC generally and the K&TT collaborations in particular, but they attribute this weakness to the political and financial situation, in which Palestine is going through.

The experts also said that the government make an effort to introduce the concepts of intellectual property inside the universities and the industry too,

the effort may not cover all universities and industry sectors, but they are trying to cover all of them, in order to encourage all parties to involve in the IPR process.

4.3.1. Discussion of government interview results:

A 62-year old law, without any change, this law will not be suitable and doesn't provide a good protection environment to the partners in the K&TT collaboration, the world of technology and knowledge are developed rapidly every day, the laws must be flexible to cover all changes, the technology that existed in 1953, are extinct now from the rapid world of technology and knowledge, if the government is concerned to develop the socio-economic system and to support the IPR, to provide a good legal incubatorfor industry- university collaboration, especially in the field of K&TT.

4.4. Conclusions and Recommendations

1. The universities are the core participant in the K&TTCollaboration,they make a remarkable effort to involve in these collaborations, by educating the researchers, communicating with industry, this effort may not create a culture of K&TT collaborationuntil now, the university must create a system that manage the K&TT collaboration.

 This system must start with the researcher's development and end with the transformation of the university to the entrepreneurial form.

2. Industry cultural awareness at the minimum rate with the low affiliationto the community services.The trends of the industry are financial trends only.And the technological experience is imported from other

countries without giving the locals any chance to produce the technology and knowledge that is needed by industvcry, that doesn't mean that there is no trend toward that, but this trend is still the lowest voice inside the industry sector.The industry must involve in K&TT collaboration, and this process will provide the necessary knowledge, technology and profit. The world-wide experience is a good witness for success of K&TT collaboration.

3. The government effort is low, too because of the external financial dependent which covers the basics of life without looking at such collaboration, the industry and universities must look at each other as the only supporters for the K&TT collaboration.

4. Universities don't have specialized centers for K&TT process. the K&TT process is done as part in other university centers, so building a knowledge and technology office(center) is essential for identifyingand coordinating the K&TT process activities with the existence of the right structure and experts inside this center.

5. The researchshows that the link between industry and universities is weak which affects the innovation system.The development of such K&TT collaboration will provide the environment needed to rise up the level of innovation by providing the knowledge and technology needed for all participants.

4.5. Operational framework:

This section of the research will provide an operational framework that is developed through this research, this framework will provide systematic operations for universities to coordinate the K&TT process starting from the researchers, ending with collaboration with industry to reach the success in a Win-Win relationship.

This framework is developed according to the literature which provides the past experience among the world-wide in the K&TT, in order to link the operations inside the framework with the low and medium levels of factors of the universities and industry, the aim is to mitigate the barriers that hinder these collaborations.
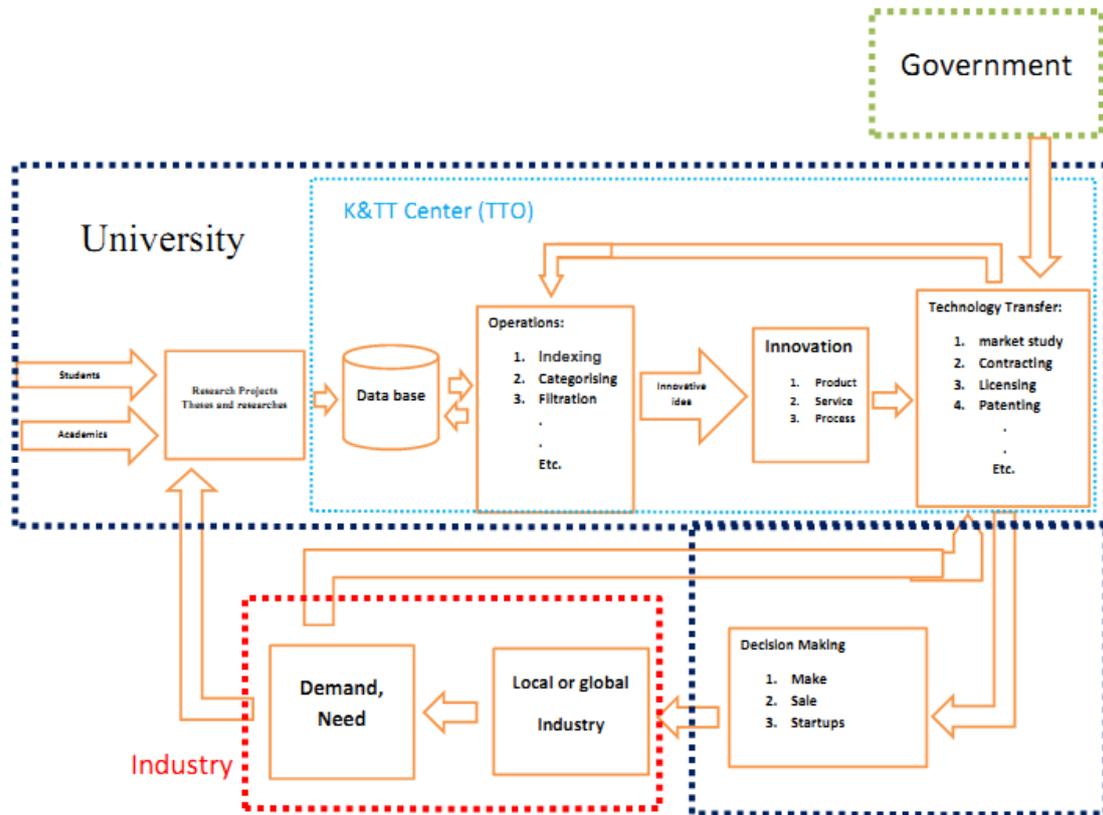
Figure 4- 2 Operational framework for K&TTO collaborations

According to (Siegel et al,2003, (lane 2012), (Manoela,2012),), (Bradley,2013) the K&TT process starts with the researcher's discovery, in this stage as it is known, the students and academics are left alone to choose the subject of their research, university can encourage them to choose from the alternatives provided by the industry, and provide a rewarding system for best researchers who do these research projects successfully, these research projects must be taken from the industrial sector according to their demand. This process must go through the K&TT center (K&TTO) of the university, (Siegel et al, 2003), (Zawad, 2010).

We must notice that the previous step will rise up the university and industry absorptive capacity by increasing the innovative ideas that are good for collaborations and rise up the communications between the parties. The university must communicate with all industry sectors to raise up its collaboration level. The usage of the ICT will decrease the physical distance between the university and industry. This step won't also cost the industry anything, so the industry will be more collaborative and will respond to this step well.

After creating the amount of research project (Siegel et al,2003, (lane 2012), (Manoela,2012),), (Bradley,2013) suggested in their models that the responsibility goes now to the K&TT centre (K&TTO), these responsibilities are listed in a previous section, the researcher added the usage of the ICT to create a Data-Base for all projects and provide inside operations to facilitate the data organizing, managing, saving and transferring these projects. The K&TT center (K&TTO) must have a core expert or experts called investigators, this investigator has the responsibility of determining the innovative ideas that match the industry needs and the level of innovation needed by the industry, and coordinate with the industry and government. Threesome cases that need patenting, Licensing and contracting activities that K&TT center must provide them. (Zawad, 2010)

Some ideas are innovative, but don't match the local industry needs, in an advanced stage of the K&TT center, the center must have the ability to transfer the research projects to the global industry, moreover, as mentioned previously the forms of the output of research projects are tangible and intangible products, such as software and process for quality or reducing waste, this must be taken into account because these intangible productsin particular can be produced inside the university without the need of the industry, and this will save effort, time and money.

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Appendix

1. Table A- 1: Shows the detailed answers that the industry responses, with the most common theme answers, and the number of companies that answered this question

Factor	Determinant	Q. number	Answers	Number of companies
Absorptive capacity	Acquisition	1	there is no mechanism	28
			Theremechanismbut it isnot effectivewell	8
			Yes, therehas beenan effective mechanismto take advantage ofthe diagnosis ofgraduation projectshave beenutilizedin the development ofthe institution	8
			Yesthere isa mechanism, but so far have not beendiagnosed withusefulprojects	2
	Assimilation	2	there is no mechanism	28
			Developed inside the firm	6
			Developed outside the firm	2
			developed in a joint effortfrom both inside andoutside the institution	10
	Transformation	3	Doesn't search inside universities	19
			The institution search inside universities but doesn't find anything useful	16

			The institution search inside universities and found a useful research or projects	11
		4	adjusted to fitwith the organization's privacy	37
			It is applied as it is	9
	Exploitation	5	we don't diagnose any technology give us a competitive advantage	18
			we diagnose a technology give us a competitive advantage from outside the firm	22
			we diagnose a technology give us a competitive advantage from inside the firm	6
Leadership	Initiative	6	Yes we offer entrepreneurial projects to the university	15
			No we don't offer entrepreneurial projects to the university	31
	Leading projects to success	7	There is no such projects	31
			About 25 %	8
			Less than 5%	7
		8	0%	43
			25%	3
		9	There is no Joint ventures	31
			Universities	10

			Industry	5
Trust	Direct questions	10	No, universities response, output and capability is not good	29
			Yes, universities response, out but and capability very good	17
		11	≤ 50 %	26
			≥50 %	20
		12	No, universities doesn't provide Stable andSuitable environment because its look for its own Interests without considering industry interests	29
			Yes, universities provide stable and suitable environment, because it realized the mutual interests for both sides.	11
			I don't know	6
Collaboration	Number of collaborations	13	≤ 25% of firm projects	11
			There is no such project collaborations	35
		14	There is no such project collaborations	35
			25 %	3
			75%	8
	Collaborative environment	15	There is no such project collaborations	35
			Yes universities provide collaborative environment, because it realize that this collaborations will provide mutual interests for both parties	8

			Yes, but not enough	3
	Knowledge sharing	16	No, there is no knowledge sharing because there is no communication channels between the firm and the universities, universities don't start any connection	33
			Yes, there is knowledge sharing throw one or two communication channels	13
Support structure	Internal trend to K&TT	17	There is no trend for K&TT because the top management doesn't see the benefits from it	22
			There is a trend but this trend is weak because the top management doesn't see the benefits from it, they need to be to encouraged .	15
			There is a strong trend, the management reliaze the major role of universites to develop the industry	9
		18	There is no practical translation of this trend.	27
			There is a strong practical translation of this trend,	8
			There is a weak practical translation of this trend,	11
	Needed infrastructure	19	There is no infrastructure to support K&TT process, because we focuses on the manufacturing process and external sources of information and development	25

			There is, but its weak need to be developed	13
			There is a strong infrastructure to support K&TT process.	8
	employees necessary skills	20	There is no experts in this field inside the firm, this need a lot of money the firm cannot effort with low response rate.	39
			There is a experts but they are not specialized very will .	5
			There is a specialized experts and will trained in the field of K&TT.	2
	Respond to K&TT	21	The frim cannot respond to K&TT process because it doesn't seem that we have the necessary capabilities and competences and we don't able to provide it very soon, the process doesn't seem profitable	25
			We can response to the K&TT process but not soon, and if the process gain us a profitable sustainable projects .	15
			Yes we can response at very high speed, we have the necessary capabilities and competences for that in our industry sector.	6
Motivation	Incentives	22	Financial return	46
			Reputation	46
			Development of technological and knowledge capabilities	46
			Community Service	40
			Publications	27

		23	Yes if these incentives are provided our collaboration with the university will increase because this will provide a profitable process for all parties	42
			No, because until now there is no real evidence that the universities will provide that	4
Communication	Links	24	There is no communication channels between the firm and the university	27
			There is a communication channels like : Regular conferences, regular meetings, mutualtrainingsessionsperiodically, emails patrol.	8
			There is communication channels but not periodically, it take long time between each communicate	11
		25	Yes increase this communications will provide a mutual benefits such as : Experience exchange, internal developments, fund and problem solving	20
			No, increasing these communications will not provide the required developments and interests until the university change its culture to be entrepreneurial	26
Distance	Physical distance	26	The physical distance is not a barrier for communication or for K&TT	36

			process, Palestine is a small country and the usage of the ICT decrease these distance	
			Yes, its barrier because of the occupation which prevent movements between cites	10
	Cultural distance	27	Yes, there is gap between the cultures of the universities and the industry, the industry is looking for the profit, market share, competitive advantage and reputation, universities on the other hand looking for academic development, research activities and reputation .	43
			Yes there is a gap but it is shrinking with the times	3
		28	Yes, there is a deference between the research and projects which made inside the universities and the requirements of the industry, because the students and academics doesn't focus on the demand of the industry, the university doesn't encourage them to link between the researches and the needs.	41
			Yes there is a deference but the universities are working to reduce it	5
Knowledge and technological capability	Internal R&D	29	No	29
			Yes	17
	Skills	30	No	38
			Yes	8

		31	≤ 25%	10
			No	36
		32	Yes, in a strong way	10
			Yes, but it still weak	12
			No we don't	24
	Training	33	No we don't	30
			Yes, but not enough	13
			Yes, in strong way	3
		34	No, the universities doesn't allow us	33
			Yes but doesn't cover all students or academics	9
			Yes, through conferences, meetings, guest invitation, students visit to the firm.	4
	Ability to transfer	35	No we don't have this ability.	36
			We have this ability if the project or research doesn't exceed the firm financial ability and serve the firm.	10
Openness	partner variety	36	0	32
			1	7
			2	4

			3	2
			4	1
		37	Yes	9
			No	37
		38	Yes	8
			No	38
	innovation phase variety	39	Yes, if the output of the current collaborations achieve the goals	9
			No	27
			Yes if the university provide itself as entrepreneurial one	8
	Intensity of collaboration	40	No	32
			Yes, if there is a need for that	4
			Yes, in a way that doesn't affect firm privacy	10
Obstacles	Direct questions	41	1. the industry cannot carry the support of such operations	
			2. The absence or weakness of culture within the industrial sector to go for such operations	
			3. the output from the university doesn't match with the industry needs	
			4. Lack of the match trends in research between universities and the industrial	

			sector
			5. There is no clear mechanism for the K&TT process
		42	1. The inability of universities to communicate with the industrial sector effectively
			2. The negligence of some industrial sectors in these relations
			3. The lack of a clear mechanism for cooperation between the industrial sector and universities
			4. The lack governmental support and laws to protect such relationships.

2. **Table A- 2shows the detailed answers that the universities responses, with the most common theme answers, and the number of universities that answered this question**

factor	Determinant	Q. number	Answers	Number of Universities
Absorptive capacity	Acquisition	1	there is no mechanism	0
			Theremechanismbut it isnot effectivewell	3
			Yes, therehas beenan effective mechanismto take advantage ofthe diagnosis ofgraduation projectshave beenutilizedin the development ofthe institution	1
			Yesthere isa mechanism, but so far have not beendiagnosed withusefulprojects	2
	Assimilation	2	there is no mechanism+	0
			Developed inside the firm	2
			Developed outside the firm	0
			developed in a joint effortfrom both inside andoutside the institution	4
	Transformation	3	Doesn't search inside universities	0
			The institution search inside universities but doesn't find anything useful	0
			The university search inside and found a useful research or projects	6
		4	adjusted to fitwith the university privacy	6
			It is applied as it is	0

	Exploitation	5	we don't diagnose any technology give us a competitive advantage	0
			we diagnose a technology give us a competitive advantage from outside the firm	2
			we diagnose a technology give us a competitive advantage from inside the firm	4
Leadership	Initiative	6	Yes we offer entrepreneurial projects to the industry, but the industry dosent response well	5
			Yes we offer entrepreneurial projects to the industry, and the industry response well.	1
	Leading projects to success	7	There is no such projects	0
			Less than 50%	3
			More than 50%	3
		8	0%	5
			10%	1
		9	There is no Joint ventures	0
			Universities	4
			Both	2
Trust	Direct	10	No, industry response, output and capability is not good	4

			Yes, industry response, out but and capability very good	2
		11	≤ 50 %	3
			≥50 %	3
		12	No, industry doesn't provide Stable andSuitable environment because its look for its own Interests without considering university interests, Lack of awareness in the collaborations benefits	4
			Yes, industry provide stable and suitable environment, but not enough, because it realized the mutual interests for both sides.	2
			I don't know	0
Collaboration	Number of collaborations	13	≤ 25% of university projects	6
			There is no such project collaborations	0
		14	There is no such project collaborations	0
			25 %	2
			75%	4
	Collaborative environment	15	There is no such project collaborations	0
			No industry doesn't provide collaborative environment	4
			Yes industry provide collaborative environment,but it is not at the required level	2

	Knowledge sharing	16	No, there is no knowledge sharing because there is no communication channels between the firm	0
			Yes, there is knowledge sharing throw one or two communication channels	6
Support structure	Internal trend to K&TT	17	There is no trend for K&TT because the top management doesn't see the benefits from it	0
			There is a trend but this trend is weak because the top management doesn't see the benefits from it, they need to be to encouraged .	1
			There is a strong trend, the management realize the major role of universities to develop the industry	5
		18	There is no practical translation of this trend.	0
			There is a strong practical translation of this trend,	5
			There is a weak practical translation of this trend,	1
	Needed infrastructure	19	There is no infrastructure to support K&TT process, because we focuses on the manufacturing process and external sources of information and development	1
			There is, but its weak need to be developed	4
			There is a strong infrastructure to support K&TT process.	1

	employees necessary skills	20	There is no experts in this field inside the firm, this need a lot	1
			There are experts but they are not specialized very well.	3
			There is a specialized experts and will trained in the field of K&TT.	2
	Respond to K&TT	21	The university cannot respond to K&TT process because it doesn't seem that we have the necessary capabilities and competences and we don't able to provide it very soon, the process doesn't seem profitable	0
			We can response to the K&TT process Slowly	4
			Yes we can response at very high speed, we have the necessary capabilities and competences for that	2
Motivation	Incentives	22	Financial return	6
			Reputation	6
			Development of technological and knowledge capabilities	6
			Community Service	6
			Publications	6
		23	Yes if these incentives are provided our collaboration with the industry will increase because this will provide a profitable process for all parties	6
			No	0
Communication	Links	24	There is no communication channels between the firms and the university	0

			There is a communication channels like : Regular conferences, regular meetings, mutualtrainingsessionsperiodically, emails patrol.	4
			There is communication channels but not periodically, it take long time between each communicate	2
		25	Yes increase this communications will provide a mutual benefits such as : Experience exchange, internal developments, fund and problem solving	6
			No	0
Distance	Physical distance	26	The physical distance is not a barrier for communication or for K&TT process, Palestine is a small country and the usage of the ICT decrease these distance	2
			Yes, its barrier because of the occupation which prevent movements between cites	4
	Cultural distance	27	Yes, there is gap between the cultures of the universities and the industry, the industry is looking for the profit, market share, competitive advantage and reputation, universities on the other hand looking for academic development, research activities and reputation.	6
			No	0

		28	Yes, there is a deference between the research and projects which made inside the universities and the requirements of the industry, because the students and academics doesn't focus on the demand of the industry, the students doesn't focus on the economic sideof there projects or researches, the universities can't force them to do that, lack of fund from the industry.	6
			No	0
Knowledge and technological capability	Internal R&D	29	No	1
			Yes	5
	Skills	30	No	2
			Yes	4
		31	$\leq 25\%$	4
			No	2
		32	Yes, in a strong way	5
			Yes, but it still weak	1
			No we don't	0
	Training	33	No we don't	1
			Yes, but not enough	1

			Yes, in strong way	4
		34	No	0
			Yes but doesn't cover all students or academics	1
			Yes, through conferences, meetings, guest invitation, students visit to the firm.	5
	Ability to transfer	35	No we don't have this ability.	1
			We have this ability, there is publications, several Patents, start -ups with the support of the concerned institutions	5
Openness	partner variety	36	< 5	2
			Between 5 and 10	3
			>20	1
		37	Yes	6
			No	0
		38	Yes	6
			No	0
	innovation phase variety	39	yes	6
			No	0

	Intensity of collaboration	40	No	0
			Yes, if there is a need for that	2
			Yes, in a way that doesn't affect university privacy, because this will affect positively in the development of each partner in the collaboration process	4
Obstacles	Direct questions	41	1. Lack of entrepreneurial culture in universities and the industrial sector	
			2. Lack of trust	
			3. Lack of fundingand support by the government and the industrial sector for such operations	
			4. Lack of experts	
		42	1. Lack of government encouragement for these collaborations	
			2. Lack of trust between the industry and the university	
			3. Profitability culture for the industry.	
			4. the inability of the universities to communicate effectively with all companies in all industrial sectors	

3. Interview questions:

Table A- 3 : Questions of the interview

	Factor	Determined by	Source	Questions
A	Absorptive capacity	Acquisition	(Fosfuri & Tribo, 2008)	1. What is the mechanism that the institution apply for the evaluation of the research projects inside the university for the purpose of transfer it to the other partner in the K&TT collaborations, is it effective?
		Assimilation		2. If there any mechanism could i check it, it was developed inside or outside the organization?
		Transformation		3. Does the organization search for a knowledge of technology inside the universities for the purpose of self-developing?
				4. If the organization found a knowledge or technology does it applied as its or the knowledge or technology customized to match the organization internal requirements?
		Exploitation		5. Does the organization have been diagnosed a knowledge or technology that helped the organization to gain a competitive advantage? What is the source of this knowledge or technology?
B	Leadership	Initiative	(Kotter, 1990)	6. Does the organization progressing Entrepreneurial projects for the other party (industrial / universities)?
		Leading projects to success		7. How much projects has been implemented under the leadership of the organization? What percentage of the total, led by the organization projects that have been implemented in the past year.
				8. What are the percentage of projects that have been transforming its leadership during the implementation to other institutions?
				9. Who had the greatest influence in the implementation of projects universities or industrial sector?
C	Trust	Direct questions		10. when a project or an innovative idea or a problem Appears, Is the first external choice to collaborate with about it, the

				(universities, industry)
				11. What is your evaluation on a scale of 100% about the power of internal and external projects execution for (industry / universities)?
				12. Can the (industrial sector / universities) provide a stable environment for collaboration projects? Why?
D	Collaboration	Number of collaborations	(Goh, 2002)	13. How many projects were transferred to (industry sector / university) through the last three years? (The percentage of the transferred projects will be enough) if the exact number is not exist.
				14. What is the ratio of the successful projects which have earned the satisfaction of both parties?
		Collaborative environment		15. Does the industry/universities provide a convenient collaborative environment for you? Why?
		Knowledge sharing		16. If new informations emerged in a particular field, do you share it with the (industrial sector / universities)? How is this done?
E	Support structure	Internal trend to K&TT	(JAFARI, et al., 2014)	17. Is there a trend from the internal management of the organization to the K&TT collaborations with the (industry/university)?
				18. Is this trend have a practical translation ((training programs, lectures, meetings with the other party, awareness campaigns for students and researchers, any activity that promotes or raise awareness about these programs?
		Needed infrastructure	(Goh, 2002)	19. Is there a structure to support this trend (laboratories, equipments, specialized offices to this thread TTO, staff, specialized researchers in this subject)
		employees necessary skills	(Szulanski, 1996)	20. What are the experiences available within the organization to deal with the K&TT?
		Respond to K&TT	(Trafdar, 2006)	21. If an innovative research projects appeared, can the organization handle with it, to achieve the desired gains? Why? What is the estimated time period for such a response?

F	Motivation	Incentives	(Sung & Gibson , 2010)	22. What are the incentives that encourage your organization to engage in technology and knowledge transfer programs? (Financial return, reputation, community service, publishing in international journals, the development of knowledge level in the organization ... etc)
				23. If these incentives are available, would you expect raise the proportion of cooperation between your organization and (industrial sector / universities)? Why?
G	Communication	Links	(Sung & Gibson)	24. Are there regular and consistent communication channels between your organization and (industrial sector / universities) (people visit constantly, regular conferences, regular meetings, regular workshops, regular phones, regular emails, any other way?
				25. Do you think that raising the level of this communication will achieve gains for both parties, what are the expected gains?
H	Distance	Physical distance	(Sung & Gibson , 2010)	26. What are the obstacles caused by geographical distance in the communication between the industrial sector and universities?
		Cultural distance	(Sung & Gibson , 2010)	27. Do you think that there is a gap in cultural trends and requirements of both the industrial sector and universities so that it is form a barrier in technology and knowledge transfer between them? Can you identify this gap, and what are the causes?
				28. What is the difference between what is being done out of projects and researches in universities and the requirements of the industrial sector?
I	Knowledge and technological capability	Internal R&D	(Santoro & Bierly, 2006)	29. Does the enterprise have a research and development department or contracting with another Foundation for this goal (product development, researches … etc.)?
		Skills	(Barton,2008)	30. What are the skills that available inside the organization in the field of K&TT?
				31. Is there a part time employees for the purpose of R&D? What

				is the percentage from the total number of employees?
				32. What are the knowledge and technological capabilities that the organization have to support the K&TT to (industry/universities)?
		Training	(Santoro & Bierly, 2006)	33. What is the methods that the organization take to introduce the concepts of K&T collaborations and its benefits inside the organization?
				34. How the undergraduate students or researchers are introduced to the requirements of the industrial sectors?
		Ability to transfer	(Santoro & Bierly, 2006)	35. Does the organization have the ability to turn any research project into a commercialized or published research in partnership with the institutions concerned? Are there success stories?
J	Openness	partner variety	(Lazzarotti, et al., 2010)	36. How many partners of the organization from the (industrial sector / universities)?
				37. Is this partnership is expanded?
				38. Is this partnership with all industrial sectors/universities?
		innovation phase variety	(Lazzarotti, et al., 2010)	39. Is the organization planning to expand its partnerships with the (industry/universities) at the strategic level? Why?
		Intensity of collaboration	(Laursen & Salter, 2006)	40. Do the organization allow the (industry/universities) to interfere and provide their opinion in the innovation process inside the organization? Why?
K	Obstacles	Direct questions		41. What are the obstacles that from your point of view led to the delay or obstruct the process of transfer of technology and knowledge of the universities to the industry sector?
				42. What are the obstacles from your point of view that lead to the weakness of the relationship between universities and the industrial sector?

4. Questionnaire for Researchers inside the universities

- **Part one**: Personal Information

    sex :   ☐ male☐ female

    University :…………………………………

    College: ………………………………..

    Academic level: ☐ Bachelor Graduate☐ Master Graduate ☐

    PhD. Graduate☐ An academic at the university

- **Part two**: The main motivation of my research project is :

1. Graduation only

2. Commercialize the research or project

3. The development of the scientific base

4. Publishing or patent

5. Solving a local problem

6. Other incentive: …………………..

- **Part three :** Please choose the degree to which commensurate with

    your knowledge and your experience in the field of transfer of

    technology and knowledge:

Table A- 4: Questions of the questionnaire

Factor	Question	Excellent	Very good	good	Weak	Very weak
Knowledge and Technological capabilities	My ability to use the concept of commercialization in my project/ research					
	My ability to use the concept of innovation in my project/ research					
	My ability to use the concept of knowledge and technology transfer in my project/ research					
	My ability to provide a research project can be adopted by the industrial sector?					
	the ability of my research project for publication or patent					
	the relationship between my project and the market needs					
Confidence	The ability of the universities to support research projects until it is commercialized					
	the ability of the industrial sector in Palestine to support research projects					

جامعة النجاح الوطنية

كلية الدراسات العليا

تعزيز الشراكة بين الجامعات والقطاع الصناعي في فلسطين عبر برامج نقل التكنولوجيا والمعرفة

إعداد

اسعد عبد الله حسن البيضه

اشراف

د. يحيى صالح

قدمت هذه الاطروحة استكمالاً لمتطلبات الحصول على درجة الماجستير في تخصص الادارة الهندسية بكلية الدراسات العليا في جامعة النجاح الوطنية، نابلس – فلسطين .

2016

تعزيز الشراكة بين الجامعات والقطاع الصناعي في فلسطين عبر برامج نقل التكنولوجيا والمعرفة

إعداد

اسعد عبد الله حسن البيضه

اشراف

د. يحيى صالح

الملخص

إن التعاون بين الجامعات والقطاع الصناعي مهم جدا لكلا الطرفين ، فالجامعات تستفيد من هذا التعاون دعم الابحاث والمشاريع البحثية داخل الجامعة لتطوير المخزون المعرفي للجامعة وتزويد الطلبة والاكاديميين بأحدث انواع المعرفة المصنعة داخليا، أما بالنسبة للقطاع الصناعي فان هذا التعاون سيقدم له المعرفة والتكنولوجيا التي يبحث عنها من اجل الحصول على ميزات تنافسية او مشاريع ربحية أو تطوير عملياته الادارية والصناعية لتحقيق افضل النتائج وتوفير المال والوقت والجهد دون اللجوء الى مصادر خارجية .

إن هذا التعاون له ايضا تأثير على المجتمع والاقتصاد في فلسطين فان هذه المشاريع المشتركة لها تأثير على المجتمع بشكل مباشر او غير مباشر من حيث تقديم العائد المادي وتوفير الوظائف وتطوير عمليات التصنيع الداخلي من غير اللجوء الى مصادر خارج الدولة تسحب معها الاموال المخصصة للبحث والتطوير .

إن هذه الرسالة هدفها الاساسي هو تحديد المشتركين في عمليات نقل التكنولوجيا والمعرفة وتحديد العوامل التي تؤثر على التعاون بين هؤلاء المشتركين وفحص الحالة الراهنة لهذه العوامل من اجل تطويرها مستقبلا للحصول على أفضل عائد من هذا التعاون من خلال دراسة السرد الادبي حول العالم وعرض خبرات العالم في هذا المجال من خلال الدراسات السابقة واستخدام اليات تحديد وجمع البيانات وعمل مقابلات مع مختصين في هذا المجال للحصول على أفضل نتائج.

بعد تحديد المشتركين في عمليات نقل التكنولوجيا والمعرفة تم تحديد العوامل التي تؤثر على التعاون بينهم في عمليات نقل التكنولوجيا والمعرفة وتصميم ادوات لجمع المعلومات منهم ودراسة الحالة الراهنة لتطبيق هذه العوامل على ارض الواقع، وقد كان المشتركين هم الجامعات، القطاع الصناعي والحكومة بالإضافة الى الطلبة والباحثين المنتسبين للجامعة .

تم اختيار الشركات في داخل القطاع الصناعي والتي يمكن للباحث عمل مقابلات معها بخصوص نقل التكنولوجيا والمعرفة بناء على توصيات اتحادات الصناعات الفرعية، وقد كان عدد الشركات المرشحة 85 استجاب منها للمقابلة 46 ما يعادل 54.1 % من الشركات، تم تصميم اسئلة المقابلات بناء على كل عامل من العوامل المؤثرة في عمليات نقل التكنولوجيا والمعرفة ومحدداتها التي تم استخراجها من السرد الادبي للموضوع .

هذه المقابلات تم تصميمها لتصلح لكلا المنتسبين الرئيسيين في عملية نقل التكنولوجيا والمعرفة وهم القطاع الصناعي والجامعات، بالنسبة للحكومة تم تصميم مقابلة خاصة بهما من اجل دراسة حقوق الملكية الفكرية والقوانين المتعلقة بها .

الطلبة والباحثين داخل الجامعة هم المصدر الاساسي الذي ينتج المعرفة والتكنولوجيا التي يمكن نقلها الى القطاع الصناعي، تم تحديد ما هي العوامل التي تشجعهم على انتاج ابحاث ومشاريع تخرج قابلة للنقل للقطاع الصناعي وعمل استبانة تحدد مدى استعدادهم لإنتاج ابحاث ومشاريع تخرج قابلة للنقل الى القطاع الصناعي.

نتائج المقابلات والاستبانة اظهرت العديد من المعلومات والنتائج التي تزيد من وعي الباحثين وفهمهم لمثل هذه العمليات وفوائدها، حيث كانت الجامعات في الصدارة واظهرت مستوى جيد في التعامل مع مثل هذه البرامج، بينما كان القطاع الصناعي في مستوى متدني للتعامل مع برامج نقل التكنلوجيا والمعرفة لعدة اسباب اهمها النظرة المادية واهمال البعد الاجتماعي والمسؤولية المجتمعية.

اظهرت نتائج الاستبانة ان الطلاب والباحثين داخل الجامعة في الكليات المستهدفة لديهم مستوى

جيد جدا لإنتاج ابحاث ومشاريع قابلة للنقل، لكنهم ليس لديهم الحافز ولا الثقة في الجامعات او

القطاع الصناعي بالذات لدعمهم في مثل هذه المشاريع .