Tomas Bata University in Zlín
Faculty of Management and Economics

Doctoral Thesis

University's Open Innovation Strategy

Towards Creating a Self-Sustainable Competitive Advantage

Strategie otevřené inovace univerzity

pro vytvoření samo-udržitelné konkurenční výhody

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ABSTRACT

Universities are the main source for developing future creative entrepreneurs and they engage with other sectors in research and knowledge transfers. Commercialization of the university's innovation is essential for creating added-value for the university, the surrounding region and for the whole society. A new paradigm that is called "Open Innovation" (OI) can play a vital role in increasing the competitive advantage of the university by using internal and external ideas, while finding internal and external paths to the market. Most of the universities' strategies have failed in the talking-doing gap. Beside this, there are few studies that investigate the application of OI at universities. Furthermore - a university as a living organism - has to search for achieving a self sustainable competitive advantage. Therefore, this research tries to mitigate this gap by providing a new strategy based on actions – not statements. This research is based on a qualitative study that uses multiple case-studies and in-depth interviews. Each case study has to support a specific part of the research. A combination of primary and secondary data has been collected and analyzed. Finally, the conclusion brings forth the components of the new strategy and the success factors and cultural influences that support its implementation.

ABSTRAKT

Vysoké školy jsou hlavním zdrojem rozvoje budoucích kreativních podnikatelů a podílejí se na aktivitách v ostatních odvětvích v oblasti výzkumu a předávání znalostí. Komercializace inovace univerzity je nezbytná pro vytvoření přidané hodnoty pro univerzitu, okolní region i celou společnost. Nové paradigma, které je nazváno „otevřené inovace" (OI), může hrát důležitou roli při zvyšování konkurenceschopnosti na univerzitě pomocí vnitřních a vnějších myšlenek a zároveň nalézt vnitřní a vnější cesty na trh. Většina strategií aplikovaných na univerzitách skončila v propasti mezi slovy a činy. Vedle toho existuje několik studií, které se zabývají použitím OI na vysokých školách. Navíc univerzita coby živý organismus by měla provádět průzkum pro dosažení vlastní udržitelné konkurenční výhody. Proto se výzkum snaží zmírnit tento nedostatek poskytnutím nové strategie založené na činech - nikoli na tvrzeních. Tento výzkum je založen na kvalitativní studii, která používá více-případové studie, individuální hloubkové rozhovory a průzkumu. Každá případová studie je zaměřena na podporu určité části výzkumu. Byla shromážděna a analyzována kombinace primárních a sekundárních dat. Závěr přináší prvky nové strategie a faktory úspěšnosti a kulturní vlivy, které podporují jeho realizaci.

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LIST OF ABBREVIATIONS

Aleph	Library Information System
ALUC	Association of Libraries of Czech Universities
AUTM	Association of University Technology Managers
CA	Competitive Advantage
CAER	The Center of Applied Economic Research
EFA	Entrepreneurial Faculty Advisor
EIR	Entrepreneur-In-Residence
FaME	Faculty of Management and Economics
FDA	Food Drug Administration
FY	Fiscal Year
GSP	Gross State Products
GWN	Grant Writing Network
IA	Intellectual Assets
IP	Intellectual Properties
LexDATA	Information system for Legal System
MEYS	Ministry of Education, Youth and Supports
MIT	Massachusetts Institute of Technology
OBD	System for keeping records of publications activities
OI	Open Innovation
OIS	Open Innovation Strategy
PU	Pharos University
SAP	Information System of Economics Management
SDC	Software Development Center
SI	Student Intern
TBU	Tomas Bata University
TC	Technology Commercialization
TCO	Technology Commercialization Office
The U	The University of Utah
TTO	Technology Transfer Office
TV	Technology Ventures
TVDC	Tech Venture Development Center
UNI	The University Institute at Tomas Bata University
VBSP	Venture Bench Service Program

ROZŠÍŘENÝ ABSTRAKT

Vysoké školy dnes čelí mnoha výzvám. První z nich je způsob jak vytvořit některé formy konkurenční výhody, které budou trvat navzdory téměř neustálým inovacím ze strany konkurence. Každá vysoká škola čelí potřebě najít vhodnou strategii, která umožňuje dosažení tohoto cíle. Nicméně strategie sama o sobě žádnou hodnotu nepřidává, pouze činy vytvářejí hodnoty. Ale činy, které nejsou v souladu s dobrým strategickým zaměřením, mohou hodnoty stejně snadno zničit jako je vytvořit. Jak můžeme rozlišit činnosti univerzity pro vytvoření vlastní udržitelné konkurenční výhody? Tato diplomová práce se snaží najít odpovědi na tuto otázku.

Role univerzity byla v nedávné době rozšířena, aby zahrnovala nejen výuku a výzkum, ale také regionální rozvoj pod názvem „podnikatelská univerzita". Tento koncept je založen na myšlence, že by měla být vysoká škola ve spojení s průmyslem a vládou a formulovat tak podnikatelský trojúhelník (Etzkowitz, 2004). Navíc, paradigma otevřené inovace (OI) se domnívá, že získávání přidané hodnoty může být dosaženo založením vztahu dvojího vítězství mezi univerzitou a všemi komponenty svého ekosystému (např. studenty, zaměstnanci, personálem, dodavateli, zaměstnavateli, rodiči, malými a středními podniky, průmyslem a vládními agenturami). Tyto nové představy prosazují univerzitu jako živý organismus, který využívá znalosti, management, kreativitu, inovace a podnikání jako strategické nástroje, kterými reaguje na tyto nové výzvy. Pro získání přidané hodnoty musí univerzita coby inovační továrna převést své učebnicové znalosti na trh. Přenos technologií lze provést buď komerční činností (např. patenty, autorskými právy, licencemi apod.), nebo v některých případech dokonce zdarma (např. bezplatné konzultace). Integrace komponentů ekosystému v inovačních procesech zajišťuje maximální přidanou hodnotu pro všechny zúčastněné. To je jediný způsob, jak dosáhnout samostatně udržitelné konkurenční výhody. Každá univerzita si musí najít jedinečné metody výkonu těchto funkcí, aby se odlišila od konkurence. Zaměření se na tyto úkoly pomáhá univerzitě snížit zátěž a zvýšit návratnost. Kromě toho, komercializace univerzitního výzkumu je nezbytná z mnoha důvodů (např. zvýšení zisku, získání konkurenční výhody, účasti na regionálním rozvoji apod.).

Tento výzkum ukazuje stavbu strategické výhody v jednotlivých vrstvách, které se dále dělí na dílčí vrstvy-podvrstvy. Největší výhodou je, když se univerzita naučí propojit aktivity svého ekosystému způsobem, který přináší vyšší úroveň výkonu. Tím se vytvoří samo-posilující cyklus zvyšování schopnosti, samo-posilující cyklus

strategické výhody, která řeší tvorbu strategické výhody, jež nejenže trvá, ale ve skutečnosti roste s tím, kolik jí universita má (Jackson, 2004).

vrstev budování samoudržitelné konkurenční výhody (A-U-B-D-E)

Tato disertační práce je složena z pěti vrstev, které formulují pyramidu Escherova cyklu. Každá vrstva obsahuje podvrstvy (kapitoly). Tato pyramida začíná iterativním způsobem, od zdola nahoru, vrstvu po vrstvě, aby bylo dosaženo samo-posilující konkurenční výhody, a vrací se zpět od shora dolů za účelem přezkoumání každé vrstvy a přijetí nápravných opatření. Tím se cyklus uzavře a vytvoří se samo-posilující cyklus. Uvnitř tohoto cyklu se každá vrstva skládá z podvrstvy (podvrstev) nebo kapitoly (kapitol). Každá část stejně jako v živém systému formuluje kruh. Tento cyklus je zobrazen v následujícím obrázku:
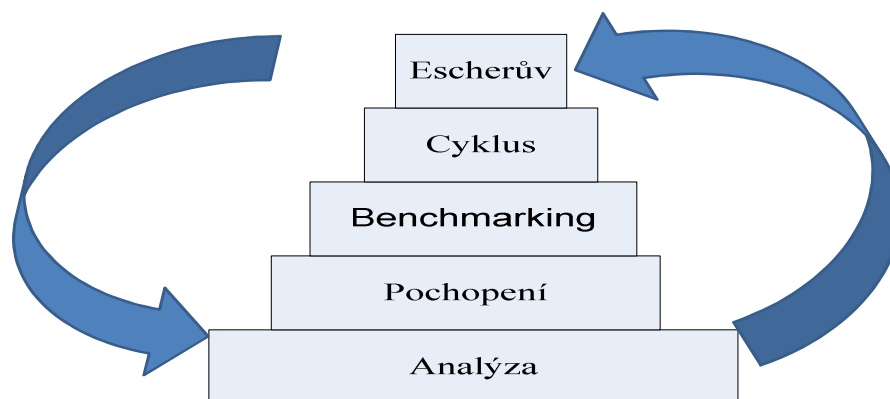
Figure 1: Sebe-posilující konkurenční výhoda (Escherův cyklus)

Source:Autorův výzkum

První vrstva - *Analýza (A)* - poskytuje úvod a přehled literatury k této disertační práci, aby čtenář pochopil, odkud tento výzkum pochází (výzkumné otázky) a jak se autor pokouší tyto otázky zodpovědět (metodika výzkumu). Druhá vrstva - *Pochopení (U)* - ukazuje univerzitu jako živý organismus a související pojmy pro vytvoření společného základu za účelem pochopení nové strategie. Skládá se ze dvě podvrstev/kapitol (např. význam výzkumu, univerzita jako živý organismus, nástroje otevřené inovace, faktory překážek a úspěšnosti). Třetí vrstva – *Benchmarking (B)* - představuje krátkou diskusi o úspěšné univerzitě při uplatňování OI a dosahuje viditelných výsledků. Analýza University of Utah (UOU) je používána jako standardní model, aby umožnila vedoucím pracovníkům dvou vysokých škol, Univerzity Tomáše Bati ve Zlíně (UTB) a Pharos

University v Egyptě (PU), přizpůsobit díky diferenciaci nové metody k dosažení vlastní trvalé konkurenční výhody. Čtvrtá vrstva - *Design (D)* - se skládá ze tři dílčích vrstev (kapitol). Poskytuje výsledky této studie. Poté na základě těchto výsledků, nabízí také novou strategii, která se skládá z propojených kroků, které formulují OI strategii pro dosažení vlastního posílení konkurenční výhody. Kromě toho dává některá doporučení pro obě univerzity (UTB a PU), aby se přizpůsobily této nové strategii na vytvoření strategie akční. Pátá vrstva - Escher cyklus, poskytuje diskuzi o tom, jak může univerzita dosáhnout konkurenční výhody, dále je obsažen závěr disertace i budoucí výzkum. Tato vrstva zakončuje cyklus a dává příležitost k opakování celého cyklu.

EXTENDED ABSTRACT

 Universities today face many challenges. The first is how to create some forms of competitive advantage that will last in the face of almost constant innovations by rivals. There is a need for every university to find a suitable strategy that allows achieving this goal. However, strategy by itself adds no value, only actions create value. But actions that are not aligned to a good strategic direction can just as easily destroy values as create it. How can we differentiate university's activities to create a self-sustainable competitive advantage? This dissertation tries to find answers for this question.

 Recently, a university's role has been enlarged to include not only teaching and research but also regional development under the name of 'entrepreneurial university'. This concept is based on the idea that a university should be connected to industry and government to formulate the entrepreneurial triangle, (Etzkowitz, 2003). Moreover, Open Innovation (OI) paradigm believes that gaining added-value can be done by establishing win-win relationships between a university and all the components of its ecosystem (e.g. students, employees, staff, suppliers, employers, parents, SMEs, industry and governmental agencies). These new notions enforce a university to be a living organism that uses knowledge, management, creativity, innovation and entrepreneurship as strategic tools to response to these new challenges. A university, as an innovation factory, has to transfer its on-the-shelf knowledge to the market to gain added-value. Transferring technology can be done either by commercialization activities (e.g. patents, copyrights, licensing etc.) or even for free in some cases (e.g. free consultation). Integrating ecosystem's components in the innovation processes ensures maximizing the value-added to all participants. This is the only way to achieve a self-sustainable competitive advantage. Every university has to find unique methods to do these functions in order to differentiate itself from the competitors. Focusing on these tasks helps the university to reduce its workload and increase the return. Additionally, Commercialization of university research is essential for many reasons (e.g. increase profits, gain a competitive advantage, and participate in regional development etc.).

 This research shows how strategic advantage builds in layers and each layer consists of sub-layers. The greatest advantage of all comes when the university learns to link its ecosystem activities together in a way that generates higher levels of performance at them all. This creates a self-reinforcing loop of improving ability – a self-reinforcing loop of strategic advantage – that addresses the task of creating strategic advantage that not only lasts but actually grows the more of it a university has, (Jackson, 2004).

Five layers for building self-sustainable competitive advantage (A-U-B-D-E)

This dissertation consists of five layers that formulate the Escher cycle pyramid. Every layer contains sub-layers (chapters). This pyramid starts in an iterative way, from bottom-to-top, layer after layer, to achieve the self-reinforcing competitive advantage and returns back from top-to-bottom to review each layer and take a corrective action. This will complete the cycle and makes the self-reinforcing loop. Inside this loop, each layer consists of sub-layer(s) or chapter(s). Each part-as in the living system-formulates a circle. The following figure shows this loop:
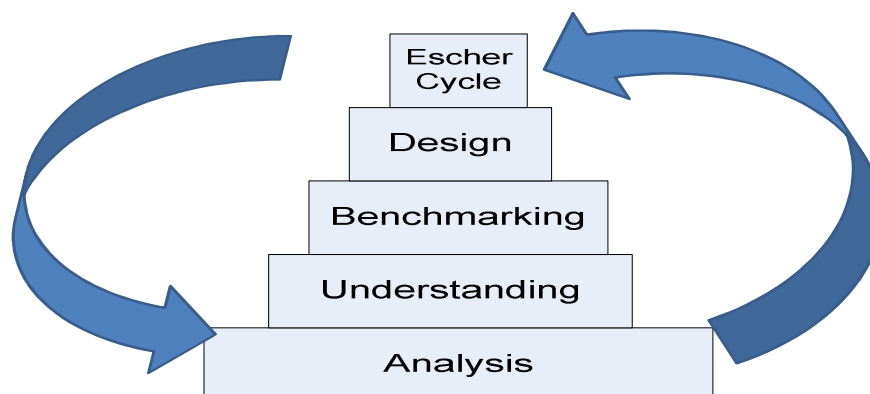
Figure 2: Self-sustinable competitive advantage (The Escher Cycle)
Source: Author's work

The first layer –*Analysis (A)* - provides an introduction and literature review for this dissertation to allow the reader to understand where this research comes from (research questions) and how the author tries to answer these questions (research methodology). The second layer -*Understanding* (U) – shows a university as a living organism and related concepts to build a common ground to allow comprehending the new strategy. It consists of two sub-layers/chapters (e.g. importance of the research, university as a living organism, Open Innovation tools, barriers and success factors). The third layer – *Benchmarking (B)* – introduces a brief discussion of a successful university in applying OI and achieves noticeable results. Analysis of University of Utah (UOU) is used as a standard model to allow seniors managers inside two universities, the Tomas Bata University (TBU), and Pharos University (PU), to adapt new methods to achieve the self-sustainable competitive advantage through differentiation. The fourth layer – *Design (D)* – consists of three sub-layers. It provides results of the study. Then, based on these results, it provides a new strategy that consists of connected steps which formulate the OI strategy to achieve the self-reinforcing competitive advantage. Additionally, it gives some recommendations for both universities (TBU and PU) to adapt this new strategy to create an actionable strategy. The fifth layer – the Escher Cycle- gives a discussion of how a university can achieve its competitive advantage, dissertation's conclusion and future research. This layer completes the loop and gives an opportunity to repeat the cycle.

CHAPTER ONE
 INTRODUCTION

In knowledge-based economy, capturing and leveraging the value of intellectual property is generally held to be the path to sustainable wealth creation and societal benefits. Economic prosperity depends heavily on exploiting innovation capacity, improving competitiveness, and enhancing productivity. Globalization, knowledge revolution and networking are driving forces for the knowledge-based economy. Universities are part of a larger economic ecosystem, which works best if the partnerships are open, collaborative and organized around win-win principles. Currently, there are many obstacles that face the university (e.g. internationalization, and Marketization), (Gibb, 2009). As a result, Diffusion of Higher Education' which means increasing the demand of higher education leads in turn to the creation of openly competitive market between universities (Rinne and Koivula, 2009). Additionally, most of universities' applied strategies have failed in the talking-doing gap. This means there is a need for universities' senior managers to control this uncertainty and to handle such a complexity by innovating new strategies to mitigate most of mentioned obstacles.

The so-called "linear model of innovation" ideas flow naturally from university science and technology that can be commercially exploited and turned into economic growth. This paradigm has turned out to be ineffective because of many reasons such as: Organizational collaboration has replaced competition and networking has been advanced as being beneficial for the innovative performance of the organization, (Zeleny, 2005). The vital role of open networking has been well confirmed and understood by organizations, and cooperation with other parties such as: suppliers, customers, competitors and governmental agencies - has been attracted their attention. Advantages of OI to introduce new successful innovation are higher when they are seen from a collaboration perspective. At the same time, cooperation means a lot of risks because it indicates having new partners, (Teece et al, 1997). Risks are higher when the reason for collaboration is also to open up the innovation process, (Valkokari et al., 2009). The OI paradigm has a potential advantage for universities to increase their returns through enriching their innovation activities and intellectual property (IP) by releasing their control over both, (Chesbrough, 2003 b). The new paradigm explains that competitive advantage can be achieved through inbound and outbound OI, (Chesbrough and Crowther, 2006).

In this dissertation, universities in Egypt and the Czech Republic are divided into two groups: public and private universities. There are numerous similarities in both systems. The Egyptian Higher Education system is composed of public and private universities as well as a number of medium and higher institutes. There are twenty three public universities making up 63% of total higher education enrollment and

overcrowded with students' body of several thousands. Al Azhar University is somewhat unique, as the country's largest government-funded religious university. It is administrated by the Ministry of Religious Endowments, and it attracts 18% of total enrolled undergraduates. The second type is the private universities and institutions which increased in number from two universities before 1993 to more than thirty universities and institutions now. Private universities receive no-state funding and are solely dependent on their internally generated resources, supporting foundations and non-for-profit organizations. The new educational trend in Egyptian society is to escape from the overcrowded universities to new efficient universities that provide modernized and up-to-date education.

The Czech Republic is one of the 'transition' or 'post communist' countries where higher education reform was implemented together with the transition from an authoritarian to democratic political system and forms a command-type to market-driven economy, (Mateju et al., 2007). There are three types of higher education institutions in the Czech Republic: public, state and private. Universities carry out research, science, and development activities in addition to teaching, while colleges focus on teaching, (Mateju et al., 2007). There are twenty four public universities and two state colleges: the Police Academy and the University of Defense. Public institutions comprise more than 90% of students and the vast majority of their revenues -comes from public resources. Other income sources include property revenues, services to students, extra teaching activities, R&D activities and study related fees, (Pabian et al., 2006). Additionally there are thirty private schools. They must receive accreditation from the Ministry of Education, Youth and Sports. Private colleges usually offer bachelor's degrees, although a few have master's programs. The majority of private colleges are in Prague, (Mateju et al., 2007).

The large number of universities and institutions in both societies increases the competition between peers and forces every university to create its competitive advantage to attract students and encourage their parents with enhanced capabilities to place up-to-date graduates in the market. Trying to preserve the status quo is not a viable option for any institution in the coming decade, as technology, demands, and increased competition from private, public and for-profit providers continues to transform the higher education industry. Cabrera (2010) stated that "*the current system is under enormous pressure, and if old actors don't change, new ones are likely to take their place. In the era of Massachusetts Institute of Technology (MIT)'s open courseware and Apple's ITunes University, content differentiation cannot be the answer. Institutions will compete through their specific differentiated approaches to education, their values, their brands, their networks, their capacity to accommodate the preferences and needs of specific population*".

Therefore, in such competitive societies those are moving towards re-localization 'think globally and act locally', corporate universities, entrepreneurial universities and on-line education; there is a need for applying innovation to gain a self-sustainable competitive advantage. "…*Innovation is a strategy and action-not a statem*ent", (Zeleny, 2006). Shorter innovation cycles, research and development's increasing costs as well as the scarcity of resources are some of reasons for organizations to look for new ways to innovate, (Chesbrough, 2003a). The question is not why to innovate but how to innovate. The game is differentiation-not imitation, (Zeleny, 2005a). University can be considered as a living organism that needs to combine all internal and external capabilities to advance its role in teaching, research and regional development. Firstly, this living organism has to produce and advance internal skills and resources. Secondly, this living organization should look for nurturing these capabilities by combining external resources through OI. This combination will ensure achieving two balances: internal balance and outer balance with the surrounding environment, (Zeleny, 2006). This will lead to a self-reinforcing competitive advantage.

However, innovation is a risky process that requires careful planning and risk analysis because organizations need to protect their internal knowledge to gain a competitive advantage. To mitigate this risk the organization can use the strategy of co-operation and spreading of risk among different projects and partners. OI can play a vital role in building competitive advantage of the university by focusing on creating differentiating factors in the value chain in ways that make them difficult for competitors to replicate. This approach requires internal focus on key processes and the use of resources to support and sustain the business model, (Chesbrough, 2003a).

The new OI model stresses the idea that the organization requires opening up its innovation processes and combine internally and externally developed technologies to create business value (Chesbrough 2003a; 2003b). Chesbrough stated that " *the old closed innovation model, which depends on the idea that innovation process inside the organization should be internally controlled and to be as a self- reliance, is dogmatic and has to be changed*", Chesbrough defines OI as:

"...the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes -firms can and should use external ideas as well as internal ideas, and internal and external paths to the market, as the firms look to advance their technology..." (Chesbrough, 2006)

The new trends in higher education system and analysis of the literature review in this research give some direction to what university should do to apply an OI strategy. By combining the work of Chesbrough, Jackson, Zeleny, other educators and the OI literature at large we can identify some capabilities and some reasonable practices and

models that give substances and some detailed description for university change. There are some issues that have to be taken into consideration to allow applying the OI strategy such as: cultural, strategic, financial and structural circumstances. Beside this, the role of managers and leaders who should create these circumstances and reshape behaviors including their own should be investigated, (Burykhina, 2009). The university' success in applying a coherent OI strategy will increase the ability of the university to achieve a self-reinforcing sustainable competitive advantage and create added-value. So, the OI approach should be enforced and encouraged through the entire university- from the student to the professor level. This means support of a specific state of mind and intellectual approach to science and related network which would enable rapid responses to the coming challenges and acceptance of new ideas.

Benefiting from applying the OI strategy, Pharos University (PU) in Egypt and Tomas Bata University (TBU) in the Czech Republic can achieve their goals such as: aspires to be one of the leading comprehensive universities in the region by gaining a self-reinforcing sustainable competitive advantage. In addition, they can seek to meet the needs of the community, cope with the continuing technological development and prepare their students for inspired leadership, personal fulfillment and lifetime learning. This can be achieved through creating a methodology to apply OI strategy and allow the university to serve as a particular fertile ground for innovation due to its large human capital inflow represented by students - the source of potential highly qualified human capital. Both universities can create an innovative culture to support the new strategy and permit students and professors to innovate and to introduce new ideas for different fields – intellectually, politically and commercially, (Burykhina, 2009). The guideline developed in this dissertation can be further adjusted and refined for other individual universities, depending on their stage of development, size and overall resources and capabilities. The dissertation introduces a conceptual base for further exploration and managerial practices. In addition, the author wishes that this study would allow senior university managers to better address the capability issues. The next part provides a brief description of the driving forces to foster the utilization of OI.

1.1. Open Innovation Driving Forces

In the era of internationalization, there are a lot of new forms and trends of business which enforce the university to open its boundaries and to combine internal and external capabilities through a dynamic OI strategy - to be able to quickly and flexibly respond to unpredictable changes. The era of forecasting and predicting has gone, (Zeleny, 2005a). According to (Gassmann, 2006), these changes have affected the business environment and create a need for new strategies. The following figure shows these driving forces:
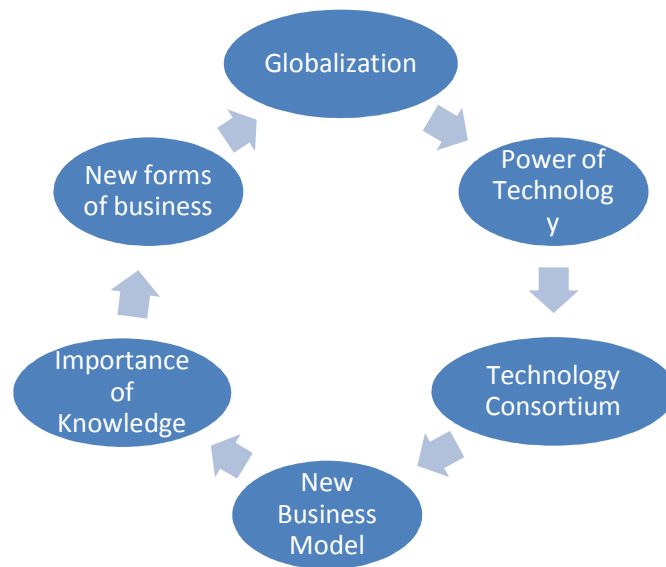
Figure 3: Driving Forces for Open innovation
Source: Author's work

1.1.1. Globalization

It is characterized with a high mobility of capital, diminishing in logistics costs, advanced technology and communications and existing of knowledgeable customer. Globalization decreases the entry barriers and changes the competition into co-operation or "coo-petition" even with the competitors. Integrating the whole components of the ecosystem is useful. Additionally, networking is the new powerful tool for competition. Moreover, global organizations need OI to achieve economic of scale, sustainable competitive advantage and more powerful market segmentation (Anderson and Tushman, 1990).

1.1.2. Power of Technology

Currently, many advanced technologies have emerged and organizations, even large ones, cannot cope with all emerging technologies because of the lack of financial sources to utilize all of them. Universities have a lot of "on-the-shelf "technologies and many organizations require such technologies for developing new products and services. There is a need for both parties (universities and public/private sector) to collaborate together to decrease cost and enrich the developed technology.

1.1.3. Technology Consortium

New fields of complex and advanced technologies such as: Nano-technology, Mechatronics, Optronics and Bioinformatics (Kodama, 2007) have emerged requiring a network of *intellectual properties* (IPs) and a massive financial support. Although large research universities have the required IPs, there is a lack for capitals required to make

a significant progress and to provide successful innovations. Meanwhile, academia thought has to be enriched and supplemented with practical ideas and practices from industry, suppliers, customers and competitors who are "thinking out of the box".

1.1.4. New Business Model

The massive diffusion of advanced technologies and the global open boundaries create new business opportunities. For example, multinational organizations acquire a lot of new companies and build giants organizations (e.g. the multimedia industry merges together firms in different sectors and specialties as for example hardware, software, telecommunications, information and entertainment). At the same time, new alliances have been shaped leading to complementary partnership (e.g. Vodaphone – Swisscom, Sony Ericson or Sony-BMG). The most important reason for such coalitions is to divide and share risk and to achieve synergy of resources. Companies and universities have to choose the best innovations and technologies that are compatible with their business model, or they have to adjust their business model to be more flexible to absorb and utilize advanced innovations. A business model will be explained in details in the next layer.

1.1.5. Importance of Knowledge

Knowledge as an action has become the most powerful asset for the organization, (Zeleny, 2005 b). Building the organizational brain can be beneficial for enhancing the organizational strategy. It is a crucial task and could be considered as a corner stone for future progress. Due to the large number of knowledgeable workers, knowledge shift is easier and could be transferred from one organization to another through (e.g. freelancers, consultants, or part-time engineers).

1.1.6. New forms of business

Globalization creates the global customer who is knowledgeable, looking for a unique quality with fair cost and faster delivery. These requirements enforce the organization to develop new types of business that can handle the global customer requirements (Zeleny, 2010). OI can play a vital role in this part by integrating customers, users, competitors and suppliers in innovation processes. Some of these new forms are as follows, (Zeleny, 2007):

- *Mass customization*: tailoring the customer order according to specific measurements. This concept is based on an idea of "First sell then produce". It allows the customers to design their own product or service.

- *Disintermediation*: removing the middleman and keeping an open line between the producer and the customer. The idea is to re-evaluate the adding value of dealers, agents, wholesalers, retailers, and warehouses in order to decrease or eliminate their costs.

- *Self-service and do-it-yourself*: customers can help themselves. This new trend is based on the concept that customers should be integrated into suitable production processes which decreases cost and accelerate the production rate.

- *Work at home:* saving the location cost and travel expenditures are the most important drivers of this new trend. Many programmers and translators can work from home. Many companies build a mixed network that consists of professionals, experts and even some amateurs, all of them working from home enriching the databank of the company. It allows the firm to differentiate it-self and achieve the self-reinforcing competitive advantage.

1.2. Motivation for This Study

The motivation for this study emerges from an attempt to understand how a university can create and maintain its self-competitive advantage in a complex and dynamic environment. The significant contribution of the OI model in advancing and sustaining the competitive advantage for some universities was the stimulus and motive to create a new mechanism that allows a university to apply the new approach. As the application of the new approach is an individual trial and there is no common well-designed strategy, the purpose of this study is to create a concrete mechanism to solve this issue and to create the self-sustainable competitive advantage.

1.3. Justification for The Study

Based on the above discussion, it is possible to argue that there is a need for a research that identifies a new guideline for the university to know how to benefit from applying OI model. Chesbrough (2003a, 2003b, 2006) is the author who invented the term 'OI'. His work explained the definition of the term and how to apply it in a business organization. He provided the required definitions and methodology on how to apply OI strategies by focusing on business companies. For the research requirement, there is a need to customize OI strategy according to a university business model and to do the required adjustments to mitigate the differences. Second, Zeleny (2006) provided a study for building Innovation Factory. This research introduced two types of cycles: Knowledge Cycle, and Innovation Cycle. It considered the knowledge cycle as the enabler of the innovation cycle. According to this study, there is a need to identify a new dynamic framework for the OI approach. Third, Zeleny (2007) said that "*no organization is an island and all are part of a network*". He emphasized that the old traditional scheme of production and service delivery process that is based on [inputs ➔ process➔outputs], has to be changed to disaggregated and distributed, subjected to non-linear modularity. This will bring forth entirely new ways of making things and delivering services. Additionally, he mentioned that both internal and external sources of knowledge and competitiveness formulate new core competencies. Network co-operation replaces competition. As a result, the university should build its open

ecosystem to enrich its capabilities and competencies. It must look for long-term alliances and sustainable competitive advantage. Short-term competitive advantage is ineffective in a radically transforming world. The university should focus on the adding-value process to serve the global and local students well. The global student is searching for the best quality at the lowest cost and the greatest speed. Achieving this combination is the essential condition for gaining sustainable competitive advantage, (Zeleny, 2007). Fourth, the notion of strategy implementation is typically the gap between doing and talking. Top-down approach that starts with vision, mission statements is an obvious meaning of talking substitutes actions. There is a need for new generation of strategic approaches that mitigate the gap. There is a need for knowledge-based strategy not information-based strategy. Fifth, traditional strategic approaches treat the strategy from a static point of view, or a forecasting position. There is a need for agile - iterative approach that allows identifying the actual capabilities, actual activities, reasonable objectives and suitable plan to achieve these goals through side by side activities - not sequential activities. Developing a coherent evolving pattern of action is what modern organizations need. Sixth, Competitive advantage is correlated with created value for both the business and the customer. A win-win relation does exist. For this research, there is a need to identify the university competitive advantage from the customer point of view. Seventh, the university has to differentiate itself through maximizing the value that delivered to the global customer. The university's customers should be specified to measure the added-value for them.

1.4. Research Focus

This new strategy considers the differences between each university and therefore, it has to be circumstances-based-view approach. Strategy implementation is a long-term task that needs a long time to measure its effects. As a result, this research focused only on planning and designing the OI strategy and the OI implementation will be out of the scope of this dissertation.

1.5. Thesis Goals and Research Objectives

Applying OI strategy in the university requires a guideline or a protocol to allow the governance of the strategy and to make its application more predictable. This study is intended for university's managers who wish to implement OI strategy and need a guideline to proceed with successful application. So, the main research objectives are to: first is to identify and explore the new OI phenomena and the gap in the literature review. Second is to highlight the importance and benefits that the university gains from applying the new model. Third is to provide an explanation for the self-sustainable competitive advantage. Fourth is to introduce a brief explanation for success factors or barriers that advance/obstruct the application of OI and fifth is to create a mechanism for the university to effectively apply the OI strategy to gain a self-sustainable competitive advantage.

1.6. Research Questions

Research main question

How can a university form and apply an open innovation strategy to create a self-sustainable competitive advantage?

To answer this question, there are some sub-questions that have to be answered first:

- It is required to identify the importance of the new strategy and the benefits of applying it to the university and to the community surrounding the university. So the first question will be:

Q1: Is the creation of a guideline / protocol to apply open innovation strategy in the university important to gain a self - sustainable competitive advantage?

- OI is a new paradigm that replaces the closed innovation. There is a need to define the new model and to identify the available alternatives for the university to apply this new strategy. Therefore, the second question will be:

Q2: What is open innovation? And what are alternatives of open innovation strategies available for the university?

- A university's self-sustainable competitive advantage is based on actions not statements. The researcher will introduce a brief discussion of different competitive advantage concepts and definitions. Then, the author will provide an explanation of the main activities that should be executed to allow the university self-sustainable competitive advantage to emerge. Therefore, the third question is:

Q3: What is the university's self sustainable competitive advantage and what are the required activities to achieve it?

- Applying OI at the university is not an easy task and it is risky, so success factors that support the new strategy should be identified in order to increase the effectiveness of the new strategy. Meanwhile, obstacles that may hinder this application should be specified and handled to avoid their side effects. Therefore, the fourth question will be

Q4: What are the success factors/obstacles that support/ hinder applying an open innovation strategy?

- The university that wishes to apply the new model must have a guideline /protocol that allows easy application of the new strategy in order to facilitate the transformation and minimize application problems: therefore, the fifth question will be:

Q5: What is the mechanism for applying the open innovation strategy at the university?

The following figure provides a framework of the research questions
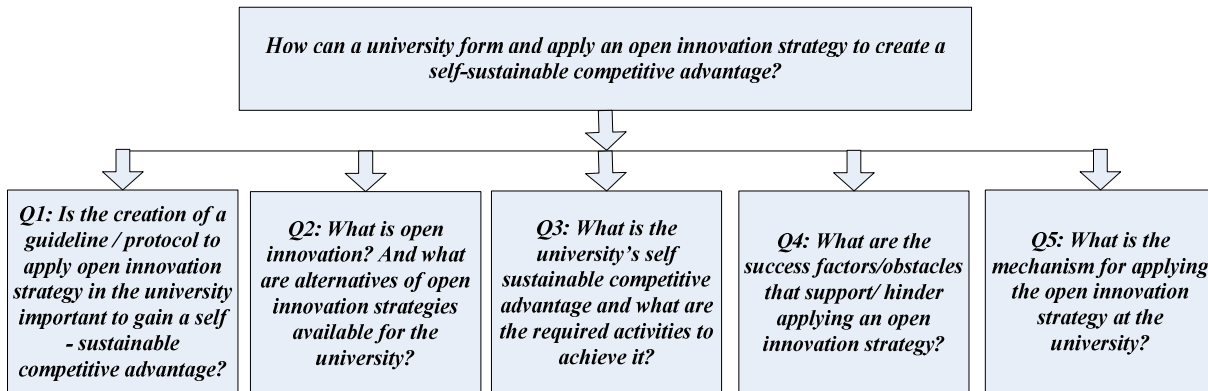
Figure 4: Research questions

Source: Author's Work

1.7. Research Model

This dissertation aims to find a methodology for a university to differentiate its activities from other competitors. The goal is differentiation by creating a self-sustainable competitive advantage. The author considers university as a living organism. So, the OI strategy has to be a spiral methodology that consists of connected components. Each step needs careful analysis, planning and implementation. This model allows a university to continuously enhance its strategy and create the required self-sustainable competitive advantage.
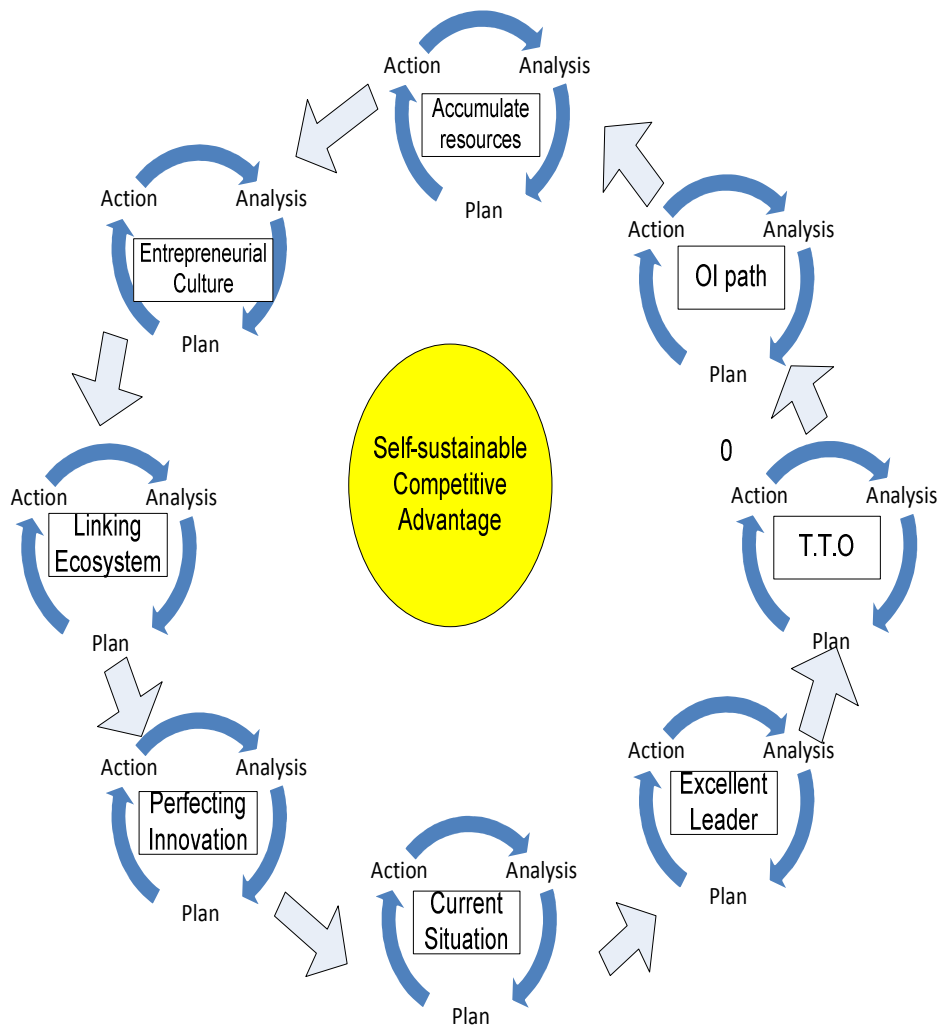
Figure 5: Research Model

Source: Author's work

1.8. Organization of The Study

As mentioned before, this dissertation considers a university as a living organism. Therefore, it introduces a new OI methodology that consists of five main layers. Each layer consists of sub-layer(s)/chapter(s).

A. The first Layer: *Analysis(A)* includes the following Sub-layers/ Chapters:

Chapter One: Introduction

It provides a brief explanation of the research and it contains motivation and justification of the study and thesis outlines.

Chapter Two: Review of Literature

It gives an overall view of the existing knowledge of driving forces, importance, mechanisms and barriers/success factors of OI and strategy formulation processes.

Chapter Three: Research Methodology

This chapter provides the theoretical perspectives for this dissertation based on the literature and research questions in chapter two. A research model is utilized to clarify the theoretical orientation of this research and serves as a guide to subsequent data collection and interpretation. This section discusses the planning and the implementation of the practical part of the dissertation. The qualitative study is based on mainly multiple case studies. Data collection is based on in-depth interviews as well as documentary data from different sources. Data analysis includes the use of qualitative thematic analysis.

U. The second Layer: *Understanding (U)* includes the following sub-layers/Chapters

Chapter Four: Understanding of Open Innovation

This chapter consists of two parts. The first part is to explain the importance and benefits that the university and other stakeholders will gain from applying OI strategy. The second part is to provide a brief explanation and principles of how a university can be considered as a living organism. It provides a new dynamic framework to advance OI. It discusses the self-sustainable competitive advantage concept. This new approach needs a new business model; therefore it introduces a new dynamic business model to advance university activities.

Chapter Five: Understanding of OI tools, barriers and success factors

It consists of two parts. The first one is to provide an explanation of the different tools used by a university to implement and utilize the OI strategy. The second part is to introduce an explanation of the barriers that prevent and diminish the implementation of the OI strategy. It describes different factors and highlights its effect on the university's performance. Additionally, this part introduces a brief explanation of the enablers, success factors and conditions that are essential for facilitating the co-development and application of a new OI Strategy. These enablers are important to identify the type of desired collaboration between the university and all other external partners.

B. The Third Layer: *Benchmarking (B)*contains the following sub-layers/Chapters

Chapter Six: The case of The University of Utah

  This chapter analyzes the University of Utah which has been chosen as a standard and a benchmark case-study. University of Utah is an example of a successful university in applying OI strategy. It provides a profile for the university and the economic impact. Moreover, it introduces an explanation for the pillars that constitute the OI strategy.

  C. The Fourth Layer: *Design (D)* consists of the following sub-layers/Chapters:

Chapter Seven: Results of the research

  In this chapter, analysis of the interviews will be explored to allow the design of the proposed strategy.

Chapter Eight: Open Innovation Strategy to achieve a Self-Sustainable Competitive Advantage at a University

  Based on the previous results, this chapter provides a dynamic strategy that allows university to achieve a self-sustainable competitive advantage. This strategy is a circumstances based-view. This means that it considers the differences between each university regarding resources, structure, shared values, skills, styles and staff.

Chapter Nine: Recommendations and applying the proposed strategy

  This chapter introduces a brief discussion of how both universities, (TBU and PU), can benefit from applying the OI strategy. In this part, activities of both universities will be analyzed and investigated to identify differentiation capabilities that allow every university to achieve a unique competitive advantage. Additionally, some recommendations will be suggested to advance the applied strategy and achieve the self-sustainability of the competitive advantage

E. The Fifth Layer: *The Escher Cycle (E)* consists of the following sub-layers/Chapters

Chapter Ten: The Escher Cycle- setting all together

  In this chapter an explanation of the Escher Cycle will be explained and the sources of self- sustainable competitive advantage will be discussed.

Chapter Eleven: Conclusion, Limitation and Future research

  The conclusion of the research is provided. Finally, the limitations of the study are discussed and possible directions for future research are suggested.

CHAPTER TWO
REVIEW OF LITERATURE

"Search previous studies to identify the research gap"

This chapter provides a brief literature review for this dissertation. It introduces an introduction of the origin of innovation studies, reasons for OI, mechanisms of innovations and benefits of implementation of the new approach. Moreover, it introduces a discussion of barriers and success factors that face universities applying OI, competitive advantage explanation and sources, and the using of strategy in higher education institutions in order to identify the literature gaps that will be mitigated by this dissertation.

2.1. Innovation

Open Innovation is not a new phenomenon. "*The first open-source project was writing the first Oxford English Dictionary. Editors solicited the participation of hundreds of amateur volunteer readers*", (Bughin, 2012). Many years ago, several authors started the discussion of innovation that created the foundation for developing the ideas and concepts of OI. In 1934, Schumpeter, one of the best pioneers in the innovation field, pointed up the need of studying the relationship between innovation and entrepreneurship. Schumpeter provided a creative-destruction model that was described in his book named "Capitalism, Socialism and Democracy", (Schumpeter, 1942)). In this model, he explained the process of creative-destruction as a process of transformation that resulted from radical innovation. For example, the invention of the electric typewriting machine destroyed the market of manual typewriting machines and created a new market for the new product, (Schumpeter, 1947). Von Hayek (1945), a co-winner of the Nobel Prize in 1974, specified the problem of the rational economic model that is the lack of equal distribution of knowledge. This problem affected the centralized models for economic planning and failed because of the inability of these models to combine this distributed knowledge. Lawrence and Lorsch (1967) provided a study to explain the importance of connecting technological innovation success and the degree to which an organization can couple its research and development activities to the market. Armour and Teece (1980) complemented the previous work by stressing the importance of co-operation between several phases of innovation and the sharing of common technological information, (Gasparin, 2010). This integration would facilitate the dissemination of new technology when interdependencies are involved. Besides this, there should be a common research objective to increase integration among processes.

2.2. Reasons enforce Open Innovation

Today, the innovation processes is facing deep changes in the way it is managed because of many reasons such as globalization and technological developments, (Pinheiro et al, 2009). Many authors provided brief explanations of driving forces that enforce organizations to advance their innovation management's way and shift to OI approach. For example, the organization has to look for a self-sustainable competitive advantage instead of a short-term competitive advantage, (Zeleny, 2010). In the closed innovation approach, the organization achieves its competitive advantage based on ideas and inventions that are internally emerged in their R&D labs, (Balu, 2007). Any project that is not compatible with the enterprise's key activities should be put on-the-shelf, waiting for a commercialization chance, (Hemphill, 2005). Practically, there is a limited possibility for such an opportunity to come, (Blau, 2007). In this closed model, large financial investments are crucial for gaining a competitive advantage, (Chesbrough, 2003a). The organization that cannot adequately finance its internal R&D activities for discovering new innovative products and services will face the risk of losing its competitive advantage and become obsolete by competitors who are able to provide capable resources for internal discovers, (Alio, 2005). Additionally, the used business model focused only on internally developed technologies that have to be commercialized by the organizational sales activities, (Chesbrough and Schwartz, 2007). This static business model ignores the fact that innovation processes need interaction between partners and network all collaborators, suppliers, customers and even competitors, (Smith, 2004; Zeleny, 2008). There are some other reasons that pave the way for organizations to open their boundaries for external collaboration such as: 1) Technological variety introduced by external collaborators that could achieve a sustainable competitive advantage, (Zeleny, 2010), 2) Strategic management change towards utilizing on-the-shelf ideas and projects otherwise they should be considered as a wasting of time and efforts, (Chesbrough, 2008); 3) Availability of experienced workers mobility who are able to move their knowledge between organizations, (Smith, 2004); and 4) The private sector support to finance new companies and utilize ideas and discovers, (Chesbrough, 2003a). Furthermore, globalization and internationalization of the knowledge-based society permit the organizations in different fields (e.g. Pharmaceutics, Petrochemical, Heavy Equipment, Automobile and Biotechnology) to practice innovation processes based on the new open concept, (Gassmann, 2006). Studies mentioned above are focused only on commercial enterprises. There are no practical studies to describe the reasons that enforce higher education institutes to adopt the new OI approach. *So, there is a need to identify these driving forces from a university point of view.*

2.3. Benefits of Open Innovation

According to (Pinheiro et al, 2009), there are also many authors who discussed the importance of the collaborative relationship between companies and universities. According to them, companies can obtain many advantages. Baba et al (2009) stated that companies can advance their R&D activities in terms of internationalization and maximizing the tendency of developed technologies. In many cases, collaboration in large projects encouraged by government- means increasing provided fund and enhancing investigation environment, (Saez et al., 2002). The co-operation between the university and the firm may require changes in the enterprise's strategy which could enhance its competitive position in the market, (Heidrick et al., 2005). Varity of advanced products and services and adding new technological product lines are additional benefits for the company, (Smith and Bagchi-Sen, 2006). Innovation processes are risky and difficult to be totally handled by one company. So, there is a need for risk sharing and distribute uncertainties with external partners (e.g. universities), (Hall et al., 2003). Companies can have advanced and scientific solutions for their complex-technical problems throughout collaborating with universities, (Heidrick et al., 2005). Additionally, a company can utilize the partnership for faster technology development and gain a competitive advantage, (Hall et al., 2003). Companies also can enhance its strategic planning by establishing short-term and long-term co-operation plans that can guarantee a flow of innovative ideas to achieve a self-sustainable competitive advantage. Company's researchers can use the academic labs which decreases R&D costs, (Heidrick et al., 2005). Besides this, sales and profits increase because of implementing new technologies and enhancing the enterprise image and prestige are additional advantages for the company, (Macpherson and Ziolkowski, 2005). There are limited number of authors who discussed the benefits of the relationship between the university and the firm. Heidrick et al (2005) mentioned that the university can gain commercialization chances for its developed technologies, gathering practical experiences needed for the researchers from industry and obtaining financial support from external partners. These studies introduced the importance of the relationship for the firm and ignored the advantages that the university can achieve for relating with the organizations (e.g. industry, government, private sector and non-for profit organizations). None of previous studies explains the potentiality of such collaboration. *Therefore, there is a need to investigate and provide a wide explanation for the importance of OI from a university point of view.*

2.4. Innovation Mechanism

Traditional model of innovation is called closed innovation, because it is a view that states *"…successful innovation requires control and organizations must generate their*

own ideas and then develop, build, market, distribute- service, finance, and support them on their own", (Chesbrough, 2003a). This model is based on the idea that the organization is totally closed within itself, (Smith, 2004; Alio, 2005). Additionally, the communication between organization, suppliers, customers and cooperators does not exist. This view was obsolete and there was a need for a new paradigm that enriched the organization with new knowledge and enhanced the organizational Intellectual Assets. The following figure represents the closed innovation.
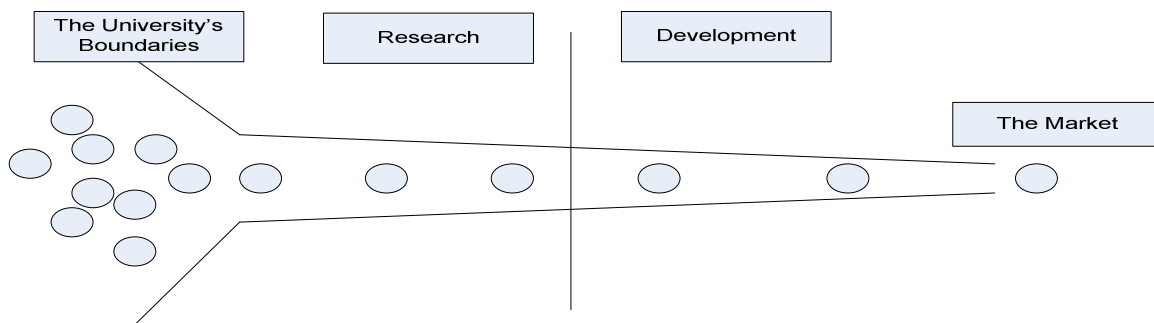
Figure 6: Closed Innovation Processes
Source: Chesbrough (2003a)

Recently, a new innovation model has emerged and developed by Henry Chesbrough (2003a). This new notion is called OI. This new paradigm depends on the idea that organizations are in need of opening up their innovation processes and linking internal and external technologies to create more business value to achieve competitive advantage. This model introduces a contrary idea to the Closed Innovation Model. In the Closed Model, internal R& D is treated as valuable strategic assets that have to be controlled by the company in isolation and kept as secrets. Due to the changes in the society and the industry such as: increased mobility of workers' knowledge and the development of new financial structures - for example: Venture Capital, OI shifts this idea to make organizational boundaries more permeable. The following figure shows the flow of innovation in OI paradigm.
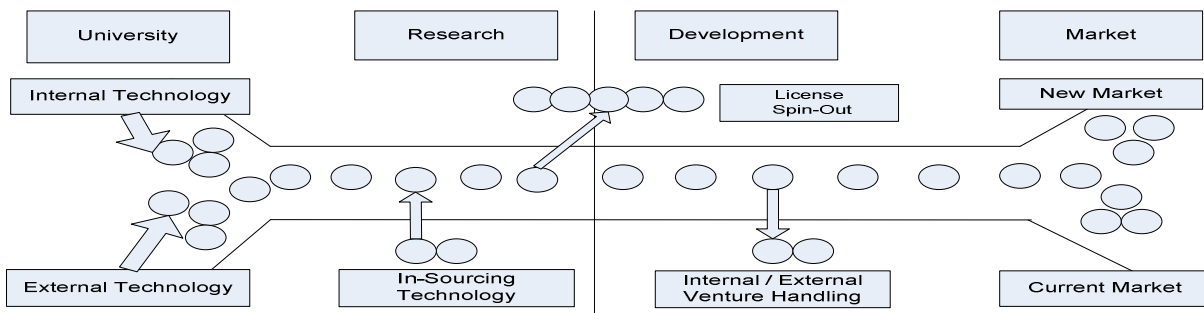
Figure 7: Open Innovation Processes
Source: Author's work adapted from (Chesbrough, 2003a)

The new approach is based on a static innovation processes. The old scheme [Inputs➔ Process➔ Outputs] is obsolete, costly and time-consuming. In a fast growing and complex technological environment, there is a need for iterative and dynamic innovation processes that can integrate all the components of the university ecosystem. The new innovation cycle has to be concurrent. *Therefore, it is required to develop a new dynamic framework for OI that mitigates the linearity problems of the old one.*

2.5.   Barriers and Success Factors

According to Salter et al. (2009), who have investigated the factors that diminish the relationship between university and industry, barriers are divided into two groups. The first is orientation-related barriers that contain obstacles such as:1) University research is extremely oriented towards pure science; 2) long-term orientation of university research and mutual lack of understanding about expectations and working practices. The second is transactions-related barriers (e.g. conflicts over IP ownership, unrealistic expectations about the commercial potential of university research, rules and regulations imposed by universities or governments funding agencies, and absence of low profile of industrial liaison offices in the university), (Claryss et al., 2007). Fabrizio (2006) mentioned that the use of university research in firm innovation is an imperative approach for the firm because of many reasons. However, he added many restirections that diminish this relationship. For example, firms are more willing to protect their property rights and commercialize all the developed technologies to gain profits. A university is more open and looks for knowledge sharing as a part of its role in the society. Seashore et al. (2001) find that university researchers, who are more involved in commercialization of developed technologies, are more secretive about their research information and out-put. Ramaprasad and La Paz (2007) provided a typology that explains barriers and facilitators that affect the transformation of a university into entrepreneurial university. They mentioned barriers such as: 1) Few resources available to finance research and collaboration projects; 2) Limits, protection and regulation on the use and creation of new inventions; 3) Differences in goals and objectives between university and industry; 4) Bias in research due to industrial pressure; 5) Resistance to participate in collaboration; and 6) willingness to focus basic research. Additionally, they emphasized many facilitators for this transformation, for example, 1) Creation of Spin-offs; 2) Multi-skilled research teams; 3) Financial support for commercial applications; 4) Appropriate management of spin-offs; and 5) Fostering of entrepreneurial culture at all levels. Kirkland and Sutch (2009) emphasized the importance of modifying the academic curricula to include educational innovation. So, they provided a different view of barriers that hinder these initiatives (e.g. resistance of risk talking, lack of expertise in innovation management, lack of formal system, and lack of financial funding). Bohringer and Maurer (2004) categorized barriers into many

groups (e.g. personal, problem identification, social interaction, organizational, resources, culture and perception). Most of the studies have investigated the barriers and success factors from the industry point of view. Few numbers of authors studied the barriers and facilitators from a university point of view. *It is essential to provide a complete picture of the barriers/ success factors that obstruct/facilitate the implementation of the OI Strategy at the university.*

2.6. A University's Competitive Advantage

Actually, there is no specific definition of a competitive advantage (CA) which increases the ambiguity regarding the application of this notion. Alderson (1937) provided the basic principle of CA" *it is the specialization of suppliers to meet variations in buyer demand*". He added that the firm should fight for unique characteristics to differentiate itself from rivals in the eyes of the customer, (Alderson, 1965). He mentioned that differential advantages could be created by lower price, advertisements, product development and innovation, (Hoffman, 2000). Hall (1993) stated that a firm needs unique advantages to survive and continue to exist. In (1984), Day suggested new strategies that can support a firm to sustain its CA. In (1985), Porter provided basic forms of competitive strategies (e.g. low-cost or differentiation) to achieve a long-term CA without introducing a clear definition of CA. Barney (1991) tried to introduce a formal definition. He stated " *a firm is said to have a sustained CA when it is implementing a value creating strategy not simultaneously being implemented by any current or potential competitors when these other firms are unable to duplicate the benefits of this strategy*". Hoffman (2000) provided a formal conceptual definition of sustainable CA" *…it is the prolonged benefit of implanting some unique value-creating strategy not simultaneously being implemented by any current or potential competitors along with the inability to duplicate the benefits of this strategy*". New definitions emerged from the customer's point of view such as: "*The strategic development where consumers will select a specific corporation's product/ service over its competitors based on extensively more positive awareness or offerings*"(IISD, 2000).

Additional literature focused on sources of CA. Day and Wensley (1988) focused on the elements involved in CA such as: 'superior skills' or 'distinctive capabilities' of individuals and 'superior resources'. Barney (2001) mentioned that specific resources that have the following characteristics could be a source of sustainable CA (e.g. rareness, value, inability to be imitated and inability to be substituted). Peteraf (1993) provided his resource-based view of the firm to achieve a CA. These resources should have four criteria: superior resources, ex-post limits to competition (including imperfect imitability and imperfect sustainability), imperfect mobility, and ex-ante limits to competition, (Hofmann, 2000). Other researchers have participated in identifying

certain resources and skills that help in the development of CA. they suggested that companies should merge their resources and skills into core competencies, (Prahalad and Hamel, 1990). Potential resources can be classified into financial, physical, legal, human, organizational, informational and relational, (Hunt and Morgan, 1995). The relational view focused the attention on inter-firm relationships that could provide relational assets or capacities, (Lavie, 2006). The activity-position view emphasizes the imperative of systematic activities that fit the strategic position or respond to the competitive context, (Porter, 1996).Porter (1998) stated that achieving competitive advantage strengthens and positions a business better within the business environment. It arises from discovering and implementing ways of competing that are unique and distinctive from those of rivals, and that can be sustained over time, (Porter, 1998). Some researchers have recommended combining different views, (Foss et al, 2007). According to some marketing academic (Hunt & Morgan, 1995), CA is the output of a chain effect, including both resource and positional advantages. Hunt and Morgan (1995) introduced a unique view of competitive advantage that contains CA in resources and CA in market position. These three views of competitive advantage can be categorized into two types. First, the resource-based and the relational views are more resource-oriented. Second, the activity-position view is more position-oriented.

According to Autopoietic cycle CA is defined as "*The increased ability of an organism to survive and reproduce in comparison with other organisms competing for limited resources*" (Stephan et al, 2009). According to Zeleny (2010); in the era where co-operation complements or replaces competition, network of firms are the sources of competitive advantage, customer oriented strategies have emerged, mass customization replaces mass production, and strategy as action is used instead of strategy as a declaration; there is a need to redefine the competitive advantage concept and to measure it according to customer added-value. CA is correlated with created value for both the business and the customer. A win-win relation does exist. He mentioned that both internal and external sources of knowledge and competitiveness form new core competencies. Competitive advantage has increasingly become derived from the external resources of the organization through the extended networks of suppliers and customers. Network cooperation is replacing competition. As a result, the university should build its open ecosystem to enrich its capabilities and competencies. It must look for long-term alliances and sustainable competitive advantage. Short-term competitive advantage is dogmatic. The university should focus on the adding-value process to serve the global student well. The global student is searching for the best quality at the lowest cost and the greatest speed. Achieving this combination is the essential condition for gaining sustainable competitive advantage**.** *For this dissertation, there is a need to identify a self-sustainable competitive advantage from a university- as a living organism- point of view.*

2.7. Strategy and Strategy Formulation Processes

Traditionally, strategy is defined as the designing of a plan of actions to achieve a particular goal/s. It introduces a clear direction to the organization. It contains major developing initiatives controlled by managers to achieve the required goals by exploiting resources to enhance the performance of the organization. However, as a result of the changeable environment and increased competition, strategic planning is understood as a necessity for higher education institutions to face the unpredictable situation, (Dill 1996; Schmidtlein and Milton 1990). During the 1980s, it has been claimed that the period of incremental planning has passed and that universities should implement strategic decision-making, (Keller 1983).

Actually, the use of strategic planning in higher education started in the US during the 1960s, and represented a practice borrowed from the private business sector, (Maassen and Van Vught 1992). Like in the USA, many governments and higher education organizations in many European countries have started to employ strategic planning as a useful tool to handle changes and risk that result from the massive competition in the educational environment. Beside this, strategic planning is described as an important device for reforming higher education institutions by assessing their weaknesses and strengths, and mitigating the defect.

The application of strategic planning in higher education has many supporters because they consider it as a powerful instrument for handling uncertainties and surrounding risks. Additionally, it is obvious that strategic planning is more suitable when there is more predictability in the environment. Moreover, these planning processes are not problematic as long as the system is growing and have broad support in the institution. Meanwhile, there are lots of criticisms of the implementation of strategic planning in higher education. According to (Massen and Van Vught 1992), there is always a limited level of control on the educational environment because changes are an obvious tendency in today's society. Additionally, research has also shown mixed experiences with strategic planning for universities with economic problems (Presley and Leslie 1999). According to Schuster et al. (1994), institutions face problems in applying strategic planning in periods of economic recession. It also stressed that sometimes the environment changed in the opposite direction against the strategic planning mechanism.

Higher education institutions, as bureaucratic organizations, are characterized by a complicated professional routine system. As a result, plans are often general and vague and ultimately they do not function as a guide for future decisions. Strategy more or less loses its importance in professional bureaucracy since it is hard to agree upon any common goal in this kind of organization as goal ambiguity is one of the chief characteristics of academic organizations. Some researchers argue that a university's

research strategy can possibly be the sum of the strategies of all the professors who carry out research, (Mintzberg 1983).

Implementation of strategic plans is another critical point because of many reasons: first, there are no clear procedures for plans implementation. Second, fragmentation and diffusion of power in higher education make it difficult to affect change-for instance, an individual professor's independence over research and teaching makes it difficult to formulate plans and even more difficult to implement them (Larsen and Langfeldt, 2005). Many institutions have tried to implement planning procedures suggested by external consultants. Unfortunately, results have been disappointing because there is a problem in approving general goals, the resistance of some sub-units to discuss important questions and expectations which go beyond available resources. Musselin and Mignot-Gerard (2002), in a study of strategic planning in French higher education institutions, argued that there are three reasons for strategic implementation failure. Firstly, there is a resistance to implementation explained by individual resistance and autonomy. Secondly, less attention is paid to the implementation process. Thirdly, the strategy is communicated to the university communities insufficiently. If the organization is able to agree upon a common goal, there is no way to achieve it. As a result, Hardy et al. (1984) argued that much of central university planning has been purely decorative as a result of a lack of implementation. Dill (1996), mentioned that planning processes are an exercise which tries to avoid difficult decisions, and plans for implementation and reallocation of resources are often neglected or underestimated.

To conclude the gap in strategy literature, most of the applied strategies in organizations have created the talking-doing gap. Pfeffer and Sutton (1999) defined this situation as talking about desired goals (knowledge), which has replaced the actual implementation of these goals (i.e. knowledge implementation). According to Zeleny (2005), there is a difference between information as a description of action, and knowledge as an action itself. All knowing is doing; and, all doing is knowing. Based on his differentiation, Zeleny corrected the concept of the knowing-doing gap as the difference between building only a description of action (i.e. Information/Desired Strategy) and the transformation of this information into actions (i.e. Knowledge/Actual Strategy). The notion of strategy implementation is typically, the gap between doing and talking. The top-down approach that starts with vision/mission statements is an obvious example of talking substitutes action. There is a need for a new generation of strategic approaches that mitigate the gap, (Zeleny, 2005a). *The first gap in the university strategy literature is the need for knowledge-based strategy - not just an information-based strategy.*

Meanwhile, traditional strategic approaches treat strategy from a static point-of-view, or forecasting position. In other words, managers use a sequential approach that includes: defining corporate objectives, developing a plan to achieve these objectives, and allocating requisite resources to implement this plan. In a changing, dynamic world, there are many constraints to the implementation of the desired strategy which depends more on wishes than facts. Resources are scarce and competition is massive, so there is no time to forecast, implement and then measure the results. *The second gap in the strategy literature is the need for an agile-iterative approach that allows the identification of the actual capabilities, actual activities, reasonable objectives and a suitable plan to achieve these goals through side-by-side activities-not sequential activities.* Developing a coherent evolving pattern of action is what modern universities need. In this respect, the new generation of strategy formulation process that will be used in this dissertation is one of these attempts, (Zeleny, 2005a).

Also in his book, Jackson (2004) stressed the idea of an open organization by describing the business as a living organism that can create self-reinforcing business advantage. He stated that"…*To be successful, a business has to make money by using its resources to satisfy customer needs*". He addressed two major problems that face current businesses. The first is a strategic problem, which is the searching for a form of sustainable competitive advantage, and the second is a practical one, how to do all daily activities that should be done. He provided seven operational activities that drive the strategic performance of any business. He added that there are four layers that constitute the advantage of the business: operations, leadership, strategy and the Escher Cycle (e.g. self re-enforcing competitive advantage). This book is a base for this research on how to build a strategy based on facts, activities and capabilities - not wishes and statements.

CHAPTER THREE
RESEARCH METHODOLOGY

"Design and customize a research methodology that allows achieving research goals and objectives"

3.1. Introduction to Methodology

This part has been done in the spirit of Osterwalder (2004) and Zeleny (2005a). It is not an easy task to find adequate sources in research methodology to tackle the goal of this research because this dissertation does not follow certain mainstream management or research direction. In traditional researches, the focus often lays on two different approaches: theory building or theory testing. At first sight, working on formulating an OI strategy is a theory work. But it is not only that because theory building notion is searching for understanding why of a phenomenon in question (Whetten, 1989). Theory helps discerning how things come to be as they are and how they function. In addition, theory helps to explain patterns characterizing our world.

The nature of constructing OI strategy is quite different. The need for OI strategy is not to understand a phenomenon; it is a problem-solution finding approach. It is about creating a mechanism for universities to gain a self-sustainable competitive advantage. It means designing a guideline that allows university to differentiate itself from others by capturing value from applying OI strategy. Despite this, research is not a theory building as discussed above or theory testing, which is the second major scientific preoccupation, it should be considered as a scientific method, (Osterwalder, 2004).

However, the question is how a problem-solving approach, as applied in this research, qualifies as a scientific method. To answer this question, the researcher should consider science in the light of Fuller's design science definitions. Fuller (1992) defines it as" *The function of what I call design science is to solve problems by introducing into the environment new artifacts, the availability of which will induce their spontaneous employment by humans and thus, coincidently, cause humans to abandon their previous problem-producing behaviors devices*".

In fact, according to Zeleny (2010), strategy is what the organization does, and what organization does is the strategy. Always there is a gap between talking about strategy (vision and mission statements) and applying the strategy (actual work). To mitigate this gap, Zeleny provides a strategy formulation processes that depends on knowledge, actions and real activities. These processes present a knowledge-based view. They start with analyzing the organizational activities and try to build upon them to enhance the organization's position. In order to translate this into the current research, strategy formulation methodology can be used in designing an OI strategy that helps university's managers to create a self-sustainable competitive advantage. So, there is a

need for applying new formulation processes that mitigate the gap and advance the implementation of the new strategy.

3.2. Strategy Formulation Processes

At the end of information era, (information becomes a commodity), there is a need for a new strategy that would replace descriptions of actions (information) with doing the actions (knowledge). Strategic management is an ongoing process to develop and revise future-oriented strategies that allow an organization to achieve its objectives, considering its capabilities, constraints, and the environment in which it operates, (Mitchell, 2010). "*Strategy is about making series of decisions that derive corporate action under specific coupling with company's environment and context*", (Zeleny, 2010). Strategy formulation is a part of strategic management. It includes five phases: Analyzing the current activities, benchmarking activities, differentiating current activities from competitor's activities, specifying the activities to be conserved, eliminated, changed or added and finally, developing *ex post* descriptive mission and vision statements to be communicated to stakeholders. As a result, the described strategy reflects the actual strategy and the talking-doing gap have been eliminated. See the following table:

Table 1: Strategy Formulation Framework

		Processes	Output
Strategic Phases	Analyzing	- Current activity analysis through developing the Actual Activity Map	- Actual Activity Map
	Benchmarking	- Identify the relation between activities. - Compare with successful competitor's activity map.	- Activities interdependencies
	Differentiating	- Identify different activities from competitors. - Identify alternatives for OI activities.	- Value Curve Map
	Specifying	- Identify activities to be conserved, added, changed or eliminated.	- New Activity Map (New Strategy)
	Developing	- Write an *ex post* mission/ vision statement to communicate to other parties	- Vision- Mission Statements

Source:Author's Work based on (Zeleny 2005a)

3.3. Strategic Phases, Processes and Outputs

There is a need for organizations to evolve the area of doing, not just maintain the talking. It is a complex process and not a simple routine. This process is necessary for such organizations in order to develop a more coherent, effective, and enacted strategy. The five phases described below are interrelated not isolated steps. They have to be carried out carefully, (Zeleny, 2005a).

Phase1: Analyzing. This includes: creating of a detailed map of key organizational activities to identify the current situation from the action point of view. It will represent the real strategy that the organization is carrying out and already embedded in action. The following figure provides an example of the university activity map.
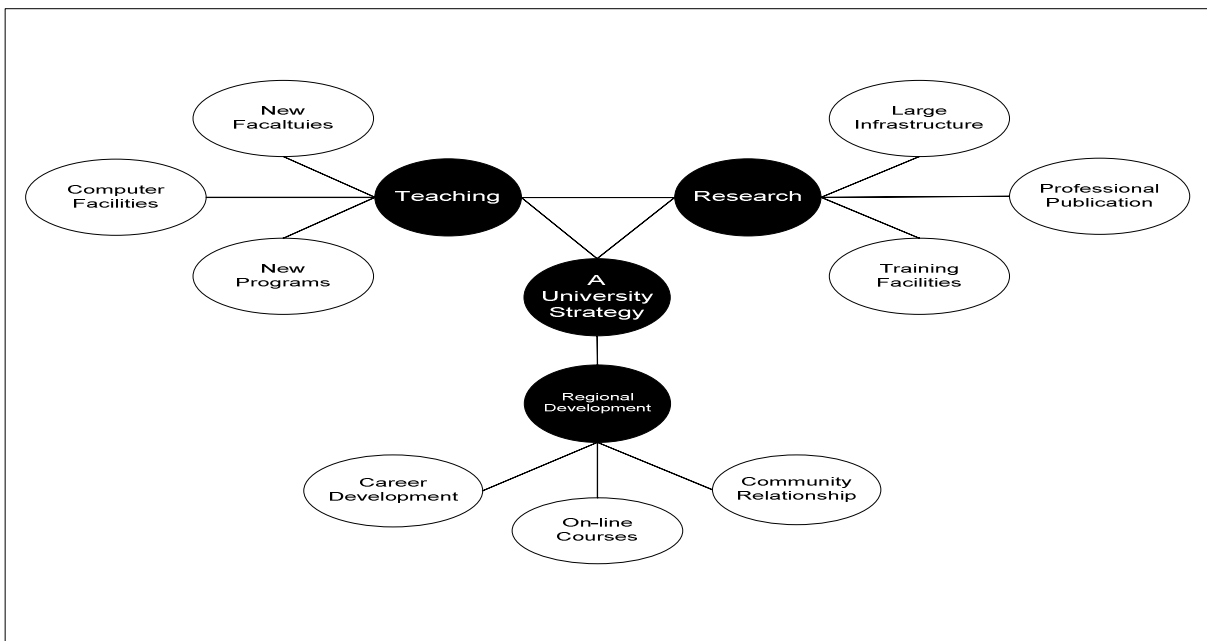
Figure 8: University Activity Map
Source: Author's Work Adapted from (Porter, 1996)

According to Porter, (1996), strategy consists of a unique group of activities that allows company to create values in a competitive market. Activity map shows how a company creates value in a competitive market (Morgan et al, 2007). The map shows activities that are important for developing this market value. By identifying these key activities, it will be possible to measure how well the company is performing. Activity map consists of black circles that present the high-order strategic themes and their corresponding activities in white circles.

Phase2: Benchmarking. This phase consists of two steps. First is analyzing current activities. There is a need to evaluate these activities' performance. So, it will be helpful

to identify the relationship and interdependencies between them. The effect of changing one activity on other activities and the ways to strengthen these activities has to be specified. The position of each activity and the type of customers served should be clarified. All of this information will allow reformulating and redrawing the map. Changing the map means quick changing of the strategy. This process of evaluating and changing aims to reduce trade-offs and brings forth the new strategy. Second is benchmarking or comparing current activities with competitors without imitating them but striving to be different. The main goal is to establish the difference between the organization and its competitors. The organization is defined by the customers or markets it serves and the products or services it sells; it is not defined by its vision and mission statements, (Zeleny, 2005a).

Phase 3: Differentiating. The main goal is to distinguish the organization's activity from those of the competitors. "*Differentiating, not catching up or imitating is the key to effective competitiveness and sustainable strategy*", (Zeleny, 2010). The main output is a value curve. This curve consists of two axes: on the horizontal axis there is a list of criteria or attributes while on the vertical axis, are the performance criteria. Every value profile will represent a unique university. According to Zeleny (2010), a profile consists of criteria and attributes and refers to the individual patterns, so there can be *our profile, their profile* and *the desired profile*. The task of differentiating is to identify not just the performance on existing criteria but to develop a set of new criteria (attributes or themes), which could differentiate the organization from the competitors or standards, (Zeleny, 2010). Therefore, identifying alternatives of OI activities is highly crucial for specifying the new trends and activities to be added to the activity map. See the figure below:
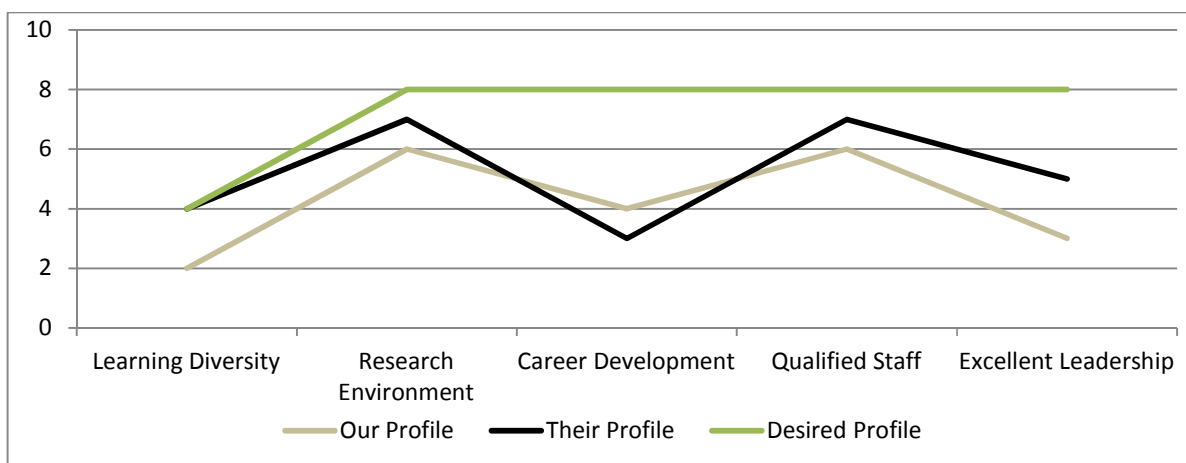
Figure 9: Profile Map of Environment
Source: Author's work adapted from (Zeleny 2010)

Phase 4: Specifying. In this phase, activities to be unchanged have to be conserved and identified first. This will help identifying the activities that have to be changed in the new strategy. Then, changed activities have to be recognized in order to fill the opportunity spaces revealed by Value-curve profiles as being most effective for successful differentiation. The main output for this stage is to define a new activity map that combines the conserved activities, changed activities and added activities.

Phase 5: Developing. Depending on the new map that describes the actual new strategy, the organization can then write the vision, mission statements that reflects the current activities situation.

3.4. Research Methodology and Techniques

The objective of this study is to explore and form an OI strategy to create a self-sustainable competitive advantage for a university. The subject of this research involves under-researched area and needs an exploratory study thus make the qualitative approach appropriate for this type of inquiry. Moreover, case studies provide researchers with opportunities to examine complex relationships the university and its ecosystem components. Therefore, as suggested by Miles and Huberman (1994), the general research approach chosen to achieve the objective of this study is a qualitative, multiple case study. Gummesson (2006) argues that qualitative research is superior approach, allowing researchers to examine issues including complex, contexts and persona. Qualitative research is characteristically exploratory, fluid and flexible, data-driven, context-sensitive, and the decision about design the strategy are ongoing and grounded in the practice, process and context of the research itself, (Mason, 2002). The empirical research for this study takes two approaches: (1) Multiple-case-studies (2) Documentary Data . The choice of these particular methods was made because they allow systematic yet flexible analysis and interpretation. The application of the case-study is based upon the claim that the case study is, as Robert Yin (1994) argues, appropriate to answer "how" or "why" propositions, and to analyze a contemporary phenomenon. According to Yin (2002), the case study approach allows researcher to examine a social phenomenon and its context, provides more holistic explanations, permits grounding of observations and concepts about social action and social structures in natural settings and provides information from a number of sources over a period of time. The case-study satisfies the three tenets of the qualitative method: describing, understanding and explaining, (Yin, 2002), to explore the new strategy and identify in-depth information.

For the purpose of contributing insights into relatively unexplored area, case-study method can be a useful exploratory approach for acquiring data, where suitably planned and designed, (Bryman, 1989). Explaining how a university can achieve a self-

sustainable competitive advantage by adopting OI strategy can be better achieved by a profound exploration of the background, processes and outcomes of multiple cases.

Generally, researchers use a deductive approach in quantitative studies and inductive approach in qualitative research, (Strauss and Corbin, 2008). However, some scholars suggest a combination of deductive and inductive methods, termed "abduction" or "systematic combining", (Dubois and Gadde, 2002). Peirce (1958) proposed abduction as a third way between deduction and induction, which is referred to the generation of new ideas and both the inductive and deductive models of inquiry do not describe the processes that lead to discovery. The abductive logic is particularly suited to research where some guidance is necessary to manage the development of novel knowledge during the study. This study examines a relatively unexplored topic and needs abduction method that is driven by creativity and insight.

3.4.1. Research Design

Generally, the purpose of any research study can be distinguished into three categories: exploratory, descriptive and explanatory. This research uses different research methodologies to allow a comprehensive analysis of the collected data. Every methodology mitigates a specific part of the dissertation. This approach consists of a combination of the exploratory and the descriptive studies. The reason for using both categories is that 'Exploratory Research' is undertaken when not much is known about the situation at hand or no information is available on how similar problems or research issues have been solved in the past, (Sekaran, 2003). The OI strategy at universities is a unique model presented by the researcher and there is a need for exploring the components of the model, success factors, barriers, and related tools and techniques. In such cases, extensive preliminary works needed to be done to gain familiarity with phenomena in the situation, and understand what is occurring, before developing a model and set up a rigorous design for comprehensive investigation. Additionally, 'Descriptive Study' is undertaken to ascertain and to be able to describe the characteristics of the variables of interest in a situation. Descriptive research helps to find out the answer of who, what, when, where and how of a problem. It has been undertaken to understand the characteristics of universities that follow certain common practices. It was an important tool to offer the researcher with a university's profile and to describe relevant aspects of the OI (e.g. importance, best practices, governance and implementation methods), (Sekaran, 2003).

3.4.2. Case selection and recruitment

  In this study, case selection was purposive, not random. Case studies with a purpose are most likely to contribute to new knowledge. In this regard, the aim is to pursue analytic generalization rather than statistical generalization, (Yin, 2002). Hence, the cases selected should be able to cover various aspects of the research that is being conducted. In this research, case-studies are used for the purpose of benchmarking and comparing the university activities with competitor's activity map to identify spaces for differentiating. Multiple case-studies, mainly three universities, have been used in this dissertation. Each case-study, a specific university, is employed to serve a certain part of the research study. First is the University of Utah (the U), an American Public University, has been chosen as a referential university that can be used as a standard and a benchmark. This choice has been made based on many reasons such as: 1) Its noticeable success in adopting and implementing the new OI strategy, 2) It has created 120 start-up companies during last 10 years and 3) It has an effective contribution in its regional economic. The author analyzed its strategy to get a complete picture of the applied methodology. Then, the author customized and adapted the proposed methodology for two main universities: Pharos University (PU) in Alexandria, Egypt as an example of a private university and The Tomas Bata University (TBU) in Zlin, the Czech Republic, as an example of a public university. The author chose these two universities because: 1) He works in PU and has studied in TBU. He knows their background, history and development from analysis and private experience and 2) Both of TBU and PU are targets of the research and being young prospective universities, they may achieve their success by using appropriate model suggested in the research.

3.5. Data collection
3.5.1. Semi-structured interviews

  Interviews for the purpose of qualitative research, are defined as*" an interview whose purpose is to get a description of the life world of the interviewee with respect to interpreting the meaning of described phenomena"*, (Kvale, 1996). Interviews are different types ranging from open-ended to completely structured interviews, (Creswell, 2007). The semi-structured interview merges the benefits of both completely structured and open-ended questions, which can focus on main themes within the research but also allow new themes to emerge, (Pettigrew, 1990). In other words, this approach was directed by a pre-planned interview schedule, but the interviews were adjusted and modified according to remarkable themes that were emerged from the interviewees' responses, (Bryman, 1989). This is reliable with the logic of this research as a qualitative study. Hence, the semi-structured interview approach was used to gather primary data for this study. To achieve the research goals, the author considered

it necessary to analyze the views of the participants on the importance of proposed strategy, success factors, tools, barriers and the components of the strategy. The model suggested in chapter eight was based on these results. The detailed interviews list is in Appendix 1.

For this study, a sample of twenty three interviewees has been chosen to give coherent responses. This number is considered sufficiently large for an interpretive study to offer balance and diversity of views, whilst still generating a manageable volume of data. Interviews were conducted with selected interviewees in different countries. First, email-interviews have been conducted with four pioneers' professors in the field of OI from (e.g. Australia, Germany, Sweden and Denmark). Second are two email-interviews with two Technology Commercialization Office (TCO) Managers in two American universities (the University of Utah and the University of California, San Diego) that implemented OI approach and achieved significant results. Third are four face-to-face interviews that were carried out in Tomas Bata University with the Rector, the Dean of Faculty of Management and Economics and two managers of Technology Innovation Center in Zlin, the Czech Republic. Fourth, thirteen face-to-face interviews were conducted with President, Vice President, Deans, Vice Deans and top managers of Pharos University in Egypt. Additionally, interviews with Henry Chesbrough, who invented the OI innovation approach that were conducted by other researchers, have been used as supplementary information that will help in exploring the new phenomena. Moreover, interviews that were carried out by (Burykhina, 2009) with Zlin region authorities and the key persons from TBU have been used to confirm and strength collected data. All interviews were conducted during the period from September 2010 to April 2011. The choice of the interviewees of this study was determined by the research questions, rather by representativeness, (Miles, and Huberman, 1994). Interviews codes are sorted and grouped in Appendix 2.

3.5.2. Documentary data

The method, documentary data, includes inspection of university publications in order to establish: an institutional profile (institutional type, purpose, goals, mission, funding basis and organizational culture), current strategy (funding, governance, management and leadership) and current activities. Also, it includes university announcements, press releases, annual reports and information from company websites. Documentations and documentary analysis are, furthermore, used for coding particular concepts for analysis through interviews. Additional secondary data were used such as scientific research or journal articles and governmental reports. Bryman (1989) argues that documents can provide three significant advantages for qualitative researchers, which other sources cannot introduce: first is to provide a supplementary channel to obtain information. Second is to confirm the validity of information from other resources and third is to introduce a different level of analysis. Documentary data in this dissertation consists of

many tools such as: 1) *Speculation/commentary* refers to articles and research that are not really based on any hard evidences. This tool was used to provide the initial knowledge in strategy and analysis phase; 2) *Library Research* is a part of most other methodologies. It is a collection of materials that has been selected and organized to address the research needs of students and scholars. It was used as a way to summarize and synthesize past research and highlighted some of the important conclusion; 3) *Literature Analysis:* It is the study, evaluation, and interpretation of literature. It was used to examine all past studies in a particular area and conducts a scientific meta-analysis of the cumulative knowledge. These previous two methodologies were the basis for the design of the new OI strategy. However, there are some limitations of secondary data because public reports may not fully reflect the actual situation of the university, for example, the main objectives and the barriers that hinder the application of the strategy. So, it is not suitable for a researcher to use secondary documents only as the main source of research data. Documentary data in this study were employed to strength and validate the collected data by the interviews. They can also serve as the foundation for creating a summary of each case, (Pettigrew, 1990).

3.5.3. Framework and conceptual models

They are useful tool for designing the core model of this research. Conceptual frameworks (theoretical frameworks) are a type of intermediate theory that attempts to connect to all aspects of inquiry (e.g., problem definition, purpose, literature review, methodology, data collection and analysis), (Kaplan, 1964). Conceptual frameworks can act like maps that give coherence to empirical inquiry. Because conceptual frameworks are potentially so close to empirical inquiry, they take different forms depending upon the research question or problem, (Botha, 1989). In this study, the conceptual model was used to draw the research methodology and model, to provide a new dynamic framework for the OI approach and to respect a coherent model for the required strategy.

The following table explains which of the retained methodologies have been applied to which cell and accordingly to what research objectives, (Osterwalder, 2004). It shows the mixed methods with strategic outputs and strategic phases.

Table 2: Mixed research methods and strategic phases

		Processes	Output	Research tools
Strategic Phases	Analyzing	- Current activities analysis through developing the actual Activity Map	Actual Activity Map	• Speculation • Conceptual model • Literature Analysis • Interviews • Case study • Secondary data
	Benchmarking	- Identify the relation between activities. - Compare to successful competitor's activity map.	Activities interdependencies	• Interviews • Case study • Literature Analysis • Speculation
	Differentiating	- Identify different activities from competitors. - Identify alternatives for open innovation activities.	Value- curve profiles	• Interviews • Case study • Literature Analysis • Speculation
	Specifying	- Identify activities to be conserved, added, changed or eliminated.	New Activity Map (New Strategy)	• Speculation • Conceptual model • Literature Analysis • Interviews • Case study • Secondary data
	Developing	- Write a mission/vision statement to communicate to other parties depending on actual activities	Mission/vision-Statements	• Interviews • Literature Analysis

Source: Author's Work based on (Zeleny, 2005a and Osterwalder, 2004)

3.6. Data analysis

Analysis of qualitative data is to look for meaningful results by interpreting the ideas and views of the contributors. But, it is a challenge to record the process systematically. Generally, Miles and Huberman (1994) recommended three activities in data analysis: (1) data reduction, (2) data display, and (3) conclusion drawing and verification. They

described qualitative data analysis as an agile and iterative process that consists of the data collection activity and the above-stated three types of activities in data analysis. Creswell (2007) introduced the process of data analysis for the case-study includes many phases as below:

- Data managing: Create and arrange files for data;
- Reading and memorizing: Read through text, make margins notes from initial codes;
- Describing: describe the case and its context;
- Classifying: Use categorical aggregation to establish themes or patterns;
- Interpreting: Use direct interpretation: develop naturalistic generalization;
- Representing and visualizing: Present in-depth picture of the case (or cases) using narrative, tables and figures.

The data analysis activities for this study followed the same group of steps suggested by Creswell (2007). First is the face-to-face interviews that were recorded and transcribed. Data of each university, including interviews' transcripts and documentary data, were put into an individual file folder (both electronic files and printed hard copies). Second is primary data analysis (e.g. reading the interview transcripts and related documents, and sorting out the data). The researcher added margin notes, while observing particular idea. The data analysis was made easier by using a coding list. The coding of this research included three main phases: creating initial codes, gathering data related to each code, modifying the codes or creating new codes; and looking for themes. The primary coding groups were created based on the theoretical research model and the five research questions. While reviewing the data collected, the researcher began to put the gathered data into general and sub- related categories. For instance, one of the questions introduced to all participants was how to identify obstacles for applying OI at a university. The transcripts were primary coded under the level one category, "barriers to apply OI". When all the related transcripts of the interviewees had been put in this category, they were additionally analyzed. This process was to decide what sub-categories (level two) could be recognized from this wide category, for example, "Trust". Moreover, the transcripts in this category were additionally put in the level three categories-"Internal trust" and "external trust" respectively, as the characteristics have been differentiated from the data. During the process of coding, the transcripts were coded by employing a primary group of codes at the beginning. After that, a new code may be generated, or an existing code revised, if needed. The coding list was finished when all transcripts were coded by the level three codes. Codes are available in Appendix (3).

Third, the next phase was to analyze the case universities independently. The concentration of case-analysis was put on the specific characteristics of each case. To accomplish this goal, a primary case summary of each university selected for this

dissertation was made. During the process of data analysis, the most significant object was to discover any evolving topic that could be linked to the research questions, or could potentially add new insights to the subject area.

Fourth, as this dissertation is based on a qualitative multiple-case study, each individual case was a part of the entire study. Therefore, the following step was to portray cross-case conclusions. The conclusion described from each case would then be considered as the foundation of supporting proof for another use in other cases. Data collected from many sources have been compared and prioritized in order to specify which models were more important than others, (Miny, 2010). The final step was to show the influence of the research by using tables and figures. The reason of qualitative analysis is to identify or find out conceptualization of pattern, structure and meaning from the empirical data, (Strauss and Corbin, 2008). Therefore, the key chapters of this study contain tables and figures used to review and clarify the important ideas or concepts resulted from the theoretical and practical findings.

CHAPTER FOUR
UNDERSTANDING OF OPEN INNOVATION

This chapter consists of two parts. The first part is to explain the importance and benefits that the university and other stakeholders will gain from applying OI strategy. The second part is to provide a brief explanation of how a university can be considered as a living organism. It provides a new dynamic framework to advance OI. It discusses the self-sustainable competitive advantage concept. This new approach needs a new business model; therefore it introduces a new dynamic business model to advance university activities.

4.1. Importance of Applying Open Innovation at Universities

This part focuses the attention on the importance of applying OI at universities. It includes many reasons that encourage university's senior managers to adapt the new approach.

4.1.1. Gaining competitive advantage

A relationship with university ecosystem's partners allows the university to expand its network and achieve a sustainable competitive advantage. The university that encourages its faculty members to engage in appropriate outside professional relationships with governmental agencies and private industry, facilitates the transfer and commercialization of the internally developed technologies, improve the well-being and productivity of society and gain additional research opportunities. Moreover, participating in various combinations of arrangements including those with government funding, multiple corporate, a single company, and with other universities enrich the university intellectual properties and provides multiple sources of knowledge that allows the university to differentiate itself from other competitors, (Gardner, 1989).

4.1.2. Decreasing cost and increasing revenues

A good approach for the university to formulate a sustainable relationship with external partners is to consider a full refund of direct and indirect costs of the activity from research sponsor. In accepting contracts and grants from external sources, the public university has to use this consideration as a protection against the use of public funds for private gain. In the case of collaborating with non-for-profit organization or private sector, the university may agree to share some costs, (Gardner, 1989). Furthermore, a university can obtain funds for research assistance, lab equipment and their own research agendas; and obtaining insights into their own research by collaborating with external partners, (Bronwyn, 2004). Additionally, Industry provides a new source of money for university because industrial money involves less "red tape" than government money. Engaging with industry in projects that focused more directly

on improving or developing specific technologies relevant to commercial users- is an essential financial resource for both the university and industry. These types of projects allow the university to share risks, decrease research cost and increase returns, (Peters and Fusfeld, 1982). Licensing and patents policy also provide a financial return to support further research and education, (Gardner, 1989). Gifts and endowments are important source for research funding. They could be designed for colleges, schools, departments or individuals. Many universities allow industrial and private sector members to use the unique university facilities on a fee-for-service basis, which provides a new source for funding.

4.1.3. Gathering practical experience

Partnership between a university and other sectors can offer a practical knowledge that is highly imperative for empowering students, teachers and seniors' managers with required experience to solve the sector's problems. In many cases, firms approached academics to assist them with specific problems encountered in their R&D. engineering or manufacturing operations. Firms sought specialist advice provided by academics on particular problems, or involvement in the actual problem solving activity. This could be considered as a good opportunity for academics to be involved in practical applications, (Perkmann and Walsh, 2008). Additionally, student's internship and job placement, patents and business opportunities are excellent incentive for entering into research alliance with industry. Universities have the R&D capabilities to solve industrial complex problems, (Pavitt, 1998). This will allow finding external financial resources, especially with the governmental trend to decrease the higher education budget. Specialized programs planned by the university for ongoing education and training of professionals allow the knowledge sharing and exchanging experiences. Besides this, contribution of industry representatives on campus and university wide advisory groups, permits enhancing the practical knowledge and enhance the problem solving techniques.

4.1.4. Enriching the university intellectual property bank

Collaboration with external partners can enrich the university IP databank with various and large numbers of ideas. For example, integration of particular experienced users in innovation processes to introduce new forms for innovation and make specific modifications for products and services can help the university to advance its developed technologies. Crowd sourcing is another way of a university OI strategy to gather additional ideas. The main goal of crowd souring is to find new ideas and problems' solutions by allowing a participation of a group of people or community (e.g. contests and collaboration) by open call instead of calling specific individuals. This technique provides less cost and quick solutions. The fees are based on the outcomes and sometimes could be waived. Building rapport and loyal community for the university is an additional benefit of the crowd sourcing, (Whiteford, 2008). However,

increasing the number of patents on university research reflects the generous supply of the university inventors, (Henderson et al., 1998). Idea testing is a good approach in university-industry relationship. Joint projects with external collaborators permit emerging of new ideas in firms' R&D labs or manufacturing units and the firms ask the academics to explore these ideas because they were seen as having the required expertise. This approach enriches the university with new ideas and allows large number of patents. Industrially sponsored research provides university researchers a chance to work on an intellectually challenging research programs.

4.1.5. Commercialization of university technology

Collaboration with industry in general and SMEs in particular can speed the university commercialization processes and foster technology development because SMEs are more flexible in adopting the new technologies that are developed by academia. Start-up companies and consulting projects with a university offer a faster flexible and affordable mechanism for accessing specialist knowledge and capabilities. SMEs are more dependent in universities' technologies than larger companies on external sources of scientific and technological information, (Hendry et al, 2005). Consulting is another way of commercialization a university activities. Consulting is "polyvalent" as it allows academics to pursue personal income in an entrepreneurial manner, (Louis et al. 1989), and to build personal relationships with industry practitioners and learn about industry problems and applications. University's researchers do not generally posses the complementary assets necessary to bring the often early-stage research results through development into a commercialized product that is marketed and distributed to consumers. The researchers tend to specialize in creation of knowledge assets, the commercialization of which is typically left to other organizations, (Fabrizio, 2006).

4.1.6. Increasing incentives for a university researchers

Many universities have formal policies and regulations for motivating their academic staff to seek industrial assignment for a specific share of their time, (Perkmann and Walsh, 2009). Royalty sharing policies at many universities provide incentives for the disclosure of inventions to the university administration, (Bercovitz and Feldman, 2008). In their qualitative study, Owen-Smith and Powell (2001) introduced some evidences for the idea that academics are attracted by monetary profit. They found that the greater the monetary value of the patent, the higher of researchers' desire to enhance their incomes. Access to funding is also an indirect benefit as it may facilitate economies of scale and retention of staff at university laboratories.

4.1.7. Enhancing Research and Development processes

Resolving problems that occur in technology development can lead to follow-on research activities, enhance academic research agenda and in some cases even lead to new scientific disciplines, (Rosenberg. 1982). According to (Mansfield, 1995) many

academics choose to work on problems that are related to their consulting activities. A significant share of basic research is driven by the pursuit of basic understanding and consideration of use, (Stokes, 1997). Much research in biotechnology, computer science, aeronautical engineering and other disciplines conform this mentioned fact, (D'Este and Perkmann, 2010). Academics motivated by learning frequently prefer to engage in joint research, contract research and consulting. Learning is an indirect benefit in collaborative projects and may not lead directly to novel scientific outputs, but may lead to new research problems and knowing about new industrial practical applications, (Perkmann and Walsh, 2009).

4.1.8. Building a university image

Knowledge development projects' objective tends to be informed by the challenges arising at the frontier of academic research, (Perkmann and Walsh, 2009). These projects are highly complementary with academic research because they allow the academic collaborators to generate scientific publications. These publications are highly crucial for building the scientific image of the university. Furthermore, A study of German academia researchers demonstrated that researchers engage in patenting not for personal profit but to signal their achievements and gain reputation amongst their academia and industry-related communities, (Goktepe-Hulten and Mahagaonkar, 2009). University scientists seeking recognition or reputation rewards are not concerned with protecting their intellectual contributions- in fact, they openly publish and distribute their contribution in hopes that others recognize the value of their work and build upon it, (Fabrizio, 2006). Industry is a good promoter for the university technology.

4.1.9. Development of Regional economic

Currently, a growing percentage of wealth in the world's largest economies is created by knowledge-based industries that rely heavily on human capital and technological innovation, (Etzkowitz, 2000). OI can create a potential contribution in regional economic development. Networking all the components of the ecosystem achieves a synergy between all partners and helps in providing new business opportunities and jobs. The role of universities in regional development has been traditionally discussed through two issues: the economic effect of direct employment and staff and students spending in the local economy, and the technology transfer through licensing, start-ups. Spin-off companies, and constructing of Science Park, (Etzkowitz, 2000). Now, the role of university OI in regional development is going beyond this narrow technical and economic approach to a broader and enlarge role. The foundation of spin-off firms has become systemized into an organizationally refined approach that makes the entire institution as a "quasi-incubator" fostering new business ventures, helping start-up companies and encouraging the growth of regional trade and industry, (Etzkowitz,

2000). According to (Marginson, 2002), OI can help the university to practice different functions of that may potentially lead to economic development such as: creation of new knowledge, transferring of existing know-how, creation of human capital, producing technological innovation, advancing regional leadership, offering capital investment, producing of knowledge infrastructure and influencing on regional environment.

4.2. University as a Living Organism

"Understand university as a living organism, its competitive advantage, build a dynamic open innovation framework and establish a compatible business model"

4.2.1. A Living University

University, as a traditional bureaucratic organization, can be seen as a machine that works in a mechanical way to teach students. On the other hand, according to Autopoietic theory, it could be observed as a living organism that can learn from past experiences, adapt to changes and uncertainties, and could be a self-sustainable with its co-produced environment, (Zeleny, 2006). Machines are worked by commands, instructions, and programs. At the same time, organisms consider environment, condition and circumstances, and need nourishment. The concept of living university transcends the simple models of brain, heart and soul. These models have to be operational and serving the strategic objectives in order to benefit the university. So, students, employees, and staff have to behave as parts and components of a living organism, (Zeleny, 2006).

According to (Zeleny, 2006), the living organism notion is based on some assumptions that disclose the nature of such organizations. A university has to be self-produced (e.g. knowledge, technology, management, and strategy), directed by its purposes, goals and objectives. A university has to be created and managed autopoietically (self-produced by itself, evolved internally) as a network of interrelationships and influences. It has to be developing, evolving, dynamic, can change, grow, multiply, adapt- through its own interactions and influences, on its own ecosystem. A university has to be capable of regeneration, self-renewal and reproduction, maintaining its identity beyond present members and constituents. A university should consider its members as human workers in human communities- not only resources or reserves for externally controlled operations, (Zeleny, 2006). Additionally, a university has to be a learning organization that can learn as an entity and through all of its components and partners.

- *University as an Autopoietic Organization*

According to (Zeleny, 2005a) a university -as an innovation factory - can be Autopoietic (Self-producing) based on defining its process as a network of interactions and processes, involving at least the processes of:

1) *Creation (poiesis):* the rules and regulations governing the production of new components (e.g. innovation, discovers and knowledge)
2) *Connecting (bonding)* the rules managing association, arrangements, functions and positions of components during their tenure within the organization (e.g. patents, licensing and start-ups)
3) *Degradation (Replenishment)* the rules and processes associated with expulsion of old technology with renewable one to refuel the knowledge society (e.g. new knowledge, new methods, and new discovers).

The following figure represents the university's *Self-production Cycle.* It consists of three connected poietic processes. It is essential to mention that such circularly concatenated processes represent creation of parts required for the following processes, not only the one labeled as "Creation". A university turns out to be Autopoietic if *all three* forms of constitutive processes are well *balanced* and function *in harmony.* Missing of one type or if one or two types overrule (out-of-balance system), then the university can either be heteropoietic (e.g. not self-reproducing, neither as a whole, nor as to their components) or allopoietic which means the ability to produce only "the other "rather than itself (e.g. serving the industry but cannot serve itself), (Zeleny, 2006). For example, when a university creates knowledge without connecting and transferring it into market and society, in this case, knowledge is just inventions –Then this knowledge will be stored on-the shelf to be obsolete quickly. It is considered innovation if it creates added-value.
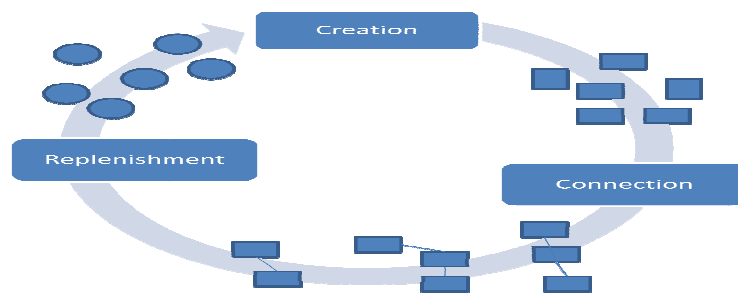
Figure 10: Circular University of interdependent processes and their "creation"
Source: Author's work adapted from Zeleny (2006)

- *Characteristics of a Living University*

Based on the previous cycle, the author suggests that a university as a living organism should have the following characteristics: 1) *Inter-dependability*: The university's large network consists of interconnected networks. Every part of each network is a potential component and its success is dependent on the success of the larger related whole. A sustainable healthy relationship must be nurtured between all the members of the large network and sub-networks. 2) *Partnership*: Co-operation and sharing of resources and competences synergistically are essential to coexist and developed. Collaboration has to be advanced and supported from top-to-bottom and vice versa. 3) *Renovation and Cyclical processes*: Living organisms continuously exchange utilities and what is waste for an organism is a food for another one. As a result, a university should reproduce the cyclical principle of nature so that waste / production of one department or faculty become raw material for further production and innovation in another one. 4) *Service Management and network structure:* a university needs to minimize the stiff control and encourage the concept of service management that means every member is working for the welfare of the whole. Additionally, it has to design its network based on a flat structure that gives each member adequate resources to be creative and the same responsibilities. 5) *Preservation and Modification*: a university has to be self-sustainable and self-maintain. Therefore, it has to protect and encourage each part that performs well and to mitigate or even – if possible, eliminate any part that does not. 6) *Powerful core values:* each member in a university is connected to all other components and has a role in the healthy life of the organism. Therefore, competition has to be replaced with co-operation and each part has to differentiate itself by adapting new capabilities to create synergy. *This living organism perspective requires a university to define OI approach from a dynamic view.*

4.2.1. Dynamic Open Innovation Framework

This part provides an answer for the second research question: *What is open innovation? And what are alternatives of Open Innovation strategies available for the university?* -The author suggests this new dynamic OI framework to advance and enhance the OI concept. In a fast growing and complex technological environment, there is a need for iterative and dynamic innovation processes that can integrate all the components of the university's ecosystem. The old scheme [Inputs➔ Process➔ Outputs] is obsolete, costly and time-consuming. It falls to the linearity trap, which means that all of the innovation activities have to be done sequentially. In a dynamic changeable business society and with global customer, there is no time to find ideas, evaluate, develop, launch to the market and get feedback. The new innovation cycle has to be concurrent. It has to involve switching back and forth between innovation phases to allow taking a just-in-time corrective action and still allow the university to utilize all of its innovations during all stages (e.g., in-sourcing ideas, out-sourcing, start-ups,

venture capital companies and final products/services). This framework consists of four cyclically connected parts:

A. On the left hand side, it starts with idea generation tools
B. On the middle, the dynamic Iterative Innovation Cycle
C. On the right hand side, the target market and Technology Catalogues
D. The arrows above and the below represent the dynamic feedback from the ecosystem
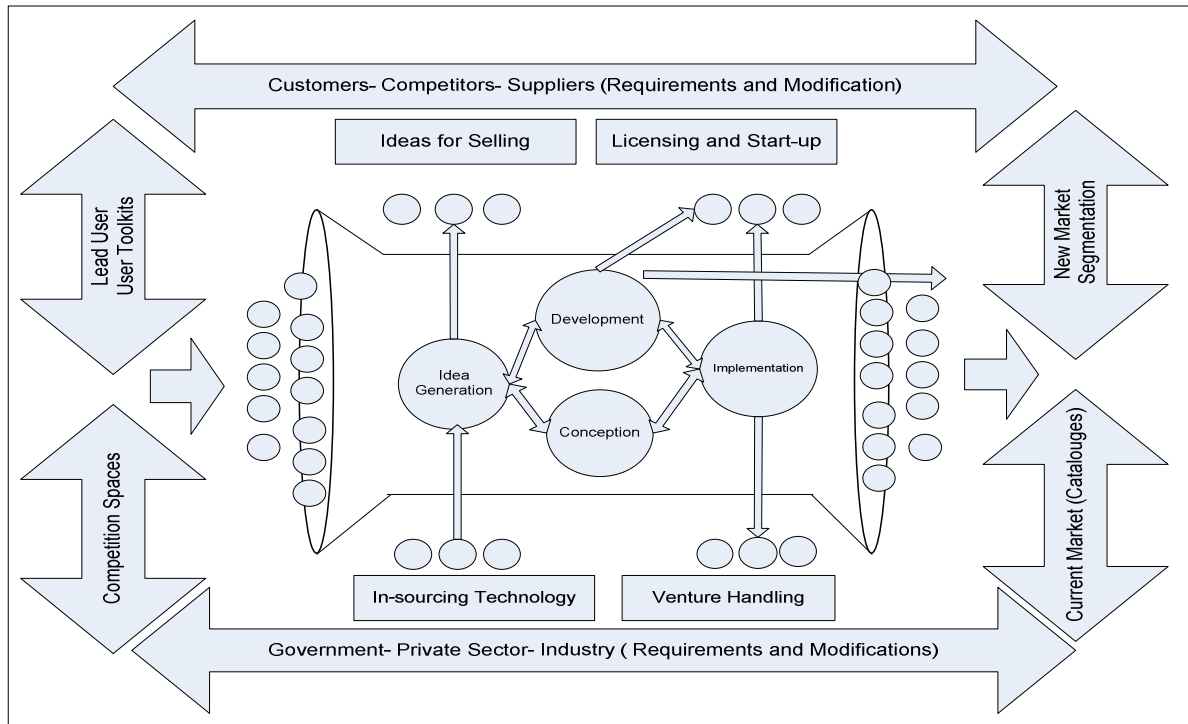
Figure 11: Dynamic Open Innovation Framework
Source 1: Author's Work

- *Components of the Framework*

   a) **Idea generation tools**

There are many tools for marketing and generating ideas. According to (Diener and Piller, 2009), there are three main tools, (The Lead-User Method, Toolkits for OI, Innovation Contests). Additionally, there are some other tools that have been applied by multi-national companies such as: Procter & Gamble and Novo Nordisk (e.g. Virtual Websites and Professional Catalogues)

1. The Lead-User Method:

This is a qualitative process-oriented approach. Its goal is to allow the integration of specific selected users to generate and provide ideas and models for innovative products, services or processes. Lead-users participate in the early stages to make specific modifications or adjustments that are required by customers. In addition, lead-users have the ability to produce a complete solution for their needs, or for others, (Von Hippel, 1986, 1988). For example, a master technician in a company is responsible for testing all new materials. They can, by means of their own experience, evaluate the new tools and suggest new modifications or even adjust them by themselves, (Diener and Piller, 2009). So, university researchers can consider such a feedback to modify and adjust their applied innovations.

2. Toolkits for Open Innovation

According to Von Hippel (2001), a useful procedure for OI is called Toolkits for User Innovation and Co-design. The aim of a toolkit is to integrate customers' contributions into the innovation processes. Then allow the organization to communicate with a large number of customers. The idea of the toolkit is to outsource the trial-and-error process to customers (Frank and Piller, 2004). A toolkit is a box of tools; a set of basic building units for graphic-user interfaces that allow the customer to log-in and transfer their needs iteratively to a concrete solution without any need for personal contacts with the organization. As a result, university can provide users with an interactive platform, by which they can create a solution according to their own requirements. This interactive web will allow uploading new ideas, best practices, and experiences. The idea-sharing platform enables the discussion and development of new ideas, encourages support of an innovative culture, and allows for wider stakeholder contribution of new ideas. The climate of idea generation seeks to exemplify these benefits by gathering ideas on ways to reduce uncertainty and communicate the university's position and ambition related to environmental challenges in an engaging and involved way.

3. Innovation Contests

In the previous approach, the motive for users to participate in the toolkit method is the benefits of using the designed or adjusted product or solution, and participants have to be experts, independent innovative persons or members of an innovation team. But there are a lot of innovative people in the society who are in need of a motive to participate and to integrate their new ideas and concepts. As a result, there is a need to create competition spaces that allow the university to build a critical mass of ideas and enrich its organizational brain with out-of-the box ideas. In an innovation contest, a university calls on its customers, users, competitors, suppliers or experts in the general public either to disclose innovative ideas and suggestions for innovation improvements

or asks for a very specific solution for a dedicated (technical) innovation task. There are many types of competitions: a broad type of competition allowing all potential participants to generate ideas, another type is a call for contributions for a very specific question directed to a team of specialists, (Diener and Piller, 2009).

4. Entrepreneurial and Innovative Virtual websites

Using the virtual space to enrich the university with new ideas is a crucial source for building the entrepreneurial and innovative culture. There are many types of websites which have to be designed to integrate all members of the university into the innovation system, such as:

- The first portal is to discover useful process tools and gain inspiration from cases and articles to enhance innovative thinking and practice. The goal of this portal is to provide adequate information about the concepts of creativity, Innovation and OI. This information will allow university's staff, employees and students to know how to foster creativity, and demonstrate and experience the difference phases in the innovation process. Internet platforms are thought to have a positive impact both on the content and on the process dimension of knowledge and the expertise that have a relevant impact on the output development. Anyone who would like to have any information concerning innovation and OI can have access to this website.
- This website's aim is to create a *community of support* where the members can help and encourage each other regarding researching and developing ideas, apart from making friends and socializing. The community also promotes positive and proactive actions to be creative and innovative by sharing stories and best practices. Anyone who has a problem in their research can access the community and seek the help of other members. Indeed, the main aim of this website is to provide mutual help, educating each other, and sharing knowledge in order to enrich the learning organization.

b) The Innovation Cycle (I-C-I-D)

The Innovation Cycle is the source for adding-value to the university. Innovation processes have to be self-reinforcing and continually repeating cycle of activities (Zeleny, 2005b). It begins with *Idea Generation* (I) containing the customer's requirements and needs. It also includes the evaluation of the compatibility of the idea with the organizational business model. Then, the idea has to be turned into a simple solution or *Conception* (C). In this phase, the potentials of the solution have to be evaluated and the required resources and activities have to be examined. If the solution has an acceptable feasibility study, then it has to be *Implemented* (I) Then, after making

required tests, the actual product is *Developed* (D). The following figure shows this cycle:
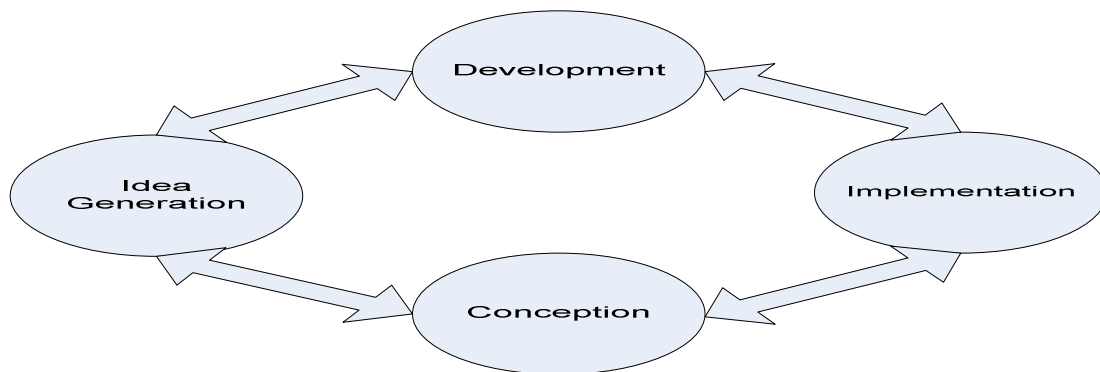
Figure 12: The Innovation Cycle [I-C-I-D]
Source: Author's work, based on Zeleny (2005b)

This innovation cycle is an iterative dynamic model. It is a self-reinforcing learning cycle which must be continually repeated if any learning from developing is to take place, (Zeleny, 2005b). Through this cycle, the university can benefit from all of its own ideas during the innovation phases. The following idea could be beneficial to achieve profits and CA for the university during the innovation cycle. The university can build a website for selling new ideas, prototypes and final products for companies. This Website allows the university to upload and announce the on-the-shelf ideas that are not used by the university. This portal has two sections:

- Section One: Selling ideas that can be commercialized and which can create an added-value for both the buyer and the university.
- Section Two: Publishes ideas that are not used by the university and cannot be commercialized by the university.

Additional OI tools to commercialize and advance university's innovation will be explained in the next chapter.

c) Target Market

There are two types of market: The Current Market that consists of currently available customers and the New Market that contains prospective or potential customers. The university has to consider both types. It should maintain its current customers and attract new customers through the creation of new entrepreneurial environments. On the other hand, there are two types of university customers: direct customer-for example students, and the indirect client, who benefit from the university's graduate outcomes such as: firms, regions, governments and society as a whole. So, the university has to differentiate itself through maximizing the value delivered to both

types of customers. One of the most powerful tools for promoting the university's technology is to design a *Professional Catalogue* that can be distributed to the target market with the available technology for commercialization. A professional catalogue includes all the technologies available for commercialization with a brief description. Information about these technologies has to be balanced, so it can also provide suitable knowledge for investors to encourage them to choose the best technology. Meanwhile, it has to be prepared in a professional way that protects the university's Intellectual Properties Rights. This catalogue should be delivered to all companies and enterprises in the area.

d) Ecosystem Feedback

The whole framework is cyclical and has been built in an iterative way that allows the continuity of the feedback from all the ecosystem components (e.g. customers, suppliers, competitors, governmental agencies, private sector and industry). All needs, suggestions and requirements of the partners of the system will be directed to the idea generation phase and this process shall be repeated over time. The previous part changes the university OI model from a static view to a dynamic one to differentiate itself from competitors to achieve a self-sustainable competitive advantage. Therefore, *there is a need to define the university's self sustainable competitive advantage.*

4.2.2. A University's Self-Sustainable Competitive Advantage

This part introduces an answer for the first part of the third research question: "*What is the university's self sustainable competitive advantage?*"- Traditionally, sustainability is defined as the organization capability to increasingly maximize its return, earnings, and profits to maintain its competent survival, or to protect its long-term competitive advantage, (Porter, 1998). Zeleny (2010) criticized the Porter's view of the strategic position and CA not sustainable without trade-offs. Zeleny –through a simple resource allocation problem based on linear programming model- confirmed that CA can be sustainable and trade-offs-free. He established that the existence of trade-offs is the sign of inefficiency- not efficiency, (Zeleny, 2010). Sustainable organization that depends on external factors (e.g. governmental support) can be sustained for long periods of time. Once this support disappeared, the organization will collapse suddenly like a pile of sand. As a result, the author agrees with Zeleny's opinion and believes that a university's senior managers should look for a long-term CA that is based on self-sustainability- not only sustainability.

According to Autopoietic theory, a university as a living organism, its sustainability depends on two types of balances (e.g. inner and outer balances). Inner sustainability of a university needs balancing customer preferences (e.g. students and employers), innovation, processes, and finances. A university must first start with advancing its

internal activities and capabilities to stay alive and function before searching successful sustainability and sustainably couple with its environment, (Zeleny, 2010). Outer sustainability refers to sustaining the balance of its development environment by eliminating conflicts between at least five elements: 1) Human and social: enhancing capabilities of its staff, employees and students; 2) Economic: advancing teaching, researching and regional development services and maximize the added-value for all participants; 3) Natural: enhancing and protecting of nature (e.g. green university), renewing and refueling innovation inputs and processes, and recycling and reuse of university innovation /waste; 4) Cultural: creating OI culture that builds a university's identity and preserving cultural diversity; and 5) Ethical: establishing an appreciation and rewarding system to fostering innovation and encouraging collaboration. The author suggests the following pillars for a university to create and maintain its self-sustainability competitive advantage.

- *Pillars of university's self sustainable competitive advantage*

a. **Richness**: Creating resources' profile coming from several sources is compatible with OI Strategy which supports the idea of connecting the ecosystem and finding different innovation sources, (Chesbrough, 2006). This profile should have three characteristics: 1) *Complex*: this profile should be built in a difficult way for competitors to imitate; 2*) Tacit-ness*: it relates to the accumulation of a university's knowledge and experience that is non-codify-able, and 3) *Customization*: it refers to the skills and assets that are specific to the transactions used in the production and delivery of a service for specific customers (e.g. specific alumni training). Additionally, a university resources' profile has to improve the efficiency, effectiveness and adaptability of a university processes as a source of self-sustainable competitive advantage. This profile has to be flexible enough to be adjusted to changes and able to achieve success now and in the future.

b. **Adaptability:** it is the ability of a university and the individuals connected to it both to: 1) generate added-value successfully via continuously improving processes, 2) think for long-term- when faced with challenge, they step back to look at the whole rather than just the present 'small' slice of history. 3) According to a dynamic capabilities approach, a university has to arrange, adjust and reconfigure its resources' profile overtime, (Teece et al., 1997). In other words, a university requires performing four kinds of activities- resource picking, capability building, bonding all together to achieve synergy and reviewing and changing this profile when necessary to face challenges.

c. **Relationships**: they are the bloodline of a university. Informal relationships are often more effective than formal structure in getting things done. How a university weaves together its different parts (assets, functions, etc.) is what makes it unique, and impacts its effectiveness and sustainability, (Bosch, 2005).

d. Interaction: Constantly interacting with its environments, a university changes itself and the environment at the same time. A university as a living system seeks to preserve its identity; when faced with change, it instinctively adapts. Universities that actively engage with their environment encourage renewal and self-sustainability. Zeleny (2007) said that "no organization is an island and all are parts of a network". Any university can only be good as the network of which it is a part. Effective collaboration between employees, suppliers, customers and competitors has become the cornerstone of organizational success. This Open approach will bring forth entirely new ways of making things and delivering services. Self-sustainable system must protect, improve and maintain communication and suitable actions between its components. Systems with partial or inefficient communication can be maintained, managed and organized only through external commands or feedback; are not self-sustainable. Traditional chain of command can be sustainable but not essentially self-sustainable, (Zeleny, 2010).

e. Added-value: a university should focus on the adding-value process to serve the global student well. The global student is searching for the best quality at the lowest cost and the greatest speed. Achieving this combination is the essential condition for gaining sustainable competitive advantage.

f. Information and knowledge: In evolution theory, information and knowledge are about the "processes" by which systems create form rather than a quantifiable object. Without meaningful information and knowledge, systems cannot create new order. (Bosch, 2005). Universities that are open to information and knowledge and that share it broadly create rich and diverse perspectives. Knowledge is powerful in motivating change when meaningful to people and a university's circumstances.

To apply the previous pillars, there is a need to create a flexible business model that allows fostering of university's activities.

4.2.3. University Business Model

This part gives the answer for the second part of the third question: "What is the university's self sustainable competitive advantage and *what are the required activities to achieve it*?" This part is based on Chesbrough (2003a, 2006) and the author adjusted it to be compatible with the university strategy. OI means that a university needs to combine internal research with external ideas and then integrate both ideas within its own business model and also through other partners' businesses. The main key for a university is to find out what crucial missing parts should be internally supplied and how to integrate both internal and external pieces together into systems and architectures, (Chesbrough, 2006). The university business model can be a helpful framework to convert these technical decisions to an added-value. A university can generate and capture value from its developed technology in many ways such as: Managing intellectual properties, licensing technologies, and launching start-up

companies that utilize the technology in new business fields. As mentioned before, the added-value of a new technology developed by a university can be achieved only through transformation of this technology (e.g. gaining tangible value from commercialization, or providing it for free to achieve intangible value from serving the society). Sometimes, the business model is called "the architecture of the revenue" to create and capture value from that technology. The right selection of the model will allow the university to yield more value, (Chesbrough, 2006). According to (Chesbrough and Rosenbloom, 2002) business model has to be comprehensive and operational in order to successfully allow the organization to capture a maximum value from its developed technology. It is considered as mediating construct between technology and economic value, (Osterwalder, 2004).

The business model is defined through the following six functions: (Chesbrough and Rosenbloom, 2002)

1. *To explain the value proposition, that is, the value created for users by the offering based on the technology. This requires a comprehensive understanding of what technology offering will be and what form a customer will use.*
2. *To identify a market segment, that is, the users to whom the technology is useful and for what purpose. The business model must focus on a group of customers, or a market segment, to whom the proposition will be appealing and from whom resources will be received.*
3. *To define the structure of the value chain within the firm required to create and distribute the offering.*
4. *To estimate the cost structure and profit potential of producing the offering, given the value proposition and value chain structure chosen. It the definition of the "architecture of the revenues" – how a customer will pay, how much to charge, and how the value created will be apportioned between customers, the [university] itself and its suppliers.*
5. *To describe the position of the [university] within the value network linking [the components of the ecosystem] including identification of potential Complementary and competitors.*
6. *To formulate the competitive strategy by which the innovating [university] will gain and hold advantage over rivals. Most recent work has examined the underpinnings of what allows an [organization] to sustain a profitable position in the market. Key factors for sustaining competitive success include the ability to gain differential access to customers and difficult for competitors to imitate.*

Based on the previous literature, the author suggests the following open business model to commercialize university innovation that can maximize the value captured for a university and for all other components of the ecosystem.
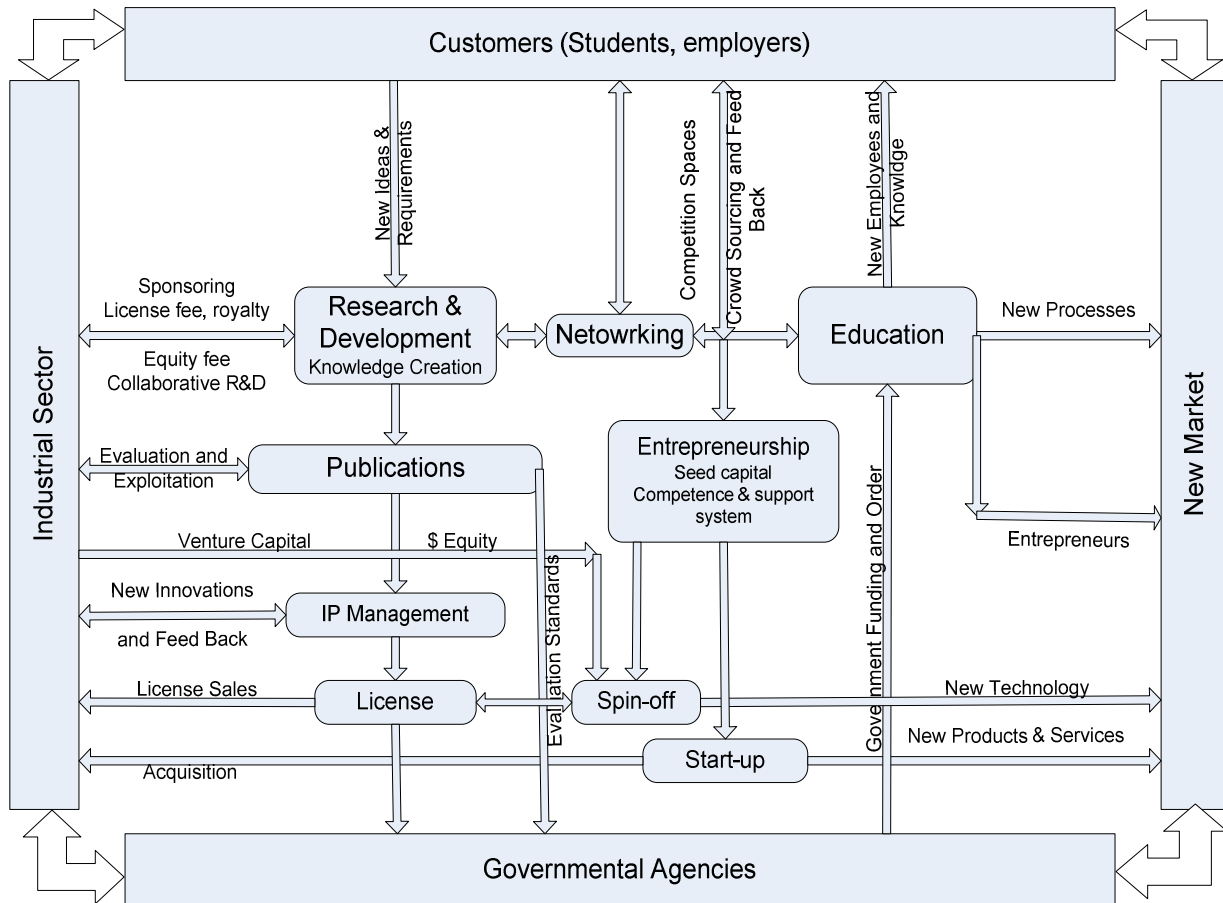
Figure 13: Open Business Model for Commercialization of university innovation
Source: Author's work based on (Mets, 2009)

This framework provides a comprehensive view of OI methods that allows capturing real value of new innovation and technologies. The framework describes main collaborators with the university to establish a win-win relationship (e.g. industry, government, customers, and new market). It provides a general business model representation that can be considered as circumstances based view because all possible methods, their positions and roles can differ according to each university status. Meanwhile, the framework does not mention all available methods (e.g. trade secrets, know-how, and copyrights etc). According to (Mets, 2009) there are two different perspectives of a university business model: first is a broad vision sees university as a producer of intellectual and social assets in and for the society. Second is a narrower view to university commercialization activities of research as fund-generation purpose.

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The author suggests that the first perspective is more applicable to allow a university to face the current challenges and to perform the required role in injecting the knowledge-based economy. This wider view of a business model will permit a university to successfully carry out its knowledge transfer mission that consists of: Knowledge dissemination; knowledge creation; knowledge association; and knowledge agreements), (Howard, 2005). In a university that works as a living organism, technology transfer missions can be connected and integrated. For example, knowledge diffusion can be made via scientific publications, university graduates with new knowledge as employees; continuous training; personal relationship; free licenses (not protected IP) and new products, processes and services. Knowledge creation indicates firstly patenting new inventions, trading of licenses via patents and protected IP to industry that can invest in spin-off and start-up companies, provides seed and venture capital, builds business incubations, and requests for consultations. Knowledge association contains endowments and business support of research projects, financing scholarships, research consultation, facilities and ventures, and business and research collaborations. Final mission is knowledge agreement that is developed from the third task. It means legal relations between a university and its ecosystem to solve complex problems before the society. Moreover, agreements with governmental agencies can help in developing standards, rules and measurements for commercialization of university innovation, (Mets, 2009). This dynamic business model will allow a university to achieve a self-sustainable CA and can be adjusted and modified according to challenges that face the university.

CHAPTER FIVE
UNDERSTANING OF TOOLS, BARRIERS AND SUCCESS FACTORS

This chapter consists of two sections. The first one is to provide an explanation of the different tools that a university can use to implement and utilize the OI strategy. The second part is to introduce an explanation of the barriers that prevent and diminish the implementation of the OI strategy. Additionally, it introduces a brief explanation of the enablers, success factors and conditions that are essential for facilitating the co-development and application of a new OI Strategy.

5.1. Open Innovation Tools and Techniques

"Specify the suitable OI tools to be used at the university"

According to (Chesbrough et al, 2006), the successful application of OI in the organization depends heavily on the excellent choice of the tools and techniques that support and organize their innovation practices. Beside this, strategies have to be aligned with internal and external conditions and factors that trigger OI. Practicing OI strategy is a circumstances-based view. In other words, the characteristics of the tools and techniques have to be compatible with the organization's specifications and conditions. Choices have to be made for differentiation – not imitation. As mentioned before, university's knowledge transfer includes: knowledge dissemination, creation, association and agreements, (Howard, 2005). Every task has its unique tools and techniques. The following diagram represents these tools and techniques:
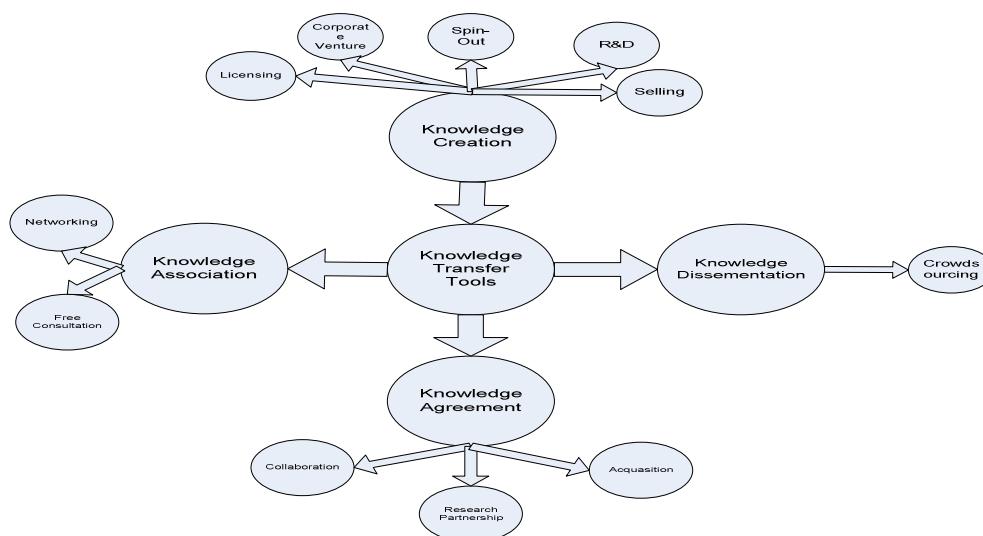
Figure 14: OI tools and techniques
Source: Author's work

5.1.1. Knowledge Creation

In the Open Approach, a university's seniors handle their IP rights in a proactive ways. That is to say - they have to obtain external IPs from outside the university to enrich the research activities and speed-up their own research plans. At the same time, they have to achieve significant profits from commercializing their own unexploited (on-the-shelf) IPs through finding external paths to new markets. There are many types of knowledge creation such as:

a. *Selling and delegating the ownership of the technology*

Selling IPs is an effective tool for universities to market their technology to firms for many reasons such as: when the market is dominated by large companies and establishing new start-up companies is complicated. Or, these large firms will accomplish a significant advantage by developing their products/services through utilizing this technology. Selling IPs approach is an important proactive technique that permits the university to shorten the innovation cycle; increase technology out-puts, increase university's revenues and enlarges the university network. It is important to mention that the decision about selling the technology is based on the agency that finances this technology (a university, industry, government and non-for-profit organizations). On the other hand, selling IPs rights has disadvantages such as: once the technology is sold, the university cannot control the usage of this technology and the university is not allowed to continue developing this technology or use it for research purposes unless it is part of a formal agreement, (IPMO, 2005).

b. *Licensing a technology*

It refers to a university authorization as a (Licensor) to allow an external partner (Licensee) to use a specific technology for a specific term (it is valid only for a specific length of time (e.g. one year) or specific territory (it is valid for use inside a specific country (e.g. Germany). This license has many types (e.g. patents and copyrights). This license is to protect university IP rights and to avoid a claim of infringement, (Raysman et al, 2009).

c. *Corporate Venture*

It refers to the investments in new or existing businesses, (De Jong et al., 2008). OI supports this type of knowledge creation. Universities have to invest in start-ups or small rapidly-growing businesses to improve innovations that were primarily ignored or that did not look promising. This program is established in universities to finance and support start-ups and other small businesses to be aware of possible chances, (Chesbrough, 2006). Universities can create an innovative culture by encouraging their employees and researchers to participate in technology development via creating start-ups. According to many researchers and scientists, this trend of individual university

members' participation will decrease the time required for developing the technology and accelerate commercialization success, (Van de Ven, 1986). In knowledge-based-economy, employees and young researchers are playing a vital role in innovation commercialization. There are many methods to encourage a university's entrepreneurship such as: investing in developing members' ideas and creativity and building teams with devoted innovation financial plans or encouraging members' external network to find new innovation opportunities.

d. Spin out

Universities can advance their commercialization processes by establishing spin-out projects by using their own resources. In this method, an invention is incubated in the institution facilities until a start-up company can be structured and funded from out-side sources and the project management can be transferred into a qualified entrepreneur. Spin-out is one of the most profitable commercialization strategies. It has the highest possible upside potential, highest degree of control over the innovation process, the largest amount of learning and feedback, and the deepest involvement of researchers (usually resulting in strong cultural change). Although spin-out is less sensitive to external environment and if done properly results in higher innovation survival rates than any other approach but it has many disadvantages. For example, until a company graduates from the program, the research institution is responsible for funding, staffing, managing risks, and offering infrastructure. Incubation is a less developed technique and therefore spin-out process is less developed conceptually and there is a need for external experts who can advance this technique, (De Jong et al., 2008).

e. Research & Development

There is no doubt that internal R&D is the basic job of the university. Internal R&D is highly essential to enhance the performance to develop new technological products, bring them to the market and gain revenues. And it is important to enhance and support the organizational absorptive capacity that is required to utilize the external sources, (Cohen and Levinthal, 1990). A university as a living organism has to be able to reproduce itself through internal R&D. At the same time, a university, as an innovation factory, has to enhance its internal R&D to improve its scientific position and to participate in the regional development. Talented people who are able to distinguish, recognize and leverage the work of external partners are crucial for a university to be able to absorb external technology. Statistics show that organizations that are able to make a balance between internal R&D and opening to creative engagement with external partners can achieve significant advantages and enlarge the market share, (Bughin, 2012).

5.1.2. Knowledge Association

a. Networking

A business network is a socioeconomic activity that consists of a group of business people looking to define and create business opportunities. It is a social network that allows the strengthening of the business capabilities and that creates a long-term competitive advantage. The stronger and the larger the business network, the more dynamic and powerful the university is. Networking includes all actions and activities to create a large vibrant pool of participants, (Bughin, 2012) and to obtain and keep connections with internal and external sources of social capital, including people and organizations (e.g. the private sector, competitors, consultants, engineers, industrial associations, universities, governmental agencies, customers, suppliers, skilled users, not-for-profit organizations and other research organizations), (De Jong and Hulsink, 2005).

The OI paradigm emphasizes the potentiality of networking as a foundation for new knowledge (outside-in) and to commercialize internal knowledge (inside-out), (Chesbrough et al., 2006). Universities and other large organizations face a radical problem in financing their (R&D). Networking can play a vital role in filling this gap - to develop that knowledge internally or acquire it from vertical integration without spending a large amount of time or money. On the other hand, networking can provide new partners who are willing to commercialize and purchase new products ideas and prototypes which otherwise would be stored on-the-shelf. Networking contains two types of connections, first is a formal co-operation which is called collaboration and informal co-operation e.g. partnerships.

There are many motives for universities to participate in innovation networks such as: to discover opportunities, or enrich its knowledge database with new knowledge and resources, or to process and absorb new technology, or to commercialize new products/services ideas and at least, to stay aware of the most developed technology and market initiatives. There are many types of university's network, for example, research consortia that can be characterized as specific mission programs organized to ensure that generic or mission-oriented research will be carried out by one or more universities, (Peters and Fusfeld, 1982). Typically, participating companies pay a membership fee; the university offers laboratory space, graduate students and faculty researchers. Additionally, research parks can be organized to strengthen the university's network. Most of research parks and incubators are located on or near the campus and are intended to draw technology-intensive firms into the university environment. Research parks can be beneficial to both university and industry by facilitating interaction and encouraging them to take advantage of each other's resources, (De Jong and Hulsink, 2005).

b. Consultation

Consultation is an additional path for commercialization of university's technology, research experience and competencies. The idea behind consultation is that researchers and scientists over the years have gathered deep multi-disciplinary experiences and knowledge of technological development in their area of study. This knowledge and experiences can be provided to help organization (e.g. large firms and SMEs) solve their research and development problems. Linking research institutions with business society via consulting contracts can achieve extra return for a university. In many cases, large complex projects require specialists with cross-functions from universities to solve related problems. Consultation has many advantages such as: providing on-going revenue, accessing to industry information and practical problems, reinforcing relations with the potential commercialization collaborators, assisting in changing research environment to more proactive activities, expanding research institution network and enriching university researchers with new ideas and practical experiences. At the same time, consultation has disadvantages (e.g. it gives little control over the innovation process after the knowledge is transferred, it provides insufficient return, and most of research institutions favor cooperating with large industrial partners and ignore smaller one, but more entrepreneurial and innovative businesses, (IPMO, 2005).

5.1.3. Knowledge Agreement

a. Collaboration

Collaboration is a formal co-operation for specific innovation purposes. It is common between (SMEs) because such organizations lack the resources to fund innovation by themselves, and they have to distribute risks among large numbers of partners. Additionally, in a large organizational environment, the collaboration trend has also increased so as to achieve faster technology development, to share financial obligations and to achieve competitive advantage, (De Jong, 2006). Recently; R&D agreements between non-competing partners have become an accepted mechanism for developing and leveraging technological capabilities. Moreover, some large organizations have started to group with competitors to share R&D costs and linked risks. Another essential movement for OI is the relationship between industry and universities. There is a need for input from academia to inject the industry with new ideas and innovation. According to (Cohen et al, 1998), scientific output increases sales, productivity and patenting returns. As a result, many enterprises engage with universities and fund their research to benefit from knowledge spillovers. In order to facilitate the procedures of collaborating and communicating between researchers and industry, some universities establish research centers focusing on a certain technology. Such centers can provide the environment for the cross-disciplinary approach that industrial problems often require, (Atlan, 1987).

b. Acquisition

Sometimes, large firms face obstacles to build new start-up companies and to establish innovative small businesses because of the lack of skills and other organizational obstacles. A good alternative is to leave universities build small start-up companies that represents a particular type of academic entrepreneurship and are based on innovative skills taught by universities. Then the large corporation can acquire these small businesses. This method can be a valuable option for business organizations that face make-or-buy decision which may affect the firm for a long time. This acquisition technique is a highly essential path for commercialization of university's innovation, (Wagner, 2005).

c. Research Partnership

It is a common approach for research institution to monetize their accumulated expertise. In this technique, long-term partnerships with experienced corporations are structured to solve specific complex projects problems. It is alike consultation but it lasts longer as a result of project long period. Research partnerships are attractive because they provide a predictable long-term source of research funding, direct access to large industry practical expertise and clear path to market in case of successful projects. But, this technique also has many disadvantages. For example, partnership projects are partner biased and focused only on specific partner needs and specific market perception. Also, these projects are risky and large firms tried to engage research institution to spread risks and to handle heavy duty issues that may take long time to solve or commercialize, (De Jong et al., 2008). Sometimes, this partnership has disadvantages for a university (e.g. partnership contracts usually give resulting IP to the paying partners and this limits a university ownership over resulted IPs).

5.1.4. Knowledge Diffusion

There are many tools for knowledge diffusion such as: publications, training, personal relationship, and crowdsourcing.

a. Crowd-sourcing

The 'official' definition of the term comes from Jeff Howe who has outlined crowd-sourcing as 'the act of an organization or institution taking a function once performed by employees and outsourcing it to an undefined (and generally large) network of people in the form of open call', (Howe, 2006). It is a community based technique to channel the experts' desire to solve a problem and gather fresh ideas then freely sharing the answer with everyone. According to (Whitla, 2009) Crowd-sourcing is a spread problem-solving and production model. In traditional use of this model, problems are broadcast to an unknown set of solvers and designers in the shape of an open call for solutions. Users or 'the crowd' typically are structured into on-line communities and

the crowd submits solutions. Then the best solution is selected and owned by the entity that broadcast the problem. The reward system is based on outputs and differs from one case to another, (Howe, 2006). Crowd-sourcing can provide a powerful function within universities and colleges to keep them on the forefront of education and innovation. It prepares students for the increasingly online-world, and to advance closer connections and involvement within the university's ecosystem. There are many crowd-sourcing techniques used to solve internal and external university's problems. The inside techniques are for instance, Innovation Lab that is used to find new solutions to case-studies and short term projects. Entrepreneurship idea evolution is an on-line platform to allow business students to develop their ideas with the collaboration of others. At the same time, this platform can be used to facilitate a semester-long program to identify and introduce new ideas to advance the overall college offering. This could include students, faculty -administration and potentially graduates. Innovation competitions are considered one of the best sources to enrich the university's ideas databank. These competitions could be in different types, for example, new business idea competition or sponsor a semester-long school-wide competition. They could be either within a particular course or department, or the university as a whole, (Brabham, 2009). On the other hand, the outside techniques can be utilized to solve universities central issues such as: crowd funding and innovation. There are many tools for example, Issue-Resolution platform that can involve the student body, graduates, employees, staff and business sectors in providing solutions for regional development. Additionally, Graduates Network is another tool to permit graduates and other interested parties to become and stay dynamically involving in the university. This platform permits the university to select the required topic of the calls and even broadcast more than one subject. Moreover, Crowd Wisdom is a tool to allow graduates to gather the collective wisdom of the greater business school community (students, faculty and administration) for OI or new business ideas, (Brabham, 2009).

5.2. Barriers and Success Factors to Apply Open Innovation at Universities

"Remove the barriers and enhance the success factors"

The aim is differentiation not imitation, (Zeleny, 2010). So, there is a need to identify the barriers to allow a university to avoid failure in implementing the OI approach to create its uniqueness and competitive advantage. At the same time, discovering enablers, success factors and conditions are essential for facilitating the establishment of the OI network. These enablers are important to identify the type of desired collaboration between the university and all other external partners. Few studies investigate the barriers and success factors of the university-industry relationship and most of them are focused on barriers/ enablers from an industry point of view. This chapter investigates the barriers and success factors from a university point-of-view.

5.2.1. Barriers to Apply Open Innovation

According to Zeleny (2008), strategy is an action, not a statement. Most of applied organizational strategies face the knowing-doing gap, which is the dichotomy between the mission/vision statement as a description of action and the actual implementation of this strategy. Zeleny (2008), said that in the traditional strategy approach, many organizations spend a lot of time working heavily on their mission/vision statements and defining, testing and measuring the goals before discovering the 'Cloud Line ' and the problem of implementation.

A university, as a traditional bureaucratic organization, faces the same problem when it tries to apply the new OI Strategy (OIS). Therefore, there is a need to analyze the components of the 'Cloud Line' to avoid its effect. This 'cloud line' consists of many barriers that hinder any university from applying the desired OIS and not to engage with its ecosystems successfully. From the practical results of this study based on in-depth interviews, there are three groups of barriers: internal, external and mixed barriers. The university internal issues consist of: their business model, strategy and management style, expected return, internal reward system and contracting management issues. The external obstacles are: partners and cooperation network management, law and regulations that control collaboration. Mixed barriers are some factors that can be considered as internal and external at the same time such as: culture differences and IP management, understanding OI concept, accessible resources, availability of innovative people, and trust. The following figure shows the university's barriers.
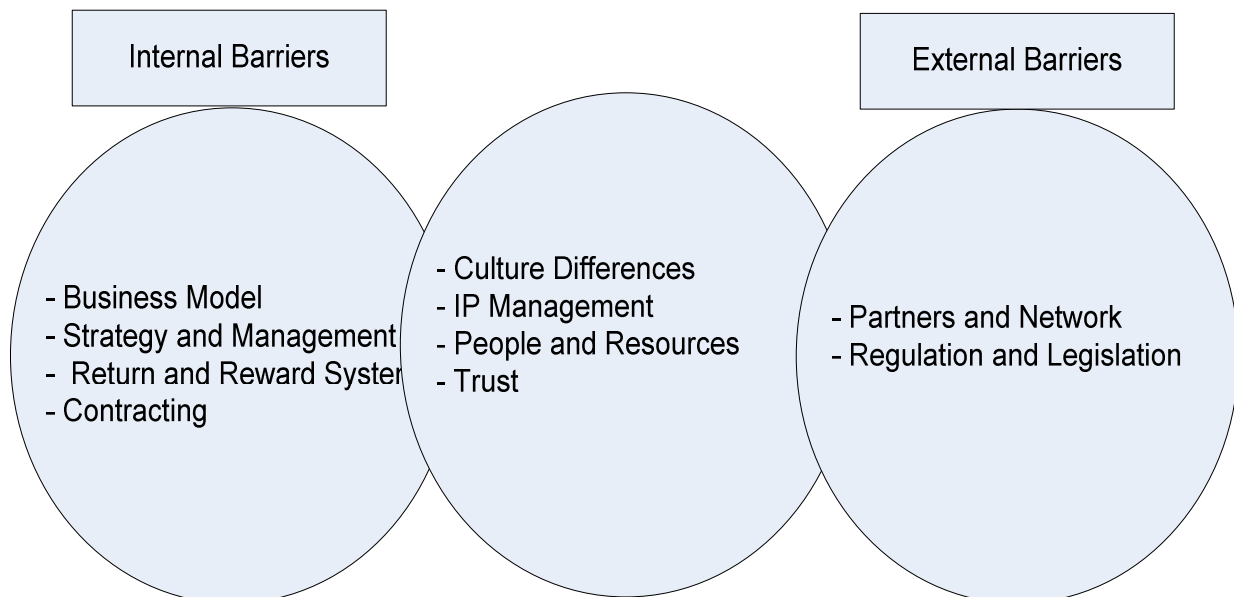
Figure 15: Barriers' categories to applying OI at universities
Source: Author's Work

Internal Barriers

a. Business Model

Many studies confirmed the importance of understanding the potentiality for each core competent of the university business model to facilitate the cooperation and collaboration with external partners. Furthermore, the business model of the university should be flexible enough to utilize these new strategies and to achieve significant returns. The problem is that most of the traditional universities have a strong belief in their business model and cannot discover new chances and opportunities specifically from collaboration with business sectors. Sometimes, it is difficult for universities with traditional business model to identify the potentiality of utilizing their own IP (e.g. patents) or research results with other business organizations. The university may not be able to recognize the importance of finding new paths for its R&D to the market and making significant returns from on-the-shelf ideas.

b. Strategy and Management Style

In addition, there is a possible barrier that is related to the university strategy and management activities. The absence of flexibility from the university's top-management and the dependability on extreme bureaucracy, are the most important obstacles that hinder cooperation. Another issue is the failure in defining the goal of collaboration. To ensure success, university's senior managers have to get a clear understanding of the required deliverables. There is a difference between a university and other partners' perception regarding the definition of the desired R&D. Universities consider any progress in gaining knowledge to be an output and this can be assumed to be a success. In contrast, industry believes that a successful product is the product with a potential marketplace, and that is a satisfactory sign of the success of R&D project, (Bruhn, 1995). In some cases, the decision-making process based on subjective opinions can hinder the co-operation because it depends only on personal perception.

c. University Return and Researchers Reward System

Reward systems or incentives for people to use OI are additional challenges. Universities - either public/private organizations- have a bureaucratic system that is organized differently from companies which are profit-driven and have a well established management structure (Rohrbeck and Heinrich, 2006). This is reflected in the reward systems in both types of organizations. A university has no explicit incentives offered to the professors and researchers, meanwhile, companies have a well-designed reward system to facilitate alignment of employees' interests with the corporate strategy and interests. In consequence, the processes of budgeting, task definition and task execution are very different, (Siegel et al, 2003). Another issue is that in most universities, researchers are not willing to work overtime to meet a certain deadline because they do not directly gain profits. Industrial managers are more

committed to meet the specific deadline, otherwise any delay will be considered as poor project management, and could cause a project delay or failure, (Bonaccorsi and Piccaluga, 1994).

d. **Contracting**

A contracting agreement process may cause many issues to the OI method when it is based only on trust. Besides this, network management is costly and OI does not mean "free of charge". Contracts are often used to reduce the differences. By using contracts, academics can be committed to the same obligations that apply to other partners, such as companies' employees. Contracts guarantee the smooth transferring of IPRs and ownership of results from the researcher to the university, and further, to the external collaborator. Contracting obligations have to be handled carefully. The problem in some universities is that they do not have practical experience and guidelines to make contracts. They can only form contracts but they do not have lawyers or any other experts drafting contracts, (Hurmelinna, 2004).

Mixed barriers (both internal and external)

a. **Culture Differences**

Culture is a major critical factor for OI and practically, the most difficult one to overcome. Firstly, there are some institutional roles that control the creation of public and private knowledge, (Dasgupta and David, 1994). Merton (1942*)* said that *"...the university system is rooted to four Mertonian norms of science, (e.g. communalism, universalism, disinterestedness and organized skepticism"*. According to *Communalism*, the essential findings of science are social collaboration out-puts and belong to the community. *Universalism* means that scientific results should be evaluated objectively, and that they should be verifiable and repeatable. The principle of *disinterestedness* persuades researchers to have a reward from the recognition of their scientific achievements not through monetary gains. The fourth principle, *organized skepticism,* refers to the fact that researchers should arrange empirical and logical criteria before judging any particular theory. These institutional rules are crucial to the method that many academics recognize and do their work, (Bruneel et al, 2010). Following these principles creates some issues in collaborating with external partners, such as: access to research results, researchers reward systems, and publicity. For example, The University requires the developing of scientific results that are validated to enhance its scientific prestige and reputation. On the other hand, partners have a different concept - for instance, industrial partners focus on gaining profits by transforming advanced university output into services and products. Additionally, there are other differences between a university and other partners' goals, missions, time, language and basic assumptions, (Hurmelinna, 2004). The main goal of the university

is to advance science and to develop the surrounding region by providing qualified graduates, advanced publishing and to improve the community's capabilities and advance its technology. This contradiction in goals directly relate to the conflict regarding confidentiality policy. Partners such as companies or competitors think that dealing with R&D as a confidential property is an excellent method to protect their innovative competitiveness. But concealment of research knowledge results does not fit with a university environment, for instance; staff needs publications for a promotion or to apply for a new position, (Hall et al, 2003). Also, to achieve the required reputation, universities need to publish internally developed scientific results or results from collaborative research activities. Additionally, universities would favor the publication of the results quickly in order to guarantee the novelty of their research. At the same time, industries or business sectors will prefer to gain profits from transferring it into products or services before publishing results. It is an industry secret - and it has to be hidden, (Rappert et al, 1999). Additionally, some partners such as industry - are searching for short - term profit on a quarterly basis. On the other hand, a university as a bureaucratic organization has a longer reporting cycle - which delays the development of the technical results, (Hurmelinna, 2004).

b. Intellectual Property Management

There are many types of IP, such as: copyright, trademarks, patents, industrial design rights and trade secrets in some authorities, (Brad and Bently, 1999). This IP system can be considered as a major obstacle to any joint project when Partners do not evaluate IP seriously, or do not know exactly how much it is worth. Licensing is a normal model of university technology transfer to the business sector. But, licensing can cause a lot of problems when combined with providing a lot of services such as: assistance in developing the product, training; technology transfer methods; consulting; developing the market place, and support for business development efforts. Another IP management challenge is when the university tries to buy IP from outside which is called "outside-in". The challenge comes when the IP has newly developed radical innovations to novel business sectors. In this situation, the university may require to have more in-depth collaboration with the organization that developed the IP in order to allow the university obtains the know-how of the new IP. This sort of cooperation may be in many types of situations (e.g. Start-up Company). Universities need robust and transparent processes for organizing and transferring IP to overcome this problem

c. Innovative People and Resources

Innovative people are absolutely vital for OI. People are the cornerstone for establishing a suitable network for enforcing OI. Although an individual has an excellent innovative idea, sometimes it is very hard to know how to exploit this idea, or how to transform it into a beneficial output. Attracting talented students and professors

is very costly. Resources could be considered as another barrier for OI because OI requires establishing many financial channels to finance its implementation.

d. Trust

In any relationship - trust is earned, not given. Trust is an essential foundation for building collaboration. Personal relationships between collaborators have the final say regarding the effectiveness of this collaboration. Lack of trust hinders individuals and organizations from engaging with collaborators outside their limited network. Additionally, there is an issue related to continuity and staff changes. For example, universities' staff is more stable than their peers in companies who are promoted or transferred to another branch. Companies are subject to unexpected radical changes e.g. acquisitions, mergers restructuring and bankruptcies, (Hurmelinna, 2004). This can affect the trust - because it is built in persons … not on organizations, (Rosenberg, 1994). If the key contact person has been changed for any reason, and the new one does not have the same required skills and experience - this will cause a lot of problems between the cooperating partners. As a result, many organizations prefer to start first with small projects in order to be able to build a degree of trust in the capabilities; skills; attitudes and outputs of the other parties.

External barriers

a. Partners and Network Management

In this open and complicated world, it is difficult to discover partners who have the same interests and language and to effectively manage your collaboration network. Understanding your partners' goals is very important to allow smooth negotiation. Also, a university prestige as a research institute may complicate - or even delay, finding appropriate partners, specifically if the university has limited experience with the innovation market. On the other hand, companies which are willing to collaborate with a university need to contact the technology transfer office or some academics and this process may be unclear or complicated. Collaboration with competitors could be beneficial, if there is a clear agenda and core competencies for each partner are identified and protected. Competitors' collaboration should be based on creating trust, shared understanding and win-win relationship.

b. Regulations and Legislations

Definitely, there are also barriers according to the laws and regulations that control the university and other legislations that organize work in other organizations. In public universities; the situation is harder because all of these universities depend on governmental funds- which put a lot of restrictions over collaboration and funding partnership projects.

5.2.2. Success Factors and Enablers to applying Open Innovation

  Enablers and success factors are divided into three groups: 1) University research infrastructure, 2) University research planning and development and 3) Connecting the ecosystem. The following figure represents enablers and success factors.
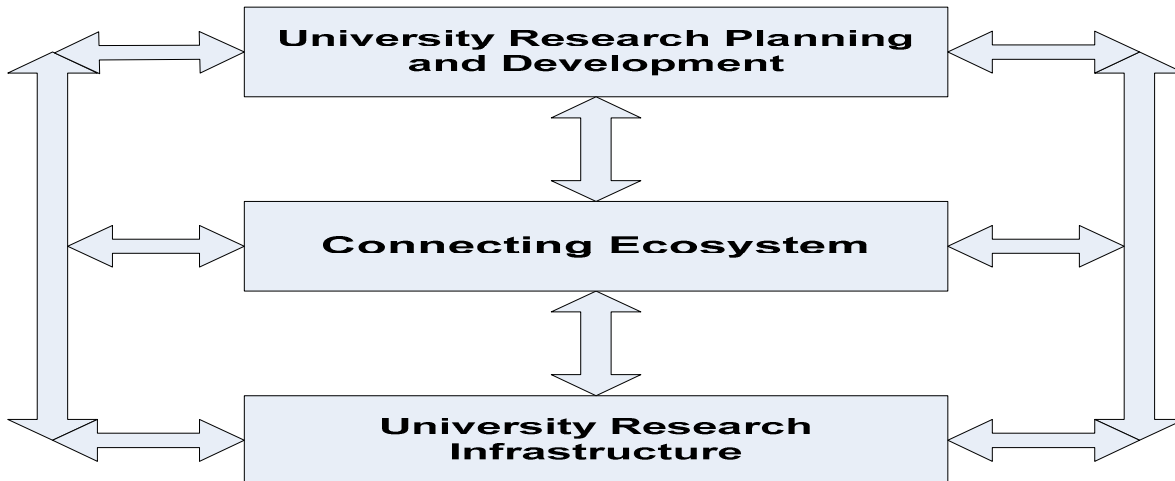
Figure 16: Success Factors and Enablers
Source: Author's Work

University Research Infrastructure

a. Effective Business Model

  A business model provides a methodology to allow a university to know when to engage and specify the terms for such collaboration. It specifies the required competencies and various skills to engage with external collaborators. A university business model should make logical judgments about how to utilize developed IPs. A university should change its role from an innovation transferor to external collaborators into a wise organization that has assets and can manage them intelligently to benefit all partners, (Osterwalder, 2004). So, the required business model must distinguish two types of Intellectual Assets (IA). The first is the knowledge that should be maintained and protected and is not available for exchange with external partners. The second is the know-how that could be sold and adds value for the university. To increase the demand for its knowledge assets, a university has to understand and satisfy the requirements of its partners. The business model has to be flexible enough to face changes and has commercial strategies to correctly evaluate the developed technologies.

b. Information and Knowledge Management

An effective information and knowledge sharing system is essential for fostering OI. There is no single organization which owns all relevant information. So, it is very important to classify, assess and integrate the required information through emphasizing the management and linking of a knowledge network, (Chesbrough, 2006). Obviously, a university needs practical information from industry and other professional organizations. Building a database for proposed partners with relative information is important to provide a fundamental knowledge of the network components. Additionally, this database should contain patents' information to allow the government and business sectors to make greater use of the technical information included in these patents, (Sainsbury, 2007). By allowing this patent knowledge to be available to external stakeholders, it is clearly possible to avoid research duplication and enhance the decision-making mechanism. Integrating university knowledge with external collaborators knowledge leverages and deepens the university's dynamic capabilities. This knowledge accumulation allows the university to differentiate itself from its competitors and hinders them from duplicating or imitating these capabilities, (Mathews, 2003).

c. Absorptive Capacity

Absorptive Capacity is the ability of the organization to identify the value and novelty of external knowledge and utilize this knowledge in a commercial way, (Cohen and Levinthal, 1990). It includes intelligent, talented and multidisciplinary people; processes for exploiting and commercializing external knowledge; the relationship between different fields and knowledge areas; the organizational capability to learn and improve itself as a learning organization and finally, the speed of adapting the new external knowledge. These factors can help and support universities to profitably apply OI. Absorptive Capacity is essential for the university to build a mature commercial model within the overall portfolio of activities, (PERA, 2009).

d. Economical Motivation

University commercialization policies are vital for encouraging academics to participate in OI activities. A university has to identify the role of its staff in the networking process and to allocate an appropriate value to their involvement through IPs rights. However, government funding and business engagement could be wisely used in increasing collaborative applied research as well as increasing R&D expenditures, (Sainsbury, 2007).

e. Talented people

There is no doubt that human capital is the backbone for the innovation processes. But in the OI model, organizations need to effectively balance between in-house

competences and out-sourced expertise and skills. Many studies recommended that universities should prepare policies to enhance their internal knowledge and skills needed for collaborative projects. Entrepreneurial training is an essential approach to leverage the knowledge of the innovative people. Universities must work on a network foundation that allows a large pool of professionals and practitioners who are clever in maximizing added-value and decreasing innovation expenditures. However, working with out-sourcing expertise is a challenge for the university and has to be handled carefully. External partners' cost is higher than in-house skills-which will affect the profit of the university. Additionally, external expertise has different goals and cultures which have to be aligned with the university's strategy and culture. As mentioned before, out-sourcing in the OI model is a circumstances-based view and every university has to make a comparison between the value and the cost.

University Research Strategy

a. Technology Road-map

The availability of innovation plan and roadmaps will allow the university to effectively enhance its networks and knowledge-sharing. Road-mapping is another important tool to encourage OI and the commercialization of technology. A Technology road-map is a plan that matches short-term and long-term goals with specific technology solutions. Developing a roadmap has three major uses. It helps reaching a consensus about a set of needs and the technologies required to satisfy those needs; it provides a mechanism to help forecast technology developments and, it provides a framework to help plan and coordinate technology developments, (Sainsbury, 2007). A Roadmap is a useful tool to enhance a university's capabilities either internally or externally. It allows a university to identify suitable partners and specify the information and knowledge required for this collaboration. A roadmap can be divided into small parts to identify new opportunities and to allow the analysis of specific issues that are located outside the university's core competencies- such as legal or environmental issues.

b. A Balance between Strategies and daily Operations

It is called "Ambidexterity". It is the ability of university's managers to handle today's business operations and to implement research strategies that are based on actions - not statements, (Raisch and Birkinshaw, 2008). Involving all external partners in innovation processes is an excellent approach to mitigate the complexity of the OI model, while meanwhile operating routine activities. These skills are important for universities' top management and administrative managers more than research academics. However, a university's ambidexterity can be recognized as a priority from two perspectives. According to (O'Reilly and Tushman, 2004)"…*The first is Structural Ambidexterity, which uses dual structures and strategies to differentiate activities to*

achieve exploitation and exploration simultaneously. The second is Contextual Ambidexterity which utilizes behavioral and social means to integrate exploitation and exploration, even at the organizational unit level". A university should be aware that ambidextrous organizations need a large amount of mobilization, coordination, and integration to maintain exploitation and exploration, (Fredberg et al, 2008).

c. Marketing strategy

A successful marketing strategy should include a monitoring system for discovering funding opportunities and proposing winning co-operative ventures. Most of the literature has shown that universities and other higher education institutions have an obvious problem regarding the demand of business engagement and IP sales. A marketing strategy can play a vital role in effectively increasing demand by: 1) Facilitating the use of the open source approach to innovation, 2) Executing online experiments to test concepts, as now used by companies such as Proctor & Gamble, Google and Wal-Mart; and 3) Publicizing specific opportunities can also help to assess demand, (PERA, 2009). The market insight is an intelligent tool that supports OI through facilitating the selection of collaborators and their proposed offerings. Wellings (2008) suggested that a university should prepare an up-to-date catalogue to include all success stories and excellent practices in technology commercialization and the utilization of university's IPs as a part of the annual report. The publication of the successful activities is a part of the promotion strategy which builds the university's trust and prestige and can encourage external partners to collaborate confidently.

d. Research Outcomes Management

One of the crucial factors to success in OI is to have a highly qualified IP system and organized method to distribute and utilize research results. IP rights allow a university to decrease risk and establish trust between collaborators who are seeking to share knowledge and looking for added-value from others, (De Jong et al, 2008). This permits the university to protect its patent rights and research outcomes. PERA (2009) suggested establishing a patent pool that contains knowledge and building blocks of a group of life-science collaborators to facilitate access and utilization of IPs. This collaborative mechanism will ensure knowledge-sharing and achieve Return-On-Investments, while meanwhile, eliminating duplication of research, decreasing transaction costs and distributing risks among multiple partners. Additionally, building an effective configuration for spreading research results will allow the optimization of advantages to society and the economy. One of the OI principles is the availability of a knowledge stock and its agile absorption by all components of the economy ecosystem. Traditionally, academic publication needs at least six months for the peer-review process - which affects OI practices because during this period, a lot of opportunities will be lost. There is a need to reconsider this peer-review process and it has to be enhanced and shortened.

e. Transparent Measurements and Rules

When a university starts an OI engagement with enterprises-for instance, large industrial players' specific standards achieve a secured income. OI collaboration projects that are equipped with measurements play vital roles in maximizing the benefits for partners through identifying innovation areas and profitable opportunities. Actually, a university has to find a dynamic approach to standardize its cooperation rules and regulations to allow business sectors and other partners to cope with these standards. It is a proven fact that codifying the right standards at the right time will support the application of OI, (Swann, 2005). Standards maintain the long-term relationship between the university and other external collaborators.

f. Entrepreneurial Strategy

Actually, there are two levels of using education as a supporter for OI. The first level is a general strategy that focuses on increasing the high and widespread quality of education. Enhancing and increasing the degree of knowledge about politics, business, science, technology, critical thinking and creativity abilities will be an essential factor for OI to flourish, (De Jong et al, 2008). The second level is by advancing and improving entrepreneurial skills through purposeful education. Building entrepreneurial students will increase the opportunities for the university to maximize the collaboration added-value and will allow the university to have the critical mass of creativity that is required to introduce new technologies and creative ideas.

Connecting University Ecosystem

a. User Involvement

Obviously, user innovation is one of the OI forms. Von Hippel (2005) studied the user innovation that is used by organizations from the supply side. He found that 10-40% of firms produce or significantly modify machines, equipment, software or other tools they use in order to meet their specific needs, (PERA, 2009). Many large firms such as BMW and Adidas opened their innovation processes to customers' contributions, (Gloor and Cooper, 2007). This type of collaborative network is self-organized and contains customers as well as external partners, (Piller and Walcher, 2006). A university can customize its network to involve students, employees, employers and suppliers in innovation processes to formulate the Swarm Businesses Network, (Fredberg et al, 2008). Crowd-sourcing is another approach that allows the involvement of individuals from surrounding society for accomplishing exploration and problem-solving. Then the university can align all of these contributions to potential commercial needs and choose the best to be produced alone or with business contribution.

b. Customer Win-Win Relationship

A customer-oriented approach is an effective strategy. It is based on tailoring business activities to satisfy customers' needs and preferences. In a business-to-customer relationship, a university should observe its customers to understand their unmet and unarticulated requirements because many students and employers have problems in communicating their needs and there is a difficulty in satisfying them. Loewe and Chen (2007) emphasized the importance of customer feedback. In the previous chapter, the author provided a dynamic framework to allow receiving and analyzing customers' feedback to take just-in-time corrective action.

c. Networking Partners

It is absolutely crucial for linking innovators either inside or outside the university, with other partners to enrich the creativity and innovative projects. Now universities, either public or private, face massive competition from innovation sectors that are commercially skilled. So, universities have to consider their competitive situations, especially the competitiveness of their knowledge resources and to rearrange their strategies to connect competitively or collaboratively with research and technology organizations based on the strength of those resources. Effective and valued collaboration between universities and other partners is multi-steps processes that includes: 1) Searching for suitable and potential collaborators, 2) Discovering collaborators' priorities, 3) Sharing capabilities and trying to achieve synergies, 4) Finding a concrete basis for collaboration, 5) Building trust, 6) Developing specific opportunities on an agreed basis and 7) Reviewing the agreements and taking the required corrective actions. Universities need many peer networks to strengthen its competitive position and to achieve financial sustainability through industry collaboration and partnerships.

d. Obtaining The Private Sector Support

Practical experiences emphasized the importance of the private sector support for developing and commercializing the technology, specifically in the early stage phases. Once the innovation is verified and shows potential, this could be an incentive for collaborators to provide the required finance which supports the idea of OI. Universities can focus on two types of funding. The first is from large corporations looking to decrease their R&D cost by outsourcing technologies. The second is by establishing a strong relationship with Small and Medium-size Enterprises (SMEs) that are more dynamic and willing to adopt new technologies to achieve the potential competitive advantage. SMEs which are innovative and entrepreneurial can innovate more radically and creatively than larger organizations and can adjust themselves to threats and opportunities.

CHAPTER SIX
THE CASE OF THE UNIVERSITY OF UTAH

"Investigate successful OI examples to learn from advanced experiences"

This chapter analyzes the strategy of the University of Utah which has been chosen as a standard and a benchmark case-study. University of Utah is an example of a successful university in applying OI strategy. It provides a profile for the university and the economic impact in regional development. Moreover, it introduces an explanation for the pillars that constitute the OI strategy.

6.1. Profile of the University

The University of Utah, also known as the U of U (further only the U), is a public, co-educational research university in Salt Lake City, Utah, United States of America. It was established in 1850 as the University of Desert by the General Assembly of the provisional State of Desert, (Utah, 2000), making it Utah's oldest institution of Higher Education ,(Utah, 2011a) However, It is one of ten institutions that makeup the Utah System of Higher Education. The University offers more than 100 undergraduate majors and more than 90 graduate degree programs, (Utah, 2011a). Graduate studies include the S.J. Quinney College of Law and the School of Medicine, Utah's only medical school, (Utah, 2011b). As of 2010, there were 23,371 undergraduate students and 7,448 graduate students, for an enrollment total of 30,819; with 84% coming from Utah and 16% coming from foreign countries, (Utah, 2011a). The President of the University is Michel K. Young. The U has a large learning diversity program.

The U has achieved a notable reputation due to its significant contribution to advanced research, Technology Commercialization (TC), its excellent education system and many other competitive activities. In 2005, the university adapted a new strategy to foster the TC approach to replace the old Technology Transfer approach. As a result, the university quickly developed and was responsible for the 2nd highest number of start-ups based on university research in 2006, just behind MIT, (U.S. Licensing Activity, 2007). In 2008, according to annual rankings issued by the Association of University Technology Managers (AUTM), the U advanced one place to tie MIT as the leading institutions in the country. Each school has generated 20 new companies based on its technologies. This accomplishment puts the U in the highest ranks of colleges and universities, ahead of universities such as Columbia, Michigan and Johns Hopkins. The U's accomplishment is made more significant due to the fact that MIT receives over four times as much research funding ($1.216, 800,000) as reported from MIT; the U receives approximately ($274,556,126).

Beside this, the university is classified as a research university with very high research activities by the Carnegie Foundation, (Bachelor of University Studies, 2011).

The university's research expenditures were the 67th highest in the US in the Center of Measuring University Performance's 2008 report. Additionally, the university was the 58th highest for federal research expenditures, 52nd for National Academy of Science membership, 50th for faculty awards, 51st for doctorates awarded, and 42nd for postdoctoral appointees (Carnegie Classification, 2009). The U was one of the four original nodes of ARPANET, the world's first packet-switching computer network and the origin of the current world Internet (Computer Science, 2009). In 2007, Mario Capecchi, professor of Human Genetics, was the co-winner of the Nobel Prize in physiology as a result of the U's innovative environment. In 2009, because of the unique programs that are taught by the university, the Academic Ranking of World Universities ranked the university 43rd in the world in the Life and Agriculture Sciences (ARWU, 2009). The university's School of Computing, part of the college of Engineering, was ranked 39th in the nation. U.S. News ranked the university 36th in Chemistry (Scientific Computing, 2009).

The University has been ranked 4th by the EPA for annual green power usage among universities, with 23% of its power coming from wind and solar sources. The 2007 (AUTM) survey ranked the U 9th in the country for the number of companies formed. The U.S. average number of companies formed by universities in the U.S. was 4 in 2005, and in 2006 the U generated 20 companies. In 2008, the U was ranked second best in the country at starting technology companies based on its research With 23 companies started and total annual commercialization and research revenues approaching $70 million. Jack Brittain said that, "*By focusing on serving faculty and students, we produced record-breaking financial results, which for me is the proof that focusing on the right things serves everyone's interests; faculty, staff and the University*".

6.2. The Economics' Impact of Sponsored Research at The University Of Utah

Research is a defining characteristic of the U, setting it apart from many other of the state's institutions of higher education. Each year, the University injects millions of dollars into the local economy as it funds these research activities. According to the Bureau of Economic and Business Research (BEBR) at the U, this spending contributes to the state's economic base in myriad ways supporting and creating jobs, increasing earnings of Utah residents, and providing tax revenue for state and local units of government. During Fiscal Year (FY) 2008, the U spent approximately $365 million to fund its research activities. Of this total, $313.9 million (86%) stayed in Utah State. When the indirect and induced ripple effects of sponsored research spending are considered, the total annual impact in FY 2008 was $525.3 million in Gross State Product (GSP) for the state of Utah. This includes $268.8 million in direct purchases by the University and $256.4 million generated indirectly. Thus, every one dollar in direct

spending by the U generates an additional 95 cents in GSP for the state of Utah, (Crispin, 2009).

Meanwhile, sponsored research directly generated 2,920 full-time-equivalent jobs at the U. The indirect and induced job creation totaled 4,380 - for a total employment impact of 7,300 full-time and part-time jobs in the state of Utah. The estimated wage bill generated by the University's research spending was $310.0 million: $169.6 million in direct University payroll and $140.4 million in earnings for workers in other industry sectors. In addition, this sponsored research spending generated $31.4 million in state and local tax revenue in FY 08. The $525.3 million impact on the state's GSP represented almost 0.5% of total state GSP in FY 2008. Every $1.0 million in sponsored research at the University supports 20 jobs in Utah, generates approximately $849,450 in earnings for Utah workers, contributes $1.4 million in GSP, and provides $86,1135 in state and local tax revenue. In 2010, total revenues from commercial sponsored research were $60,442,903 (e.g. Private Contracts: $32,344,144; Private Clinical Trials: $8,180,760; and Royalty & Equity Income: $11,253,690) with a 17 % increase from last year, 2009. Executed Licensing Agreements have also risen from 64 to 68 in 2010, (Crispin, 2009)

6.3. Pillars of the U's Strategy

The University of Utah started its strategy by looking for successful ways to substitute its top-down bureaucratic mechanism for technology transfer with a bottom-up OI Strategy (OIS). According to statistics, few programs successfully manage the transition to entrepreneurial mode (Krueger et al, 2008). Etzkowitz (2008) stated [… *although the Technology Transfer Office (TTO) uses public relation and press as supporters, many of them lose money probably more than is usually known. Only a handful regularly generates significant positive cash flow. We should know how they make it and how they are different.]* Basic strategic planning is comprised of several components built upon the previous piece of the plan, and operates much like a flow chart. The following are key principles of the U's strategy that play a vital role in strengthening and maximizing the U's intellectual assets. This strategy is based on five main pillars, as follows:

1.   Selecting excellent leadership and obtaining top management support

2.   Understanding and managing the environment

3.   Replacing traditional culture with a new innovative and entrepreneurial culture

4.   Connecting the components of the Ecosystem

5.   Executing excellent innovation processes

6.3.1. Selecting excellent leadership and obtaining top management support

It is important to consider the players involved in this risky game. A successful OI process starts with a visible and vocal leadership and a person who can anticipate the future and predict the consequences. This pillar consists of the following sub components:

Strategy Representation: Every effective OI strategy needs leaders who can provide productive actions to implement the desired strategy and who are able to make observable efforts to demonstrate their support for entrepreneurial activities. Practical leadership is highly essential to carry out the required strategy. The new President of the U, Michel Young, started the new strategy by clearly stating that the priority of the Utah institution is to drive economic development, (Krueger et al, 2008). He translated this statement by restructuring the organizational hierarchy. For example, he moved the responsibility of the Technology Transfer Office (TTO) from the Vice President for Research to be a part of the Business School and its innovative programs. Additionally, he promoted Jack Brittain, Business School Dean, to be a leader of the new Technology Ventures (TV) organization with complete freedom to establish a novel and dynamic plan. Brittain sums it up:"*Creating startups is a matter of quality funding and efficient management. We are getting more out because we work smart, supporting our startups in meeting milestones and investing in small amounts as they achieve important goals along the path to full operational independence*." Meanwhile, the U has the potential support from the state of Utah and the local business community. This one reason why the U has been so successful in getting new companies started. The state has established an extremely friendly climate for entrepreneurs. The results are reflected by these national rankings.

Comprehensive Understanding: In the U, leaders of (TV) have no understanding of the details of innovative technology but they can recognize the importance of their efforts and the consequences of failure. Jack Brittan, (TV) Director, started a long-term plan to communicate, connect with, and engage every stakeholder in the technology commercialization process, all the components of the innovation ecosystem, the media and the University's internal members. Furthermore, the U has formulated a complex, multi-layer program that supports the technology commercialization processes and links a student's venture from idea generation into a start-up company. This unique program consists of a combination of tools and programs, each one of which services a specific phase or task, and helps in developing the venture. This program allows the University to act as a "Virtual Incubator" for these fledgling companies. Jack Brittain said, *"Our innovative faculty is always looking at the big picture impact of their research. This has been manifested by the results of the latest AUTN survey.*" During the last 20 years, the U has created 180 companies - 120 of them are still in the market.

Strategic Intention: Traditionally, strategy is defined as the designing of an action plan to achieve a particular goal/s, (Nag et al, 2007). Leadership has to work in order to identify a clear strategic direction that allows organization to achieve the self-sustainable competitive advantage. Therefore, leaders are key components of any strategy and their importance cannot be measured, (Shane, 2005). As a clear signal of the new commercial-cultural intent, Brittain has changed the name of the program from "Tech Transfer" into the more proactive term "Technology Commercialization". Also, Brittain started the program by using a portion of the state's budget surplus on attracting innovative and entrepreneurial, world-class faculty staffs who are capable of co-operating in translating research according to society needs and the university's field of expertise. Additionally, the university leaders have adapted an open-door strategy and have to develop continuous communications with all ecosystem components. Furthermore, Brittain specified the role of TV to serve the citizens of Utah, the public interest and the university's economic development.

6.3.2. Understanding and managing the environment

Technology Commercialization needs strong support from an incubated environment. According to Ziedonis (2007), there are large numbers of spinout companies that proliferate more in a university's environment - which is characterized by experienced founders and science and technology classes that focus on the commercialization trend. Additionally, commercialization output increases when there is a regional industry cluster and local business community that support the developed technology. This pillar consists of the following subcategories:

Resources, either tangible or intangible, are highly essential for the development of the university's technology. These resources could be obtained from the university itself and/or via a strong relationship with the surrounding society (e.g. industry relationships and donations). Generous resources give the opportunity for more experimentation without frustration of mistakes. In addition, the availability of talented people and intellectual property are crucial to making a significant progress. The U collected a record $354.7 million in research funding during 2009 with an impressive 16 % annual increase. This research money provided laboratory jobs, fostered an excellent education for students and advanced the state's knowledge-base for humanity's benefit. The addition of nearly $50 million in research funding last year supports research training experiences for undergraduate and graduate students. Direct federal funding was $231,247,104 - and accounted for 65% of the university's research budget - with increases from both the National Science Foundation and the National Institutes of Health. The U also received another $34,480,002 in federal research money that "flowed through" to the U from other grant providers, including other universities, industry, and associations and foundations. Funding from private industry rose 27% $43,654,745, while funding from associations and foundations increased 13

% to \$18,475,604. An increase in the number of faculty submitting grant proposals, including new researchers hired under the Utah Science Technology and Research (USTAR) initiative, and an improvement in the success rate of grant proposals submitted by faculties. The number of grant proposals submitted by the faculties was up 14 % over the 2008 fiscal year, and the dollar amount requested rose by 59 % to more than \$1.5 billion. Within the university, funding rose significantly in all colleges with external research funding exceeding \$5 million annually. They include the School of Medicine and the Colleges of Engineering, Science, Mines and Earth Sciences, Nursing, Pharmacy, and Social and Behavioral Science.

Basically, there is a strong relation between the demand and supply of the technology. Before looking for a large demand for the technology, it is vital for the university to have enough technologies that are ready for commercialization. This is called the "Critical-mass of Research". Only by having a large diversity of commercialized technologies, the university can achieve some fast wins which will allow more development of the programs and then to gain legitimization and recognition of their current activities. The U has unique programs that increase the numbers of research either quantitatively or qualitatively. For example, the university has established three different types of competition to help in building the critical mass of ideas to face the demand of business markets (e.g. The Utah Entrepreneur Challenge, The Opportunity Quest, and Tech-TITANS). Additionally, the university embraces the Students Entrepreneurs Conference (SEC), as an introductory conference for aspiring entrepreneurs and to provide an overview of the programs and available opportunities. As a result, there are many unlicensed medical device "on-shelf technologies" at the U waiting to be launched on to the market. Such innovations include surgical pens, wheelchairs' equipments and core body temperature controls. The University's Venture Bench (VB) Program assists start-up companies in developing these innovations and bringing life-saving products to the market. As a result of encouraging the commercialization of IP's, the number of new inventors' IP disclosures increased from 162 in FY 2004 to 205 in FY 2010. And Executed Licensing Agreements have increased from 64 to 68. Meanwhile, Commercial Sponsored Clinical Trials have enlarged from 61 to 81 at the same year.

Changing the status quo can happen for two reasons. Firstly, when there is dissatisfaction with the current situation and secondly, when leaders have a solid confidence of the new course of action and its results. A traditional university which needs to embrace a new OIS must obtain entrepreneurs with a revolutionary entrepreneurial thinking. They should be curious to change the current system and begin development process. Radical innovation is mandatory with a customer-oriented focus. Secondly, Brittain has changed the goal of the U from Tech transfer to Tech Commercialization to focus on building start-ups and foster commercialization

processes. During the period from 2004 to 2010, the U established 109 start-up companies. Beside this, at Huntsman Cancer Institute, Dr. Hoidal, Internal Medicine Department Chair, suggested that the department should become more entrepreneurial. He mentioned that "*our doctors are not willing to wait for a solution to come to them. Instead, they will make a solution*". With open minds and an in-house commercialization expert, the department has moved forward with a renewed and energized drive to commercialize. Dr. Paul Shami's laboratory just received a $1.5 million grant from the National Cancer Institute to continue development of a low toxicity leukemia treatment. His start-up company, JSK therapeutics is developing this and other anti-cancer technologies with novel mechanisms of action. "*If you really want to get something to actual application, the only gateway is commercialization. Our TCO is very entrepreneurial. I believe it is one of the strengths of this University*" said Shami. As a result of this change, three companies have been formed and fifty one percent of disclosures have been submitted by researchers in the School of Medicine. During the last year, Dr. Yang, M.D., Ph.D., received both a Technology Commercialization Program (TCP) Grant and a Micro grant to help get him on track to start a company focused on weight-loss treatment and treatments of class elevated blood fats called triglycerides.

6.3.3. Replacing the traditional culture with innovative and entrepreneurial culture

Changing an organizational culture is a critical challenge for any strategy and sometimes it is considered a paradox, specifically when the new program has a significant importance for the organization. However, there are two main issues in replacing the traditional culture with an innovative one. The first issue is the characteristics of the new culture and the second is the steps required to change the culture.

Characteristics of the Entrepreneurial Culture

Customer Centric: The University has to answer the following question "Are we a product-orientation or a market-orientation organization?" There is no doubt that focusing the organizational culture on fulfilling stakeholders' desires is the best trend for the university to survive and to achieve the self-sustainable competitive advantage. Applied research can benefit from considering the marketplace before a project begins. By starting with a consumer need before determining what to study, researchers are often better able to develop ideas and products that will have commercial success and widespread influence. Von Hippel (1988), mentioned that the customer is the most important source for great innovative ideas and technologies. (Zucker et al, 2002) supported the customer centric approach and mentioned that there is a need for IPs to transfer from industry to a university to strengthen the industrial technology with science. Entrepreneurial Faculty Advisors (EFAs) help fill the gap between researchers

and stakeholders by pointing researchers to the right people and resources to be successful. Whenever a researcher wants to know if an idea has a potential market or sources for private funding, the EFA can help. It assists researchers to develop products and achieve economic impact. It is a customer-driven marketing approach that consists of 10 accomplished faculty members from departments across campus. Each one has extensive experience with research, product development, company formation and attracting investments, capital, and management. Their help allows other faculty to develop entrepreneurs, create viable business and this increases the likelihood that new technologies will have an economic and social impact. Partnership with industry allows the U to focus on developing customer-oriented products such as: a Smart Feeding Tube, Dual-Cap to prevent catheter-related infections during intravenous, remediation technology that is called "Heightened Ozonation Treatment" and "Safe Driving System" solution to reduce cell phone related driving accidents.

Concentrating on potential research: As a result of the rising trend of technology commercialization, - each university faces a debate in choosing whether to focus on basic or applied research. This challenge could be solved by focusing on potential research that allows the university to achieve its competitive advantage and increases its added-value. There is a connection between research and teaching and they are not isolated islands. For example, a biochemistry department member may identify a project as an applied research topic; meanwhile, a chemical engineering professor can consider the same research as fundamental research.. The university has to ensure a balance between basic and applied research and to pay attention to each academia discipline. (Acs et al, 2007), studied the case of Ireland and provided evidence that the reason of the "Irish Miracle" was because of concentrating all funds on applied research and obtaining the support from local industry clusters development. The U started enhancing commercialization through international partnerships. Partnering with 4 Indian companies (e.g. Globerian, Global Health Private Ltd."MediCity", Mainpal AcuNova Ltd. And Pregna international) will allow the university to benefit from their expertise to create a progressive alliance to accelerate commercialization of university invented medical technologies, expand educational and research opportunities, and create start-up companies, as well as aide in humanitarian efforts specifically fighting against HIV. Besides this, the U and Inha University in Korea are combining their expertise to accelerate the research and development of advanced therapeutics that will benefit the world. This cooperation will focus on clinical trials and drug production.

Open Innovation Centric: OI University is characterized by three main attributes (e.g. proactive, toleration of a high degree of risk and uncertainty, and innovative). A university has to feed and nurture entrepreneurial thinking to find new opportunities, and to avoid threats. Building an OI infrastructure supports entrepreneurial thinking and entrepreneurial actions, (Flora and Flora, 1993). Additionally, the goal is to create a

knowledge-strategy based on expert entrepreneurial thinking, (Krueger et al, 2008). In 2010, the U started to establish an OI culture by focusing on surrounding community schools. The U began the first annual Utah Lego Championship to inspire kids to pursue education and careers in science, engineering, business and related fields. This marketing tool is highly essential to the U's economic future. A potential synergy between external and internal competences is needed to enrich the university's ideas data-bank. External resources will open the door for new ideas and research. Meanwhile, internal competencies are important to allow the absorption of the new technology. However, both competencies will help leveraging knowledge spillover into many pathways and also help in forming the unique identity of the university. In case the university doesn't have a potential supply of researchers, entrepreneurial training can be very effective. To help start-up companies, the university established Venture Bench Service Program (VBSP) to provide them with the resources needed to bridge the gap between academic funding and private investment. This program provides access to resources critical to the development of early-stage companies. This program is not to run or control companies, but to create self supporting, independent entities, that are structured in such a way as to assure a positive experience and meaningful returns for all stakeholders (i.e. inventors, investors, university, potential entrepreneurs and government, etc.) VBSP introduces many facilities to start-ups such as: corporate structure, business plan development, market assessment, translational research funding, access to research facilities and labs, networking and educational seminars, and accounting and financial services. Furthermore, the Pierre Lassonde Entrepreneur Center provides entrepreneur education through a mix of programs and contests designed to give students real-world experience. In FY (2007), around 765 students participated individually and in teams as part of educational entrepreneurial programs offered this year. Programs included creating business plans and idea competitions, business development, and business lunch support. The Innovation Scholar program will help students to harness the power of innovation through a personalized road map; they will explore solutions to big problems and how to make big ideas happen in an area of unique interest to them.

Steps required to change the culture

Understanding OI processes: It is highly important that the components of the technology commercialization ecosystem should understand the facts of the OI processes. Innovative processes and start-ups projects often face a risky situation specifically in the initiation phase - which is called the "Valley of Death". So, there is a need to support OI projects before their launch, during risky processes and after growth to maintain the success, or to take corrective actions to mitigate failing, (Davidson and Klofsten, 2003). The U's commercialization processes consist of three phases: assess, protect and market. In the assessment phase, the TCO focuses on two main areas such

as: the protect ability of the invention through securing the appropriate IP rights (i.e., through patenting, or formal copyright registration); and a marketability assessment. In the protecting phase, once the assessment process is completed, the TCO will go through a multi-step process to obtain the appropriate protection. In the market phase, the marketability of a technology depends on the information identified during the assessment. A special path for unique invention will be identified, which will be dependent up-on the commercial and IP paths as well as publicly available information.

Training and Development: As mentioned before, building an OI infrastructure is crucial to maintaining entrepreneurial thinking and an innovative spirit. Training can play a vital role in this area. Providing a long-term entrepreneurship training plan through the entire ecosystem - not only the basics of technology commercialization, will allow the promotion of entrepreneurship across the university. A combination of formal classes and practical consultation will be highly effective, if timely managed and well designed. This step requires the availability of expertise with entrepreneurial mindsets to play an important role as facilitators and professional knowledge conveyors, (Krueger, 2007). The U has established many programs based on the "Learning by Doing Approach". For example, the Legal Intern Program links law students with the TCO. Students work with the licensing manager to perform the legal reviews and analysis necessary in the licensing processes. Meanwhile, the new TC Intern Program enables students to work with TCO's licensing managers to develop marketing strategies and perform portfolio and patent analyses on the University's IPs. Additionally, the EFA program provides practical training for students in how to develop successful careers by commercializing new ideas and pairing students with faculty mentors. The Lassonde New Venture Development Center provides a forum for students to apply the hard business skills that had been taught to students within their curriculum. Teams of students are asked to develop a strategy to commercialize the university's technologies into a viable market product by providing a complete strategy. Additionally, the BioInnovate track aims to provide a comprehensive biomedical device design training program through the use of a multidisciplinary, hands-on teaching approach in classroom, clinical, and laboratory settings. This track focuses students on clinical problem identification, medical device innovation, and commercial translation; all within the regulatory framework of the FDA. Furthermore, the Career Development Center is an important tool to prepare postdoctoral students with the qualifications required for the business sectors. The center gives students the up-to-date skills and resources they need to move forward in a meaningful way. The center provides workshops and courses to teach academic careers, becoming entrepreneurs and starting a company. In addition, the Foundry program is to accelerate the regional economic development Principled, lifelong entrepreneurs capable of creating innovative, fundamentally sound companies. The program is built upon the

U's legacy of providing its students with innovative, hands-on experience-based education in entrepreneurship, community networking, career development and placement. The Foundry provides participants with hand-on business training and office space. The Foundry supplies partners with members of Utah's business community to support Foundry companies with a wide array of business services, ranging from patent and IP to organizational strategy, finance, public relations, marketing and web development. As an innovative alternative to the conventional "mentor-driven" entrepreneurial learning approach, the program employs a peer-driven coaching model, in which founding members coach one another. The (Software Development Center) SDC's multifaceted task includes creating a clear distribution channel for University software projects, developing state of the art entrepreneurial applications, and training students to become professional software developers. The SDC has the talent to take student's idea from initial specification to working prototype.

6.3.4. Connecting the components of the Ecosystem

Any innovative venture, entrepreneurial project and technology commercialization require an effective open ecosystem, (Audretsch, 2007 and Flora and Flora, 1993). According to the Autopoietic Cycle Theory which considers an innovation system as a living organism, every component has to interact with other components, otherwise it will die, (Zeleny, 2006). Every output can be an input for other components. No isolated one and all components should work together within the innovation strategy. The Entrepreneurial University ecosystem that is called the "Triple Helix", is an obvious example on how a university can connect three main society partners (e.g. University, industry/ business community and government) with a strong - coherent way, (Etzkowitz, 2007). An OI ecosystem requires a bottom-up approach in which every cell is an entrepreneurial unit and innovation is inherited from one unit to another. Additionally, entrepreneurial persons (Intellectual Assets) and innovation assets (Resources) have to be complexly interconnected by bridging assets like in the DNA-helix-metaphor. (Krueger et al, 2008).

Connectors: An OI ecosystem is a very complex system that is characterized as high risk, dynamic, nonlinear and discontinuous. As previously mentioned, innovative people in this system have to be connected and associated well to tangible and intangible resources to develop a new commercialized technology. This type of association is hard to be routinized and institutionalized. Connectors are people who serve as a bridge between innovative people, ideas and resources. They are passionate and proactive professionals. Connectors play a vital role in feeding the innovation ecosystem and conveying their knowledge to all blooming innovators, (Brannback et al, 2009). Entrepreneur-In-Residence (EIR) is a strong program that not only allows accessing resources but also provides advice and key person contacts from in-house

partners. The plan is to align experienced entrepreneurs with young University start-up companies to help the new companies as they develop business plans, acquire funding, and begin operations. EIR member, Stan Kanarowski, has over 15 years of entrepreneurial experience, including founding and running multiple startups. Kanarowski says, *"This new program is a great way to connect executives and experienced entrepreneurs with the advanced business ideas being incubated at the U"*. The Lassonde Venture Development Center pairs faculty inventors with graduate students from Business, Engineering, Science and Law who write extensive business plans for commercializing the technology. The TCO Medical Accelerator is a non-traditional program that bringing together key start-up services, design, prototyping, clinical expertise, and funding mechanisms in a beautiful and shared setting. The program builds on the U's model of creating robust- high value technology companies.

Resource Alignment: Any effective strategy needs a clear vision to define the scope and the nature of the desired situation and implemented program. According to the strategy formulation process, analysis of the current situation by developing the activity map and determining the required changes to apply the new strategy - is highly essential, (Zeleny, 2010). Then the university should discover methods to align resources in an optimal way to implement the required activity map. Alignment needs those contributors to recognize the most potential added-value. "Proof-of-concept" is an effective mechanism to help in aligning resources by helping entrepreneurs to move from the idea generation-stage to the proof-of-concept stage, (Gulbranson and Audretsch, 2008). There are many funding programs that help students and entrepreneurs to establish their projects. The Micro-Grant program is a new, small-scale funding opportunity, sponsored by the TCO to enable researchers at the university to develop an existing technology to a stage where it is attractive to third parties for large-scale commercial development or licensing. This program is customized to support researchers working with technologies that need a small amount of research to develop first or second generation prototypes, or that needs proof-of-concept data and experimentation results. It provides an amount between ($1,000 and $5,000) that is based on research needs. The Kickstart Program is a "seed fund"; its mission is to start companies in Mountain West by aligning technology creators, industry entrepreneurs, and capital sources behind the funding and mentoring seed investments. Since its launch in 2008, it has invested in 13 companies. It tries to align the interests of the key components of the venture ecosystem such as: Universities, Entrepreneurs, Angel Investors, Industry Partners and Venture Capital. It emphasis the idea of collaboration, network access and value contribution from across the ecosystem. Another source of funding is Venture capital companies that possess pools of money managed by professional fund managers. They invest in high-growth companies that they perceive to show particularly high return potential in a reasonably short period of time. There are four companies (e.g. Pelion Venture Capitals, vSpring Capital, Epic Venture and

University Venture Fund). Each one tries to back specific start-up companies and new technologies with the potential to transform their markets and create lasting value. The Seed StaC is a program that puts up to $10,000 into a student business for initial startup costs and to help students get to their first revenue. These funds are directed to companies that can show a believable path to initial revenue with only this small amount of seed capital.

Internal Members Involvement: Selling the value of the entrepreneurship and the OI approach to advance technology commercialization, to all members in the university leverages the added-value of the program and achieves the synergy of the ecosystem. The Total Innovation Management System considers three elements to achieve synergy. First total: all elements of innovation "technological and non technological "- Second total: all employees are considered as innovators at all levels and in all departments; - and Third total: innovation in all times and all spaces. This framework introduces a holistic view for the innovation system, (XU et al, 2006). The U's vision is about people who share a set of professional values that define the university and how it conducts its business. The U has talented and dedicated people who are committed to making an impact every day. The (TCO) has hired two new grant writers/project coordinators to assist teams in the development of professional large grant proposals.

Intellectual weapons of the students: All students besides being a source of creative ideas can help as observers to evaluate the potentiality of ideas for technology commercialization and students can launch and market their technology developments. The Student Intern (SI) serves a valuable role in the technology transfer process by assisting in the analysis and commercialization of the University's technologies. For instance, students can do the following: screen and prioritize technologies for commercialization efforts, prepare non-confidential summaries of technology for marketing purposes, perform patent searches, prepare market analysis for selected technologies and identify key companies that match up with a given technology, etc.). The MBA Clinic allows students to experience the legal and business analysis involved in launching a technology-based venture. Clinical experience will be based on actual technologies and businesses. Topics include invention disclosures, technology assessment, enforceability of confidentiality, material transfer agreements, intellectual property protection, market potential, competitor analysis, freedom to operate, capitalization, licenses and employment agreements. Beside this, establishing dynamic competitions to engage students with their technologies is a vital marketing tool. The new type of competition should be an iterative approach. Starting with an idea and going through many phases to develop a product is a fast growing model that allows participants to gain real experiential learning and to speed up the commercialization of new ideas. Faculties use the good reputation of the university in creating start-ups to attract the best students in the country to their graduate and undergraduate programs.

6.3.5. Executing excellent innovation processes

Leaders in an OI system support the innovation and commercialization processes. They use an open mechanism to create an innovation culture and to foster the acceleration of new technology. This pillar needs three main components.

Professionals, who can manage the program effectively, are a requisite to convince investors to finance the new technology. It is well-proven that the private business sector likes to spend its money with professionals - not with clever amateurs. An OIS requires actual experts at all levels and stages; for instance, in the training, monitoring, developing and managing processes. The university has hired new innovative scholars, mentors, and educators who also have professional entrepreneurial knowledge. Those professionals have to embrace the risk and uncertainty, while, identifying other stakeholders' needs and to maintain the integration of the innovative processes. Troy D'Ambrosio, Director of the Pierre Lassonde Entrepreneur Center, is a winner of the Best of State Medalist for Education Administrator in 2009. He has guided 20 start-up companies from idea to launch - involving students along every stage of the process. Besides this, the Grant Writing Network (GWN) is a program made up of on-campus professional staff whose job it is to help faculty to prepare proposals and administer grants/contracts. This group's purpose is to share information on grant resources available on and off campus, to identify and participate in the development of additional support as needed, to share ideas and to provide general support and guidance for the community of grants writers on campus. The professional computer scientists at the SDC have many years of experience with academic and industrial software development. Their wide range of expertise includes physics, optics, visualization, parallel computing, medical applications, meshing, graphics and more. They have served as principal investigators and senior staff on numerous national and international organizations worth millions of dollars.

Private Sector Participation: Entrepreneurs, in the private sector, are a crucial part of the desired innovation strategy. The functionality and sustainability of the program can be achieved through entrepreneurs - not institutions. Leaders of the private sector have a more comprehensive understanding of the importance of connecting available assets to grow the business. The university has to embrace the business community as a part of the local culture. The (TVDC) Sponsored Research team worked with over 150 organizations to help them connect the university researchers and move their businesses forward. The U shares a "win-win" relationship with a wide variety of companies and collaborators and the importance of these partnerships continues to grow. Between 2007 and 2008, the amount of commercial sponsored research at the university tripled from about $16 million to $48 million, providing faculty with a substantial source of funding beyond traditional government grants. One of the most successful partnerships has been with Cephalon Inc., a midsized biopharmaceutical company based in

Pennsylvania that employs 4,000 people and conducts business in 60 countries. In addition, the university has started finding untraditional funding resources such as: Angel Investor groups. Angels, in this context, are high net-worth individuals who invest in privately-held companies. They are often people who are themselves entrepreneurs and earned their wealth through the success of a start-up venture. Their motivation varies widely - they may want to help others achieve success or they may want to invest in a company that could potentially help solve a social problem. Angel networks have evolved to bring angles together with companies needing early stage investment.

OI Measurements: Building a concrete credibility with all stakeholders allows commercialization activities to be more transparent. There is a need for real measurements that can evaluate the outcomes of all phases - specifically intermediate outcomes, (e.g. monitoring the processes). Quantitative measurements are highly essential for evaluating outcomes, but qualitative metrics are actually necessitated - especially in the very early stages of growing goals for a technology commercialization program, (Etzkowitz, 2008). Brittain has established three main conditions to evaluate the success of technology development; 1) Create enterprises for Utah State; 2) Support technology development for existing Utah businesses and enterprises founded on University technologies to prosper and expand in Utah; 3) Generate returns to the University for investment in new research, to support and retain current faculty, and to hire world-class scientists capable of adding to Utah's technology wealth. For example, the Micro-Grant program offers a researcher an amount between ($1,000 to $5,000) when meeting the following conditions: 1) The technology is the subject of a disclosure made by the U; 2) The technology can be developed to a stage where it is more likely to attract larger-scale funding or a licensee within 6 months and within the limited budget of the award. In addition, the company that requires participating in Venture Incubator Projects (VIP) has to meet specific criteria to be able to receive this fund. For example, it has to be (e.g. a licensee of technology owned by the University of Utah before the voucher is accessible to the company, a company must not have more than 10 full-time employees, the applicant company must have a formal business plan and the award money must be spent at the University of Utah, etc,).

CHAPTER SEVEN
RESULTS OF THE RESEARCH

"Analyze the results of the study to build required strategy"

In this chapter, the key findings of the study will be discussed. The results of the interviews will be explored. The researcher quoted, categorized and analyzed the interviewees' remarks in order to form the new strategy.

7.1. Analysis of research data

7.1.1. Components of the strategy

a. *Choose an excellent leadership and obtain top management suppor*t

All of the interviewees agreed that a leader has a potential and important role in OI. Commercialization of university research depends heavily on the leadership style. Smart and visionary leaders make significant results; they can fulfill required goals and foster university synergy. There is a need for leaders who can turn their statements into actions. Planning is good but action is the best. In PU, a Professor in the Faculty of Engineering said *"…an excellent leader is the person who has a clear vision, understanding of open environment and can mange uncertainty and spread risks"*. A researcher in the Faculty of Dentistry mentioned that *"…without commercialization of our research and inventions, it will be on-the-shelf and turned out to be obsolete. We need leaders who can connect this technology to market and remove barriers that hinder fostering our research"* Additionally, a University Vice President for Regional Development stressed the idea of a leader who can utilize both internal and external resources to make significant results for a university, staff, and society. He said *"…a university leader must be a talented person who can look to the big picture, choose the best road and direct the university to serve the society"*. The Dean of the Faculty of Pharmacy and Drug Manufacturing concluded the idea of the leadership in the following statement *"…a leader needs both efficiency and effectiveness to achieve goals, in other words, he/she has to do the right things and does things right"*.

In TBU, the Dean of Faculty of Management and Economics focused the attention on the importance of top management support. She said *"…gaining a support from a head of the university and the board of directors is the best guarantee for the survival of this new strategy. This support will allow financing the new activities, eliminating barriers and tolerating risk"*. TBU responses concentrated on the necessity of changing management system in the university to enhance the managerial skills of all managers specifically the middle managers. TBU implementation of OI should cover: promotional /educational activities for better understanding and change. Showing some kind of agreement on the top, involvement of stakeholders, step by step actions

supported by shared platform, business application-driven orientation will perfect the application of the new model. Additionally, TBU respondents choose the changing of the management style from traditional to innovative and entrepreneurial style as a crucial factor for OI implementation. One respondent said"…*The most important factor is a strong leader with vision respected and followed by all managers at the TBU. The leader has to communicate his vision to all managerial levels to reach the important consensus"*.

b. Building a Technology Transfer Office (TTO)

Successful technology commercialization and OI strategy require effective IP management. There are many tools for technology commercialization such as: licensing, venture capital and spin-out. A researcher cannot decide the best option. TTO can help in managing these choices and facilitating documentations procedures. In PU, a Professor of Dental Public Health said "…*professionals in TTO are the best evaluators of our innovation. They know the market preferences, have communication with potential partners and can facilitate innovative activities (e.g. copyright and registration)"*. Furthermore, OI professional confirmed this fact. In the U, TCO Manager clarified that TT office is a cornerstone in connecting technology provides with customers"…*We consider our university as our internal network that has to be connected with other external networks. This task has to be handled carefully and managed wisely"*. He added "…*We use up-to-date policies that allow enhance the commercialization processes and we encourage our partners to utilize our innovations"*. From PU, a Professor of Mechanical Engineering said"…*Without TTO, it is highly complicated to commercialize your technology. TTO provides a university with a vehicle that allows achieving quick results and motivating our researchers. PU requires building a TTO"*. A Director for Strategic Economic Studies, one of OI pioneers, emphasized the role of TTO in implementing OI. He stated"…*Implementation of OI strategy should be through a TTO and it should start in a small scale by a particular faculty to avoid risk of failing and then it could be wide spread"*. The author believes that building TTO is not the final goal but successful technology transfer results are the best indicators (e.g. number of technology licenses, IP sales, copyrights etc.). In TBU, a University Rector said*"…it is essential to have experts who can do successful negotiations and train young researchers and inventors. Using intermediaries is costly. We can only afford free services"*. TBU has a TTO, Innovation Center and a Technology Park. These centers reflect the TBU steps in enhancing innovation activities and encouraging young researchers. The Dean of Faculty of Management and Economics said"…*TBU has its own Technology and Innovation center. But we need to accelerate and enhance its commercialization processes"*.

c. *Choosing Open Innovation path*

A university as a traditional bureaucratic organization requires a careful formulation of its strategy. There are two approaches to implement strategy either as top-to-bottom or from bottom-to-top. OI is a risky strategy and needs excellent approach. The Vice President for International Affairs in PU said that *"...OI approach needs a university to open its boundaries to external partners. This task is risky and needs careful planning and implementation"*. A Professor of Finance added "…*Traditionally, a centralized approach is used to plan and implement the strategy. Top-Down approach is the first alternative and many universities rely on it to guarantee success*". On the other hand, OI professionals explained that there are other alternatives. A Professor of Economics mentioned that "…*Top-Down approach is an effective approach but cannot involve all university's members. It is better to allow the participation of the middle and lower level in order to achieve synergy.*" Another Professor of Political Science added "…*A Bottom-Up approach can be effective to spread OI within the university. Informal relationship is essential to connect our departments with external collaborators. Sometimes, individuals can effectively support external relationships*". In PU, the Head of Mechanical Engineering Department said"… *Our current strategy is not qualified to implement this new approach; we need to change many things such as: structure, style, and culture*". In the U, TCO Manager emphasized the need for a flexible strategy. He said "…*to accelerate commercialization processes, a flexible strategy that eliminates barriers and facilitate our job is needed*". TBU respondents confirmed the necessity to establish a suitable strategy for collaboration to speed the processes and involve more people. A successful university must have an entrepreneurial and innovative strategy.

d. *Accumulating required resources for the new strategy*

Establishing a generous innovative environment is crucial for accelerating technology commercialization processes. OI professionals stressed the potentiality of this factor to advance the innovation and achieve significant results. In the U, TCO Manager emphasized that *"...building a financing network to support new technology development is the first priority in our plan*". He added "…*We allow researchers to have a space for trial and error experiments without fairing of financial defects*". A Director for Strategic Economic Studies specified some examples of the required resources. He stated "…*Universities may recruit individuals or teams with a particular expertise that complements existing capabilities. Of course, there would be costs of recruiting teams or individuals and buying equipments but I believe this is the price you pay to be different*". In PU, a Manager of Electrical Engineering Department stressed the potentiality of financial resources to achieve acceptable results. He said "…*Researchers need financial support to implement their prototypes and other inventions. At the same time, they need financial motives to continue their success. Now, PU as a private university lacks such resources*". A Professor of Management

focused the attention on the importance of a university to have adequate technologies that are ready for commercialization. He said"...*a university has to create a databank for its developed technology and make it available for potential customers. This idea will connect the university critical mass of research with the market*". Additionally, a Vice President for Research and Development discussed the role of resources in increasing the quality and the quantity at the university. He said "…*adequate resources permit the development of qualitative and quantitative technologies that facilitates the commercialization of these technologies*". TBU as a public university has been established by the Ministry of Education and therefore, the Ministry decides the amount of money for development of the university and there are also European funds. Due to the limitation in budget allocation at universities, there is a need to find and accumulate new financial sources. TBU participants mentioned that the governmental financing system is an external factor, and there is a need to depend on multi-channel financing system.

e. *Establishing an entrepreneurial Culture*

Entrepreneurial culture aim is to bond external and internal resources, capabilities and individuals to accelerate innovation and foster technology development. In PU, a University Senior Manager stated "...*establishing and managing entrepreneurial culture involves two tasks: First is the structure of this culture and the method to replace the current culture with the new one*". A University President emphasized the importance of spreading innovation culture in the university vertically and horizontally. He mentioned "...*Innovation thinking is crucial to be a part of the whole university's minds. It has to be a part of the thought of every individual, department, unit and faculty*". Marketisation and globalization are two challenges that face a university; therefore it has to focus on market-orientation approach. This strategic direction has been confirmed by a university Marketing Professor. He said"...*commercialization processes should start from a customer view. TTO is responsible for scanning the market to find new business opportunities. Customer's decision determines the potentiality of the technology.* Additionally, radical innovation is hard to be commercialized and requires many marketing and promotional activities. A Vice Dean for Research tried to make a balance between applied and basic research. He said "…*Applied research is important for new universities to make quick wins and to differentiate themselves specifically when they have few available resources (e.g. financial and human resources). Of course, basic research is vital and is a must for scientific society and for building a university image but it takes a lot of time and cost. We need to make a balance between both of them*". Furthermore, a university has to start focusing on OI approach direction. A university has to be a proactive component of the ecosystem. A Professor of Accounting said "…*we have a problem in our society that is the large gap between a theory and practice. On other words, this means our*

students are followers not entrepreneurs. We need to make a massive change in our culture". This change can be done by two important factors: 1) A deep understanding of the new model and 2) establishing short-term and long-term training courses to mitigate this gap. OI professionals emphasized the need for change. A Professor of Innovation Management stated that*"...Closed Universities will become dogmatic and produce no new knowledge. Open to the environment and the many different sources and processes can produce insights*". He added "…*Dialogue, openness, interaction, learning form others are essential concepts for understanding Open Approach*". A Professor of Strategic Management clarified the problem of misunderstanding OI model as the most important obstacle. He said *"...traditional culture and closed mentalities think knowledge and interaction is dangerous"*. At the same time, this OI culture will allow a university to be unique. A professor of Organizational Behavior said"…*Building an entrepreneurial culture will allow a university to attract capital and intelligent students*". He added "…*a university must have the following characteristics to be Open: strong faculties, open communications structure and no cannibalistic internal competition structure*". A Professor of Economics specified the major changes required for the new strategy. He said "…*Structural, Cultural aspects and Human resources are the main transformations requirements to establishing an entrepreneurial environment*". Despite these difficulties, training can play a tremendous role in spreading and establishing the OI strategy. In PU, A Vice President of Social Affairs said"…*Perhaps the application of the new model would not be to develop technologies but capabilities. Therefore, teaching students and graduates to be entrepreneurs and innovative are highly important*". He added"…*We started to provide new courses and sessions to nurture our students these new concepts*". A Professor of Marketing enlarged the goal of this training to include all university's members. He mentioned"…*Long-term innovation training is essential to allow the university's network members to speak the same language and to mitigate the gap"*. He added"…*I believe in learning by doing not by statements. We have to focus on practical sessions and real practical experiences*". TBU respondents emphasized the necessity of spreading entrepreneurial thinking among teaching and academia staff as well as management and students. They believed that implementing innovation in teaching and research is the highly important demand for the success of the OI implementation.

f. *Linking the University's ecosystem components*

OI approach is based on opening the university's boundaries and to combine both internal and external capabilities and resources to enrich the university research environment. On the other hand, OI tries to find new paths to the market to gain extra revenues and to achieve the self-sustainable competitive advantage. This complex system needs connectors to link all the members together. In the U, TCO Manager emphasized the importance of their role as connectors to link university members with

external partners (e.g. industry, governments and SMEs). He said "…*We encourage our students to be professionals, starting their companies and choose the best career. Our role is to connect them with experts from different fields to gain the required experiences. We support them, monitor their success and facilitate the road up-until their companies become independent entities"*. In PU, a Vice Dean for Research and Development clarified the need for connectors. She said "…*Connectors are just like a heart in a human body that is distributing blood to every organ. We need professional expertise who can find commercialization opportunities and bring our on -the-shelf technologies to the market"*. A Professor of Organizational Behavior emphasized the importance of students' participation in OI network. He mentioned "…*Our students are the main output of the university. Building a university image is based on the quality of this outcome. Therefore, we need to encourage their participation in order to leverage their experience and enhance their entrepreneurial thinking"*. Additionally, many financial resources are required to enrich the research environment.

In PU, a Professor of Marketing stated that"…*We believe that connecting our researchers with the private sector specifically SMEs companies is essential to gain practical experience and to find alternative resources. They are more flexible and need academia to enhance their technologies"*. A Professor of Economics added "…*SMEs use our infrastructure facilities and pay the required fees. This is a potential financial resource"*. In the U, private sector entrepreneurs can play a role as mentors to our students and graduates. A university Senior Manager stated"…*We have a well prepared program that allows students to meet SMEs entrepreneurs to exchange knowledge and experience. Now, we send our students into regular internships to have the required training to be able to face the outside world.*" A Professor of Mechanical Engineering focused the attention on the importance of establishing transparent measurements for success. He said "…*Invention is important but how to measure its success. We measure this success through its ability to satisfy a customer need or to solve a project problem"*. Additionally, there is a need to have transparent measurements to evaluate success such as: Number of patents, royalties' revenues and number of start-up companies. TBU respondents see the Technology Innovation Center as an important connector between the university and business sectors in Zlin region. The director of the center explained the business opportunities that they have created for graduates. She showed some possibilities to start cooperation in Plastic and Food Technology are through clusters of the region. Additionally, business incubator offers many facilities for young entrepreneurs such: Rental subsidies up to 50% in the first year, 40% in the second year and 30% in the third year, flexible rental contract, presence of consulting and support institutions. In addition it provides: training seminars on selected business topics, project management, intellectual property protection and advisory and consultancy services.

g. *Perfecting Innovation Processes*

Accelerating innovation processes at a university depends heavily on the availability of successful conditions and mentalities. In TBU, The Dean of Faculty of Management and Economics concluded the potentiality of this factor. She said "…*Business sector appreciate only professional ideas and advanced technology which can generate added value. Amateurs are not welcomed because of the low level. So we are trying to enhance our graduates' qualifications through training. Technology center tries to mitigate this gap*". She added "…*in our search for advancing the innovation processes, we are trying to hire some professionals who are able to provide students with real consultations that are based on practical experience*". She said"…*it is very costly but it is a must*". A University Rector said"…*there are some trials to convince members of the private sector to finance our innovation*". He added"…*lately, a private company agreed to finance a new project for producing an innovative wheel chair for people with disabilities* ". In PU, the situation is different. As a fresh university there are many trials to establish and advance the innovation processes. The Dean for International Relations said "…*we tried to mitigate the gap between practice and theory through establishing many agreements and protocols with international universities and institutes to learn and gain experience in innovation processes*". A University President said "…*our focus is to differentiate Pharos university from other competitors. We have started a project to start a Nano-Technology unit in the university*". A Professor of Mechanical Engineering emphasized the importance of private sector support. He said "…*As a private university, our resources are limited. We have started a program to allow participation of the private sector in our innovative research. Maybe it is not enough but step by step we can increase it*". A Professor of Marketing stresses the potentiality of having clear measurements for successful innovation. He said *"...this real numbers will enhance the credibility of the university and attract external stakeholders to finance our research*". A Professor of Open Innovation, one of the professionals gave an example of enhancing innovation processes. He said*"...In our university, we rely on short-innovation cycle. Once an idea is evaluated and proves some accepted results, it is our duty to develop and push it to the market. There are many alternatives: establishing start-up or selling this idea to the market*".

From the above discussion, this strategy can be presented in the following equation:

$$S = \Delta(L) + \beta(T) + \alpha(O) + \pi(R) + \Delta(C) + \Delta(E) + \Delta(I) \qquad (7.1)$$

Where,

S: Self-sustainable competitive advantage

Δ **(L)**: Choosing an excellent leadership and obtain top management support

β **(T)**: Building a Technology Transfer Office

α **(O)**: Choosing the suitable OI path

π **(R)**: Accumulating Required Resources

Δ**(C)**: Establishing an Entrepreneurial Culture

Δ **(E)**: Linking the university ecosystem components

Δ (I): Perfecting Innovation Processes

7.1.2. Importance of OI strategy

This part provides an answer for the first research question: *"Is the creation of a guideline / protocol to apply open innovation strategy in the university important to gain a self - sustainable competitive advantage?"* - OI can achieve many benefits for a university and all other ecosystem components. Enriching a university intellectual property is a potential contribution of OI because the dynamic ability of OI to generate new ideas and enrich the university databank from multiple resources (e.g. collaboration, networking, consultation and partnership) can increase the qualitative and quantitative of university research. A Vice President Technology Venture Development at the U said "...*OI can achieve a potential contribution. IP disclosures have risen by over 25% in the past two years. University researchers continue to see the value of connecting our ecosystem with OI*". A Professor of Marketing said "…*SMEs companies have a lot of ideas to enhance technology and needs only a direction from academia"*. So, integrating both of academia and industry through OI model will enhance commercialization processes. He added "…*The Technology Commercialization Office has collaborated with 83% of the colleges and departments at the university of Utah during fiscal year 2010*". A Vice President of PU mentioned that "…*A university as a science provider has to enlarge its network with external partners"*.

Commercialization of university technology is another contribution of OI. TCO Manager of The U said "…*there is no technology that reaches a customer unless it has*

been commercialized. To be afraid of commercialization is to throw a roadblock in the way of your success. It's not about money, but it's about getting the science that you love to the public sector". In TBU, the Dean of Faculty of Management and Economics said "…*OI means more collaboration, less bureaucracy, mutual information, more flexible business and process oriented structure. Additionally, there will be less relying on finance per students, more internationalization, higher expectations and demands from people*". A Technology Innovation Center Director added"…*Rewarding results, commercialization of innovation and achieving regional development are the most important advantages of OI*". She added "…*TBU will be more open to new ideas and activities executed internally and externally and that will be reflected at Zlin region*". In PU, there is a need to apply such a strategy to strengthen the position of the university in the market. The Dean for International Relations said "…*this strategy can help in building a university image as a research institute that is capable to provide qualified graduates and participate in regional development*". She highlighted the need for financing R&D activities with less cost. She said"…*we need a flexible strategy that can help in decreasing our cost through cooperation and increasing revenues for all participators*". Decreasing research costs is a potential requirement because the Egyptian scientific environment has a lot of problems in financing R&D activities. There is a need for a strategy that diminishes this problem.

Enhancing R&D processes was the next choice because working based on the customer requirement is a cornerstone in technology commercialization. In PU, a Professor of Mechanical Engineering said "...*we help companies to solve their problems which involve our students in real business problems. This cooperation builds self-dependent graduates and makes them ready for real life*". TBU has many clustering partners and most of the responses are based on these experiences.

Gathering practical experiences is an additional advantage because opening university boundaries for external partners specifically SMEs and large industrial corporations allow exchanging utilities and mitigating the common problem called 'the gap between theory and practice'. Furthermore, OI can create a competitive advantage because this strategy can differentiate university activities and allows creating self-reinforcing tools. A Vice President Technology Venture Development at the U said "…*Our OI strategy allows the U to differentiate itself. In 2008, we have created 20 start-up companies. In last 18 months, dozens of universities have been here to talk about how we are doing our commercialization*". These tools are essential to advance university's activities (teaching, research and regional development). Development of regional economic was chosen by most of the interviewees as a potential advantage. A University Vice President said "…*OI can contribute in regional development but there is a need to join all stakeholders together (e.g. Universities, Industry, private sector and government)*". OI advantages can be summarized in the following table:

Table 3: Importance of Open Innovation

		The U	TBU	PU
1	Enriching University intellectual property bank	•	•	•
2	Commercialization of University Technology	•		
3	Decreasing cost and increasing revenues	•		•
4	Increasing incentives for researchers and university	•	•	
5	Gaining a competitive advantage	•	•	
6	Gathering practical experience	•	•	
7	Building a university image	•	•	•
8	Development of regional economic	•	•	•
9	Enhancing Research and Development	•		•

Source: Author's work

7.1.3. Barriers to apply OI at universities

This part answers the fourth research question:"*What are the obstacles that hinder applying an open innovation strategy?"*- Initially, the university and its professors, employees, and students must understand the comprehensive meaning of OI, its methods and functions, strategies and the expecting results from it. The research's results demonstrated that approximately all interviewees' respondents have some form of cooperation with external partners and lots of them unconsciously use OI to some degree. But, the expression 'OI' was not a familiar term for most of them. From the analysis, the expression 'OI' was really new or confusing to approximately 25% of the interviewees. The words such as"…*it is a confusing word or unknown term, I am unsure what OI is*" and "*it is a black box*" were used to explain the situation. 65% of those interviewees who were familiar with the expression" OI" - understand it as "…*It's your collaborative effort with a number of individuals outside your organization to work on a project for mutual gain*" or "*It's a way of carrying out innovation activities without the need for an internal R&D department"*. 5% of respondents defined OI as "*It's buying other people in to act as consultants to help with a specific problem we can't solve ourselves*". Also, it may indicate another meaning. For instance, one interviewee made a comparison between OI and hunting, "…*OI is the process of hunting ideas*".

In PU, few of the respondents confused the term 'open 'with the term 'free'. But, open does not indicate the same as free or public; through it, everything is open or available to everyone. It is difficult to distinguish between the levels of openness. A Professor in Oral Biology Department asked, "…*to what extent should it be opened?*" Additionally, the predicted outcomes of innovation are relatively low which shows different obstacles to applying OI. However, the certainty of receiving potential IP Returns (IPRs) from OI

is not matched with the real facts. Another Vice Dean said,"... *the probability of gaining a significant return from open innovation is not that high and a lot of uncertainty exists"*. The Dean for a Faculty of Engineering confirmed that "...*there are few successful experiments in applying OI at the university - such as MIT and University of Utah; meanwhile, there are a lot of failures"*. According to a University Vice President for Research and Development *"...OI may mean no money or postponing the gain for a long period which will be considered as the most serious disadvantage of OI"*. Controlling the whole process of innovation is ineffective and there is a need for finding ways to release ideas and to profit from them.

In bureaucratic societies, regulations and governmental laws play a crucial barrier in obstructing the new model. Public universities are financed by governmental funds which put a lot of restrictions in establishing external partnership. The Dean of Faculty of Management and Economics mentioned that*"...Governments at both Federal and State level were inclined to over-control and audit, placing restrictions and substantial accountability requirements on all public funding"*. In PU, The Dean of Faculty of Engineering said, "…*Establishing new start-up companies need a lot of signatures and agreements from many different governmental authorities such as: Patents Office, Tax Authorities, Ministry of Economy and Finance, Ministry of internal affairs and regional authority - which is a time consuming and wasting of efforts*".

At the same time, applied strategy has a potential effect in implementing OI. It is the crucial factor in determining the degree of success. A Vice Dean for Community Service explained that *"...joint venture and start-up companies are the results of effective cooperation, but the road is not that easy. A lot of changes have to be made to traditional thinking. Top management should have a civic vision and mitigate the talking-doing gap"*. TBU interviewee said "...*the university strategy is traditional and the university afraid of suggested changes and tries to slow down or stop the process using secondary and less important arguments"*. Simultaneously, the selected business model can be an obstacle when it hinders technology commercialization, for example, SMEs are dynamic and they need flexible agreements that are difficult to get without a flexible business model. An Administrative Manager said "...*as a starting point of cooperation, it is firstly, a must to identify the most important competencies that could be considered as a private know-how which will not be shared with anyone"*.

IP management is considered as an additional barrier. A TCO Manager said *"...How will you manage IP in an OI environment? - actually there are a lot of forms and there is a need to specify the most suitable one"*. Few respondents see IP and OI as conflicting terms. A Management Professor in PU said "…*OI and IP are mismatched"*. A TBU interviewee said "…*Cost of protecting IP is very high"*. Additionally, the lack of talented people who are capable enough to implement and utilize the new strategy is

a serious disadvantage. For instance, an Industrial Engineering Professor said "...*it is essential to have people who can understand innovation as a network, not as an isolated invention. You need persons with an excellent understanding of the technology and commercialization concepts to be able to connect both of them effectively.*" Attracting talented students and researchers is costly and requires accumulating economical resources and suitable infrastructure. In TBU, human resources are limited. The region does not attract talented people and salaries are very low. Many students enroll to universities outside the region and try to find jobs in rich regions (e.g. Prague and Brno). There are a lot of trials in TBU to attract talented students and staff through increasing benefits and facilities.

Furthermore, 75% of the interviews' responses chose culture as a major barrier that must be handled carefully. In TBU, the Dean of Faculty of Management and Economics said" …*Resistance to change and lack of professionals are the most serious obstacles in replacing current culture with innovative one*". In PU, a Marketing Research professor said, regarding the relationship between OI strategy and culture, "…*OI is difficult because it has to change the culture which is not only our culture but also others' culture to allow cooperation and networking*". Another barrier in TBU is, in long-term perspective, an inappropriate structure of the subsidies and grants received for the implementation of accredited degree programs and for the institutional support of science and research. Additionally, the amount of finance received for the implementation of accredited degree programs significantly predominates, while the amount of finance for the institutional support of science and research is stagnating. The revenues from cooperation contracts with the production and business spheres are very low. In addition, the trust problem has grasped a lot of the attention. In TBU, the Dean of Faculty of Management and Economics said "…*According to our local culture, there is no trust and people are conservative about their ideas*". A University Rector mentioned that "...*the problem of trust can be separated into two sub-parts e.g. firstly, issues that are related to OI processes. Both partners need to open their boundaries and share knowledge and scientific secrets. Secondly, issues are related to the individuals involved in the activities. You cannot control all individuals and possibility of knowledge leaking does exist*". A TBU interviewee explained the trust problem as "…*business men sometimes are disappointed when dealing with the university researcher because of low timing commitment, long and complicated processes and low motivation for the researchers. On the other hand, researchers say that business men want to take everything for free or cheap. They thought as a public university, they do not have to pay*". One Administration Manager in PU said, "… *you can rely on trust in a short-term relationship, but that will be very risky in the long term. Business partners' situations are changed by selling, buying or even bankruptcy*".

TBU suffers from a weak cooperation between TBU faculties and the Technology Innovation Center.

In PU, a University Vice President explained the need for a flexible business model as a vital requirement to exploiting OI. He said "…*Applying OI needs a new business model that allows successful change in the university's strategy. To develop a new open business model, it is a must that OI is comprehensively understood and communicated to all university members*". A TBU Technology Innovation Center Director focused on the importance of the business model. She said"…*A necessary condition to apply OI is to set-up the terms of commercialization of research findings at TBU, what we call a business model. We have some flexible terms*". 12 interviewees chose lack of flexible business model as a potential barrier.

In PU, a Dental Public Health Department Chief explained the lack of rewarding system as: *"…One of the university scientific principles is disinterestedness which means rewards come through recognition of scientific achievement - not from monetary gains. With the new paradigm, it is important to reward a person who comes with a new unique idea. The logical way of rewarding them is to immediately reward people as a result of their essential contribution; with the traditional norms it takes time, I cannot"*.

In addition, in the U, a University Administrative Manager explained the contracting problem"...*Occasionally, having an IP or confidentiality agreement has an advantage when you sign an agreement that will protect your own know-how from leaking away. While, it is not suitable to be committed from others with IP that maybe is already being done in your lab. So, it is very important to know the best time to sign such an agreement"*. A Vice President for Community Service said "…*To allow partners to work together, prepare agreements, assist in arranging sessions, to gather, select and filter innovative ideas, it is very costly"*. A Marketing Strategy professor said, "…*a partner may have a bad name or a bad reputation in the innovation market*".

Also, the barrier may emerge as a result of the difference between the speeds of the innovation process, *"…you can succeed in applying OI as long as you can differentiate your organization by selecting right partners who allow you to be unique and in a safe place*", said the Dean of Faculty of Engineering. A professor of strategic management stated that, "…*there are few partners who have the same concept about OI. The good selection of an OI partner will save you a lot of problems - specifically regarding publication issues, and the importance of sharing achieved results with the scientific world"*. Specifying the role of every partner is an effective approach to achieving the required goals. So, the university should know the different players in its network and the desired goal of the relationship. If you do not know the player well that means the potential for collaboration failure exists. For instance, a University President said, *"…in*

collaboration with competitors, everything should be explicit, and nothing should be kept to interpretations". The following table shows these barriers that belong to each university:

Table 4: OI Barriers

		The U	TBU	PU
1	Understanding of Open Innovation		•	•
2	Regulations		•	•
3	Finding right partners		•	•
4	Trust		•	•
5	People			
6	Defining a common problem		•	•
7	Intellectual Property rights	•	•	•
8	Culture differences		•	•
9	Contracting		•	•
10	Researcher Reward system	•		•
11	Strategy		•	•
12	Business model		•	•

Source: Author's work

7.1.4. Success Factors of OI

This part answers the fourth research question:"*What are the success factors that support applying an open innovation strategy?"* - Most of the interviewees' responses confirmed the importance of customer relationship to allow the success of the OI strategy. A university has to adopt a customer-oriented view to facilitate the commercialization of the technology. TBU has implemented three successful clustering projects (e.g. Plastic, Footwear and Wood and Furniture). The objective of the cluster is to create a creative environment for companies in the related industries, to support their expansion into new markets. Additionally, these clusters are established to build a base for research and development and to train selected candidates from members companies. A Technology Innovation Center Director said"…*These clustering projects are co-financed by the Zlin Regional Government, the European Union and were supported by a grant from the Operational Program Industry and Enterprise*". She added "…*Mechanical Engineering cluster is currently underway to map the possibilities of creating this cluster*". These projects are highly essential to allow a university to analyze the market in order to identify employers' requirements. Additionally, these projects can create jobs for TBU graduates and increase the absorptive capacity of the university.

Without excellent internal R&D 'Absorptive Capacity', it is difficult to utilize external technologies. A Professor of Economics emphasized this fact. He mentioned "…*university has to be a learning organization that can absorb new ideas and process them to provide new technologies. This process is not sequential and has to be done*

continuously". Also in TBU, these clustering projects can provide up-to-date knowledge for the researchers and the private sector. Furthermore, clustering projects allow a university to choose the right partners from members of each cluster.

Finding talented people, who are able to implement this new strategy, is an additional factor to guarantee the success of the strategy. Fourteen interviewees have selected talented people as a potential factor to help the university to apply new technologies. In the U, talented people are part of the entrepreneur-friendly cognitive infrastructure. A Vice President Technology Venture Development at the U said"…*We have more active researchers than any two Idaho schools. The filling of new patents has doubled over the past five years and so leading to a massive excess of intellectual property*". A Professor of Pathology in the U said "…*The U laboratories has become one of the leading references labs for hospitals across the country. This success is really due to the people here and our commitment to patient care and quality"*. Talented people are important to create a critical mass of technology that is ready for commercialization. The quality of the developed technology is essential but the quantity is also important to meet the business sector demand. TBU has established two programs (e.g. STOC and SVOC) to support talented students. These competitions are carried out on several levels. Students with excellent study results are rewarded in the form of merit scholarship. Students' creative and expert activities (STOC) are supported- selected students participate in national and international competitions. Some of these competitions are organized by some faculties. Exceptionally talented students have an opportunity to study simultaneously another degree program. In 2009 the project entitled "Talented Students" was lunched and successfully implemented. Within the project, a supplementary program is organized for a selected group of Master's degree students, involving lectures, workshops and internships. Top managers and experts from selected group of companies and institutions located in the region participate in the preparation and implementation of this selective program and that in contractual cooperation with TBU.

Many responses emphasized the importance of the marketing strategy to facilitate technology commercialization. In the U, TCO Manager said *"...We have a proactive marketing strategy. We depend on our selves. We do not use intermediaries. It is costly"*. In PU, a Vice Dean for R&D said" …*companies know nothing about the university and they consider it as a black box. Marketing efforts narrow this gap"*. This idea is compatible with Wellings (2009) suggestion of the necessity to create a professional catalogue that contains all the details about developed technologies that are ready for commercialization. Market-orientation approach is highly essential to support applied research and achieve quick wins. In the U, there a lot of programs that are supporting the market-orientation approach as explained in chapter six. A Professor of Medical Chemistry said" …*Entrepreneurial Faculty Advisor (EFA) helps faculty's*

members bridge the formidable gap between original research and commercialization. It is a customer driven marketing approach, which is unfamiliar to most academic scientists".

A private sector support is an important factor to enlarge the university network and gain a practical experience and financial support. Commercial sponsored research can be a win-win situation for both the commercial sponsor and the university if both parties approach the situation with clear expectations and flexibility. A Vice President Technology Venture Development at the U said "…*Universities stand to receive millions of dollars in funding for innovative and sometimes lifesaving technologies, while companies receive innovative research and a product development pipeline without the need to finance private research and laboratories"*. A TCO Manager at the U said "…*if private companies are not involved at the beginning, research may never reach the marketplace due to a lack of funding or business potential. The earlier is the better"*. In 2009, the U has provided 179 IP disclosures and established 23 start-up companies in cooperation with the regional private sector. TBU has a strategic plan to cooperate with the business sector of Zlin region. TBU concluded around 30 cooperation agreements with state institutions (e.g. Czech statistical office, Ministry of Industry and Trade, Czech Agriculture and Food Inspection Authority and Test Institute), with other higher education institutions, innovation centers, as well as with firms (e.g. Bata, Cryptonic, 3M Belgium, and Cesky Mobil etc.). PU formed a consortium with Unilever International and some NGO's for promoting sustainable community development through encouraging off-campus participation of health care faculty staff & students in educating, training, diagnosing chronic problems in community unprivileged areas and sectors. The consortium members will collect the output and perform statistical analysis of the results of the activities & of the overall outcome at the end of each academic year.

Additionally, A University President emphasized the importance of achieving balance between daily activities and strategic orientation. He said" …*We have to avoid the short sight or considering only the daily activities, we need a vision and consider the long-term plan"*. A Vice President Technology Venture Development at the U said "…*ideas are the ultimate renewable resource, and the creative environment of the U is a world class mine. Our competitive advantage comes from excellent teaching programs, focusing in potential research and we are open-minded to any idea that can contribute in the state regional development. This balance is highly essential"*. This factor is called Ambidexterity and it is a successful approach to mitigate the strategy implementation gap.

Additionally, transparent measurements are essential to evaluate success. Universities depend on the number of enrolled students as an indicator for success. Number of

qualified graduates and the employability rate are more logical and economical measurements. The U has specified the criteria required to commercialize the technology (e.g. contribution in regional development, based on the state, has a potential economic and scientific reflect). Additionally, the U established the Virtual Capital Incubator to support university spin-offs. There are many qualification criteria such: 1) the applicant company must be a licensee of technology owned by the University of U, 2) It must not have more than 10 full-time employees, 3) It must have a formal business plan, 4) It must commit matching funds equivalent to the award amount and 5) The award money must be spent at the U. TBU has established the Innovation vouchers tool to finance and support business cooperation between TBU and internal and external researchers. An innovation voucher can be awarded to a legal person established for business purposes seated in any country in the world. Company discusses its project with a researcher, who provides the company with a Knowledge offer and then an application has to be provided to the Technology Innovation Center.

Monitoring graduates success in the market and establishing a career development plan are a potential factor in applying OI strategy. The U has established a career development program for graduates and postdoctoral students who find themselves in difficult positions because they lack transferable skills to enter the corporate world. Assistant Dean of Postdoctoral Affairs said "…*there is a void where post doctors can end up getting stuck, so what we are trying to do is give them the skills and resources they need to move forward in a meaningful way"*. TBU has contributed in a program called "Reflex 2010" to monitor and improve of the success rate of graduates in the labor market. This program aims at evaluating the success of HEI graduates in the market during 4-5 years after completing their studies. Additionally, the "Alumni Portal" was still available to the graduates to offer them the possibility of communication with the university as well as their fellow students.

Economic motivation is essential to support the OI strategy. Economic incentives provide a comfortable environment for researchers to be self-reliant, create organized teams, to create effective research programs and to seek funding. The President of the U said "…*USTAR Economic Development Initiative is a perfect example to our programs to attract and retain the best researchers in the country. The initiative has already lured talented scientists, and the impact is already felt"*. TBU has increased the fund allocated to scholarships and students monthly payments to attract talented students and researchers. PU provides few scholarships for the first five students based on the secondary school results ranking.

Creating an effective technology road-map is a potential instrument to advance the development and commercialization of the technology. TCO Manager at the U said "…*The U found potential entrepreneurs coming out of the woodwork. So, they began*

gently teaching faculty and administrators about the realities of entrepreneurial activity. The U quickly identified several areas where they could focus their efforts and build centers of excellence. These centered on medical applications, nanotechnology, imaging and energy, including cleantech". The author believes that a realistic technology road-map allows a university to differentiate itself and achieve significant results. A technology road-map specified strong research areas. TBU has a long history in Polymer research. A tech road-map that concentrates on polymers research can be a potential support factor.

Establishing an entrepreneurial culture is highly essential and allows a university to gain significant results. TCO Manager said *"...at the U, we have established an extremely friendly climate for entrepreneurs. The results are reflected by all national rankings".* He added *"…due to this entrepreneurial culture, the TCO at the U evaluates almost 200 new inventions every year, some of which are nurtured and become new companies. Since the inspection of specialized Technology Venture Development Office, over 100 new companies have been created by the university".* TBU is a highly dynamic university in regional and international scales. There is a trial to spread this innovative culture but as mentioned before there are some barriers that have to be firstly eliminated (e.g. trust conservative perspective and low awareness of innovation).

Furthermore, the business model has been selected by 65%% of the interviews' respondents as a cornerstone for the success of OI. A professor of Management said *"…university success is based on how it can create an added-value. The business model can specify how much value can be created?".* The U has a large and flexible business model that allows achieving these significant results by allowing the effective participation of all the ecosystem components. The following table summarized the success factors

Table 5: Success factors

		The U	TBU	PU
1	Customer relationship	•	•	•
2	Absorptive capacity	•	•	
3	Talented people	•	•	•
4	Marketing strategy	•		
5	Private sector support	•	•	•
6	Ambidexterity	•		
7	Transparent measurements	•	•	
8	Monitoring graduate success	•	•	•
9	Economic motivation	•	•	•
10	Technology road-map	•	•	
11	Entrepreneurial culture	•		
12	Business model	•		

Source: Author's work

7.1.5. OI Tools and Techniques

This section answers the second part of the second question: "*And what are alternatives of open innovation strategies available for the university*?" -There are many tools to apply OI. The university choices are based on the university characteristics and other aspects (e.g. culture, structure, policy, economic and management). Start-up and spin-out companies are the most powerful tool to commercialize innovation. Inventing a new technology is only the beginning of the commercialization processes. After that, legally protecting ideas is one of the most important next steps. Then, finding resources is a potential step to start the project. Establishing a company is the start for marketing the technology and gain a significant return for the university and the inventor. In the U, TCO provides this service through a well-rounded staff dedicated to managing the U's intellectual property. In addition to this, TCO licenses University technology and contributes to the Technology commercialization plan. Entrepreneurial Faculty Advisor (EFA) assist faculty through the process of conceptualization, startup, funding, product launch, business development and growth. TCO Manager said "…*Although the path to success can be long and challenging, we try to shorten the time frame to success by supporting these young companies. We strive to support university startup companies rather than leaving them to struggle on their own"*. TCO in the U, as stated before, has many programs to support establishing start-up companies such as: Venture Bench Service Program (VBSP) to provide required resources critical to the development of early-stage companies. TCO Medical Accelerator is an additional program to support establishing medical companies that are based on medical technologies. TCO Manager explained the U strategy to accelerate commercialization of technology and create start-up companies. He said "…*not only does the U lead the country in the number of startups, but it does so with less research funding than other leading universities. In fact, the U received a fifth the amount of MIT, which tied the U with 20 startups in the most recent AUTM survey. MIT spent an estimated $1.3 billion, while the U spent $273 million"*. He added "…*we want these companies to establish a strong foundation that is why, instead of leaving these companies to fend for themselves- we are investing experienced human capital in them"*.

Crowd-sourcing is another device to enrich the university intellectual property bank. Students in the competitions gain insight into the business processes that they can apply to their inventions and careers. Furthermore, at the best, they earn substantial sums of money to develop and market their product. The U has created competition spaces that allow society participations in innovation processes such as: Opportunity Quest, the U Entrepreneur Challenge and Tech-TITANS). Additionally, Student Intern to participate students in evaluating and commercializing of the U technologies. Meanwhile, the new Technology Commercialization Intern Program enables students to work with TCO's

licensing managers to develop and write marketing plans, develop strategies, and perform portfolio and patent analysis on University intellectual property. A Vice President Technology Venture Development at the U said "…*competing students work with mentors and get feedback to help them develop their ideas as part of the competitions. Students are coming to the U specifically to be involved in the extraordinary programs and opportunities".* Yet the competitions are only a few of the ways that can get involved. They also can participate in several programs where they can sink their teeth deeper into the commercialization process. These programs include Lassonde New Venture Development Center to develop business plans for commercializing the technology, the Legal & Commercialization Intern Program to perform legal review and analysis necessary in the licensing process. TBU has established competitions for talented students but there is a need for different types of competitions. The Technology Innovation Center Director said "…*Crowd-sourcing reflects my understanding of OI. You upload a problem to the public and get quick practical solutions. It is just like tendering but in Crowd-sourcing, you need to specify the way a company or a professional have to solve this problem".*

Collaboration is a powerful technique to connect the university with its network. In the U, getting corporate partners involved in translational research not only enhances the mission of the university, but it also accelerates the commercialization process. The business development group at TCO has created a streamlined process to help faculty find corporate collaborators. TCO Manager said "…*the U's portfolio of innovation technologies coupled with the product development of pregna (Medical company) could contribute to the control of the spread of this devastating disease. This partnership will give the U a chance to place their technologies in the hands of people that need them most and will enhance the value of our technologies in the developed world".* He added"…*only a year ago, the technology was a simple idea in the head of a worried father. The key 2 safe driving device is a prime example about how, with the right collaboration, a simple idea can be converted into a commercial product".* TBU is located in Zlin region which is among the less developed regions of the Czech Republic. Therefore, there are many trials to raise the competitiveness and attractiveness through development of innovation activities. Clustering collaboration is an essential vehicle to advance the innovation processes, foster technology commercialization and enhance implementation of the OI strategy. Collaboration has been selected by most of the interviewees. TBU concentrates in clustering collaboration as an essential technique for knowledge creation and commercialization of the technology. PU interviewees said that there are a lot of trials to sign cooperation agreements with regional companies (e.g. pharmaceutical and petrochemicals companies).

Networking is an additional technique to foster OI implementation. TBU is involving in many international projects such as: Researchers' Nights. This event aims at acquainting the general public with the research activities carried out at TBU and the scientists themselves. This project is open to the inhabitants of university towns, popular science lectures are held, and off-work and leisure activities of the researcher are presented. Innovation Treatment of Food Disorders" (INNOFFOT) is the 6th EU framework program. These programs allow TBU to enlarge its network of partners, provide consultations for partners and to license and sell its intellectual properties. All of the OI pioneers select networking as a potential tool to support implementation of OI.

Internal R&D is the base for advancing OI and commercialization processes. To satisfy the demand of the business sector, university have to accumulate critical mass of technology. Additionally, internal R&D allows increasing the absorptive capacity of the university. In the U, the university depends on its teams to develop and commercialize its technology. Also, the U depends on external R&D with potential partners (e.g. Cephalon Company) in medical research. TCO Manager said "…*we cannot do all the research internally. With the cost of developing drug getting so high, we are always looking for other outlets to do some of the development"*. In TBU, internal R&D is the first choice. As a public university, it has a lot of researchers and institutes that develop the required technology. PU As a fresh university tries to establish teams in many different scientific fields.

Consultation is an additional technique for a university to advance its OI strategy. The U has a large network of most companies in the region to provide consultations and training programs. In TBU, Technology Innovation Center provides professional consultation services for the regional business sector in Zlin. PU has started a program to provide consultations in drug manufacturing, mechanical and power engineering and professional translation. The following table shows a summary of these tools.

Table 6: OI Tools and Techniques

		The U	TBU	PU
1	Start-up companies	•		
2	Licensing	•		
3	Spin-off	•		
4	Crowd-souring	•		
5	Collaboration	•	•	•
6	Networking	•	•	•
7	Internal Research &Development	•	•	•
8	External Research &Development	•		
9	Consultations	•	•	•

Source: Author's work

CHAPTER EIGHT
OPEN INNOVATION STRATEGY TO ACHIEVE A SELF-SUSTAINABLE COMPETITIVE ADVANTAGE AT A UNIVERSITY

"Design OI strategy based on gathered results and standard university"

This chapter provides the answer for the fifth research question: "*What is the mechanism for applying the OI strategy at the university?"*-Based on the previous results, the author suggested the following strategy. This strategy is compatible with the notion that considers a university as a living organism. It consists of six connected phases that provide the university senior's managers with an effective mechanism to commercialize their technologies and transfer them into current and new markets. The following figure shows the strategy's components:
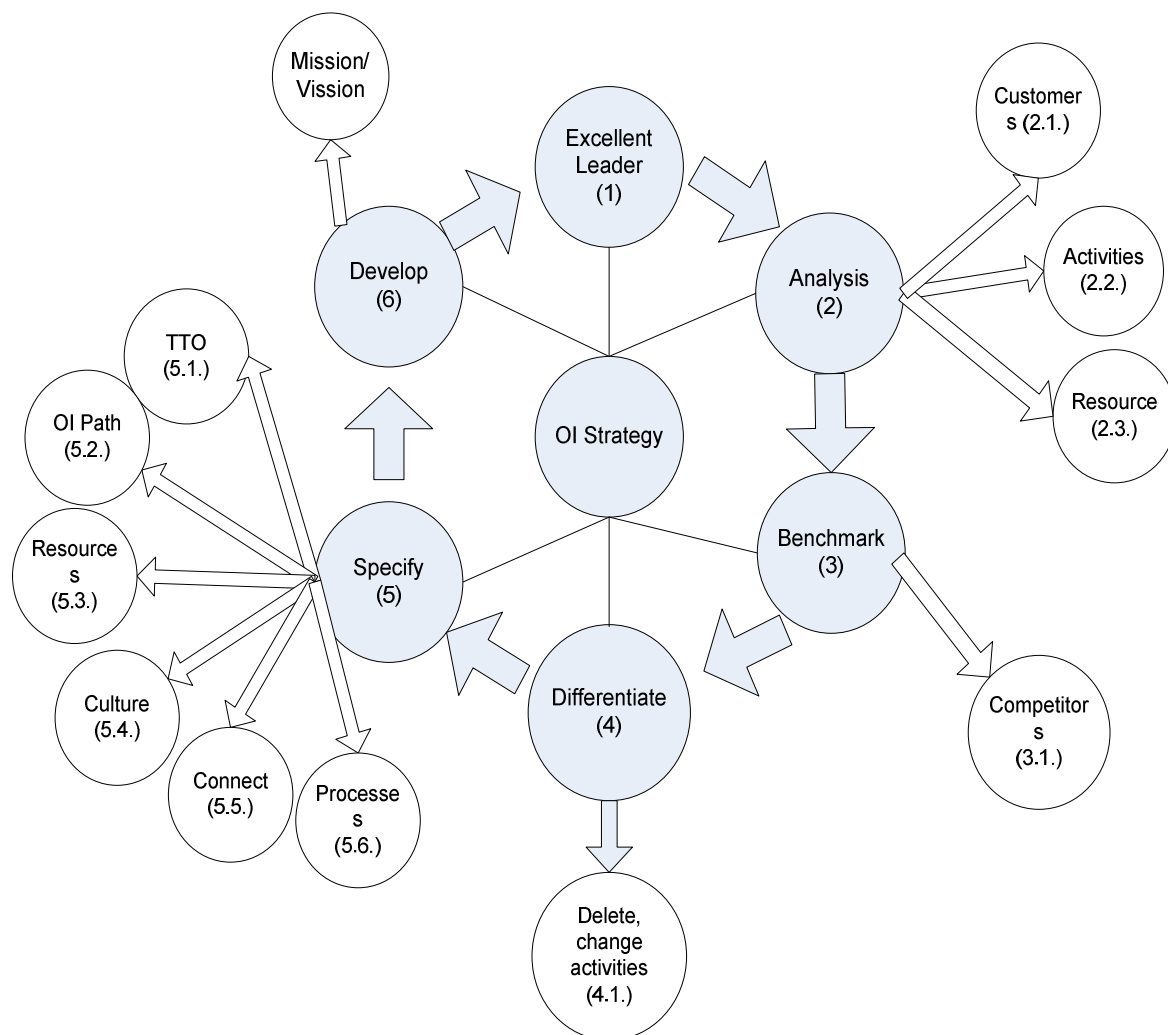

Figure 17: Components of the Strategy
Source: Author's Work

8.1. Choosing an excellent leadership and obtaining top management support

Firstly, there must be a commitment and support from the top management in the university hierarchy. Without buy-in from the head of a university, there is a lot of doubt that other members will be supportive in the planning and eventual implementation process. Commitment and support of the strategic-planning initiative must spread from the President and all the way down through the ranks, (Maak, 2007). Secondly, Entrepreneurial change is achieved by actions - not by statements or sayings, (Zeleny, 2005a).The skills that are needed to lead and direct the traditional university - are significantly different from the skills needed to overcome the challenges and risks that characterize the OI implementation. There is a need to manage the complex process of balancing relationships between formally engaged stakeholders (the board or council) and other internal and external stakeholders, (Frooman, 1999). According to (Gibb, 2009), OI leader should have the following characteristics: 1) Understanding of OI concept and its future, 2) Connecting and networking the components of the university's ecosystem, 3) Focusing on advancing innovation within the identified capacities, 4) Removing hierarchical barriers and supporting success factors and enablers, and 5) Building shared culture and ways of doing things. Additionally, Watson (2008) added that the leader should have: 1) A strong strategic orientation, 2) Able to take risks and share them with others appropriately, and 3) Able to communicate compelling vision. Thirdly, the leader has to choose the road for the university through selecting OI activities that allows a university to differentiate itself from competitors and build its long-term self-sustainable competitive advantage. In this context of strong strategic orientation, the leader has to connect the university with a coherent network either internally or externally to generate and develop resources to maintain success factors and eliminate obstacles.

8.2. Analysis of the university's current activities

8.2.1. Identify current customers

Customer is defined as the current or potential buyer of a product or user of a service. There are two types of university's clients. The first is the direct client for example students. It is essential to state that students become customers only if they purchase the educational products (contents and services), not if they get them for free, (Zeleny, 2010). The second is indirect client who are benefited from the university's graduate outcomes such as: companies, regional authorities, governmental agencies and society as a whole. In a dynamic world, the global customer is a knowledgeable customer. This customer is looking for maximizing the benefits instead of sacrificing cost or quality or high value. The global customer 'students' looks for high quality at suitable cost, delivered faster with high value. This means universities have to eliminate trade-off between choices. Therefore, the university has to differentiate itself through

maximizing the *added-value* that delivered to student. As a result, in private universities, students are customers and they have the right to demand better educational services. On the other hand, in free-education state universities, students are not customers and they do not have moral rights to ask for higher educational quality (e.g. better paid jobs). This last stated concept has to be changed, specifically, with the new governmental trend because of economic difficulties to increase tuition fees while decreasing financial support for higher education institutions. To determine customer wants and needs, a university must first understand what the wants and needs are, and then assess what educational services it can profitably provide. The target market and its environmental factors must be analyzed to determine strategic plans to reach every potential customer. When needs or wants are clearly understood, a university can address that target. So, the university has to first look at the big picture and to obtain key data such as geographic location, population, cost of living, and languages spoken in the area that may drive needs and wants. The university can obtain much of this information through simple observation; questionnaires; market analysis and local knowledge and information. There should be a full environmental scanning; a comprehensive market assessment; and definition of internal resources, competitive analysis, segmentation / targeting / positioning leading to development of the full marketing mix, and finally implementation and obtaining feedback, (Nicholas et al., 1995).

8.2.2. Identify current activities to satisfy those customers

This step includes creating of a detailed map of key organizational activities to identify the current situation from the action point of view. It will represent the real strategy that the organization is carrying out and already embedded in action. The following figure provides an example of the university activity map.
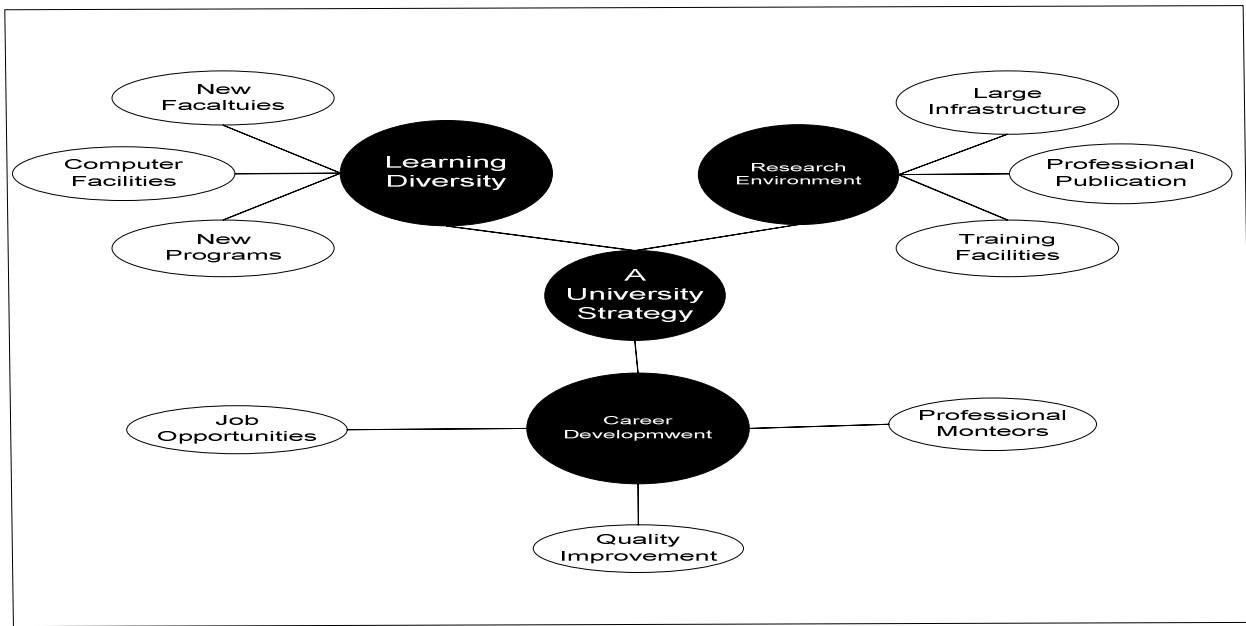
Figure 18: University activity map
Source: Author's work adapted from (Porter, 1996)

According to Porter, (1996), strategy consists of unique group of activities that allows the university to create values in a competitive market. Activity map shows how a university creates value in a competitive market, (Morgan et al, 2007). The map shows activities that are important for developing this market value. By identifying these key activities, it will be possible to measure how well the university is performing. Activity map consists of black circles that present the high-order strategic themes and their corresponding activities in white circles.

8.2.3. Identify current resources

There are two types of university resources. First are tangible assets that represent the university infrastructure (e.g. land, buildings, research labs, equipments, cars, library facilities, computers, software, and research materials). Second are intangible resources. Obviously because of the scientific nature of the university that is based on knowledge and intellectual properties, they are more valuable and profitable for the university. According to (Ling-Xing et al, 2009), intangible assets could be divided into the following types: First are external endowed intangible assets which cannot be managed by the university. This type contains: a) Environmental advantages (e.g. geographical location, climate condition, economic levels, culture and historical factors), b) Authorized power by the ministry of education, c) Various preferential policies given by the government. Second are internal accumulated intangible assets and including the following assets:

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- *Human assets*: they are the knowledge, innovation capabilities and skills that the university has by its colleges' staff, students, technical staff and employees. They are the fundamental elements and help in shaping the university's image and allow attracting high qualified students and staff and provide the university with the competitive advantage.

- *Market asset:* it includes three types of assets: information, network, images and relationships. 1) School's image asset is the overall attitude and evaluation, requirements and standards in the public mind during the development of universities' long-term efforts. It is important to determine the university's customer market. 2) Information network assets consist of statistical data and scientific experiment data gathered by the university. Additionally, it includes the network of industrial partners and scientific intelligence information network shaped during the long-term development. Finally, relational assets include graduate students contracts, employers' and stakeholders' information.

- *Intellectual Property Assets*: they are the most important type and introduce a real valuable profitable source. They include concentrated knowledge, intelligence and techniques that have to be protected or commercialized to the market. They consist of three types: patent, copyright and propriety technology.

8.3. Benchmarking with competitors

This phase consists of two steps. First, analyze current activities. There is a need to evaluate this activities performance. So, it will be helpful to identify their relationships and interdependencies. The effect of changing one activity on other activities and the ways to strengthen these activities has to be specified. The position of each activity and the type of customers served should be clarified. All of this information will allow reformulating and redrawing the map. Changing the map means a quick change in the strategy. This process of evaluating and changing aims to reduce trade-offs and brings forth the new strategy. Second, there is a need to benchmark or comparing current activities with competitors without imitating them but striving to be different. The main goal is to establish the difference between the organization and its competitors. The university is defined by the customers or markets it serves and the educational services it sells; it is not defined by its vision and mission statements, (Zeleny, 2005a).

8.4. Differentiating

The main goal is to distinguish the university's activity from those of the competitors. *Differentiating, not catching up or imitating is the key to effective competitiveness and sustainable strategy,* (Zeleny, 2010). The main output is a value curve. This curve consists of two axes: on the horizontal axes there is a list of criteria or attributes while

on the vertical axis, are the performance criteria. Every value profile will represent a unique university. According to Zeleny (2010), a profile consists of criteria and attributes and refers to the individual patterns, so there can be *our profile, their profile* and *the desired profile*. The task of differentiating is to identify not just the performance on existing criteria but to develop a set of new criteria (attributes or themes), which could differentiate the university from the competitors or standards (Zeleny, 2010). Therefore, identifying alternatives for OI activities is very crucial for specifying the new trends and activities to be added to the activity map. See the following figure:
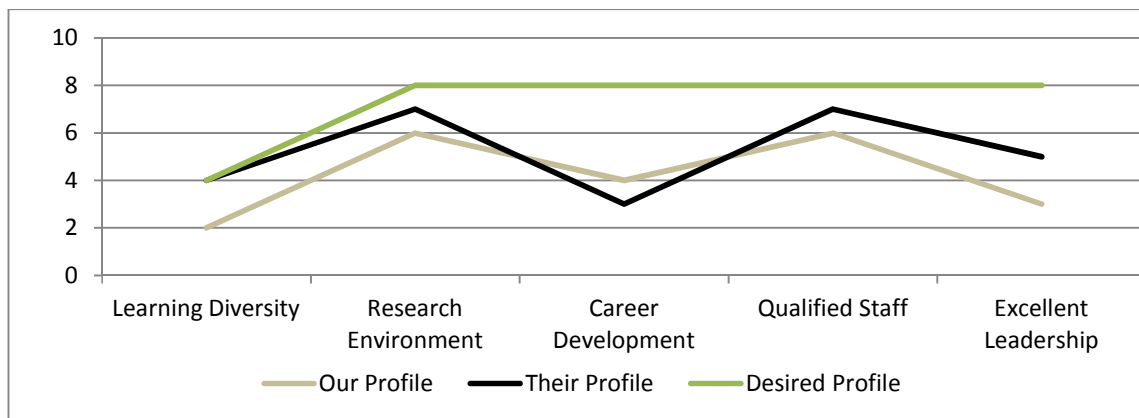

Figure 19: Profile map of environment
Source: Author's work adapted from (Zeleny, 2010)

8.5. Specifying

Now, it is the time to specify unique activities to capture added-value. The following diagram represents this phase:
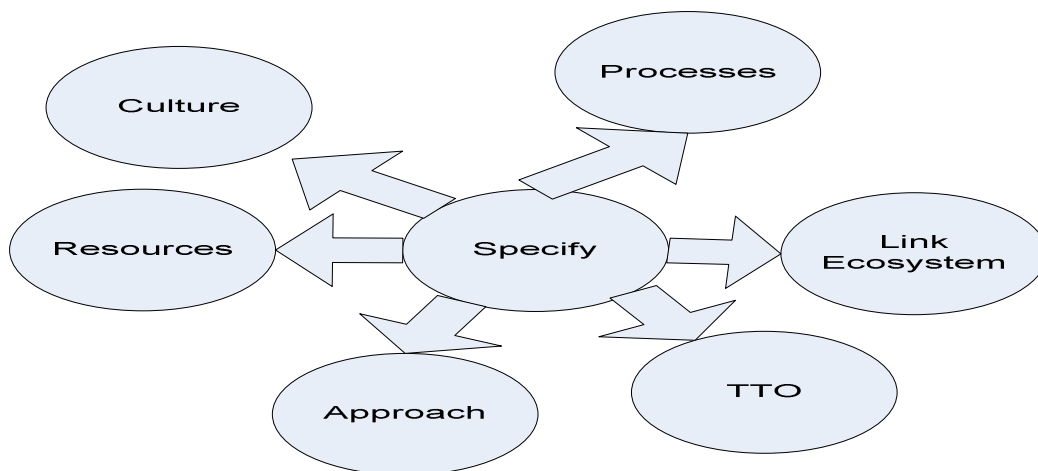
Figure 20: Strategy Components

Source: Author's work

In this phase, activities to be unchanged have to be conserved and identified first. This will help in identifying the activities that have to be changed in the new strategy. Then, the changed activities have to be recognized in order to fill the opportunity spaces revealed by value-curve profiles as being most effective for successful differentiation. The main output for this stage is to define a new activity map that combines the conserved activities, changed activities and the added new activities. This phase consists of six circulated components:

8.5.1. Building a Technology Transfer office

Commercialization of the university's technology generated, either internally or externally, is significantly dependent upon the capability of the TTO to protect and market the associated IPs. The main mission of TTO is to support and incubate new innovation, enhance research and help and drive regional economic development. This mission has to be done through protecting the internal IPs and other external sources of innovation and commercializing them for the benefit of the university, the faculty, staff and students. There are some responsibilities for TTO such as: 1) Providing suitable information and service for inventors and researchers related to intellectual property activities, 2) Evaluate disclosures for patentability and marketability, 3) Value technologies for marketplace, 4) Finding commercial partners and licensees for collaboration, 5) Negotiating and finalizing deals with partners, 6) Facilitating entrepreneurial activities either internally or externally, 7) Monitor new legal and regulatory development and 8) Administer, interpret and recommend changes to IP and licensing policies and develop licensing guidelines. In this context, hiring, training and retaining technology specialists who screen disclosures submitted by a faculty and

students, and are responsible for patenting, marketing and licensing the IP. This model encourages decisions to be mad with involvement from inventors their units and TTO. Managers of TTO work with inventors, collaborate closely with other managers, and work with out-side marketing and licensing experts to screen, assess, protect, market, and license technologies.

8.5.2. Choosing Open Innovation path

Universities can take different ways to OI, based on the required objectives that could be achieved through the implementation of OI. Many of the actions that formulate OI may be common within the university and have been executed for a long time without referring to OI. Typically, some individual departments within the university might already be very open in the way they operate, while a university as a whole may not, (Mortara et al., 2009). The following diagram represents a university's OI implementation approach (the vertical axis) as either a top-down, strategically-driven process or one that evolves more naturally from the bottom-up, (Mortara et al., 2009). The position of OI behaviors within a university (the horizontal axis) is defined as either centralized (a single team/department/faculty has the responsibility of implementing an OI approach) or circulated throughout different parts of the university (spread over several teams/ departments/ faculties).
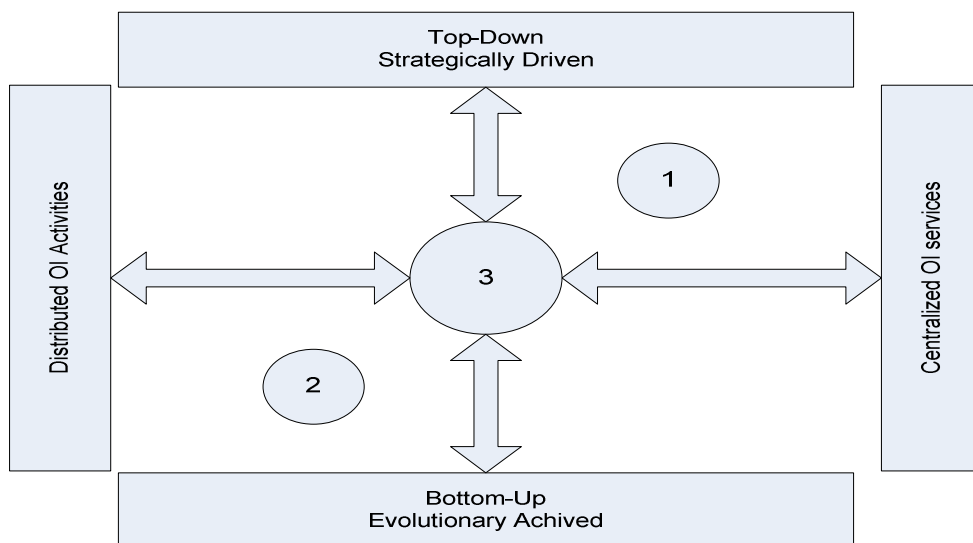

Figure 21: The OI strategy matrix
Source: Author's work (adapted from Mortara et al, 2009)

For some universities the introduction of an OI may develop over time, directed by either internal or external aspects. According to the previous diagram, there are three main routes to OI:

1. Top-down, strategically-driven, centralized activities: In this approach, internal competencies have to be integrated with new external competencies and usually a university has to rely on a central OI team led by experienced managers.
2. Bottom-up evolutionary, distributed activities: It is a more OI approach. This involves establishing formal and informal relations with a series of external suppliers, competitors, governmental agencies, and customers along the whole innovation chain. In this approach, lead users and start-up companies are very effective tools. A university has to build up a portfolio of internal and external resources to support OI (e.g. intelligence licensing, technology transfer, spin-out management and partnership services), (Mortara et al, 2009)
3. According to (Zeleny, 2010) strategy cannot be a result of *top-down* in the form of description and declaration. Neither can action percolate from *bottom-up*. Strategy has to emerge from the action cycle of **C**ustomer-**I**nnovation-**P**rocesses-**F**inance. *CIPF* should be the strategy of any business, only the measures of performance differentiate individual corporate strategies. The author agrees with Zeleny and suggests that a university has to depend on actionable strategy that considers *fore-sighting* of trends, organizational *adjustment* and *optimal* conditions for CIPF-cycle. OI strategy is not assembled like a Lego-piecewise into a unified whole. OI strategy is grown and nurtured into its existence from the past action-not backwards from the future- like a living organism, not like a contrived machine.

8.5.3. Accumulating required resources for the new strategy

a. Establishing a generous entrepreneurial environment

A university has to establish a broad financing network that allows the generation of financial resources. In case of public universities, governmental support represents the most important share of the budget. Students' tuition fees are an important contribution to finance the university research and activities. Additionally, partnership with commercial organizations and industrial corporations will provide the university with grants for financing start-up companies and incubators' facilities. Moreover, endowments, fees, gifts and non-for-profit organizations aid will be important. Commercialization of university's technologies and selling of on-shelf research will enhance the capabilities of the university to establish a generous environment. A university needs to focus its resources in order to attract potential partners and allow achieving faster and beneficial results. Availability of incentives for high qualified researchers will support the building block of the university's commercialization strategy. So, the university has to find new resources to engine its research budget through partnership with other organizations (e.g. industry, SMEs, governmental agencies and Non-for-profit organizations).

b. *Accumulation of research and technologies*

The university must have a potential supply of the technologies that are available for commercialization. By increasing the quality and quantity of the developed technology, the university will have a critical mass of research that allows differentiating itself from the competitors and to achieve a self-sustainable competitive advantage. This method can offer the university with some quick "wins" to further legitimizes their efforts. Allowing experimentations, trial and errors approaches and rooming for failing will provide researchers with trust and allow them to have more flexibility in choosing their disciplines and fields of interests.

8.5.4. Establishing an Entrepreneurial culture

OI Strategy needs a radical change in the university culture which is an obstacle for any new strategy. In this sense, the university has to solve two problems, first is to specify the structure of the new culture and second is to identify the mechanism to change this culture.

a. *Structure of the entrepreneurial culture*

i. Adopting a Market-orientation approach

Marketisation is described as a process by which universities change to become more closely engaged with the business and industry sectors of society. The university has to change its approach from protecting its Intellectual Properties to a more Market-orientation approach to facilitate the commercialization of its technology. The university has to choose between two types of risk. One is that the technology does not generate insufficient return or zero return. Second, is that viable technology does not commercialize at all. The choice should be made according to the principle that technology should be prepared for potential users' wants and preferences. The university has to adopt a proactive program with more tolerant of high uncertainty, and more comfortable with more discontinuous innovation. Universities should be considered as competitive entities, competing with each other as well as with other "knowledge organization" for resources, reputation, students and status. Universities are becoming strategic actors, driven and regulated in part by their competition for external supports and resources. Therefore, there are new trends for universities to become organized as market actors and act more strategically in relation to the environment, (Wedlin, 2008)

ii. Focusing on potential resources

In many higher education institutes, there is a wrong understanding that Commercialized research is a second-class research. The university has to make a

balance between basic research and commercialized technologies. Ambidexterity is a proactive technique that allows the university senior's managers to achieve success in the scientific field, meanwhile, advance and provide more profitable technologies. In developing countries, basic research is costly and needs a lot of time to get results, so there is an essential shift from basic research to focus all research budgets in supporting local industrial sector and applied research which will support the economic development and improve the society capabilities.

iii. Open innovation centric

OI needs a university manager's to be more proactive, tolerating to a high degree of risk and more entrepreneurial and innovative. Building innovation culture is crucial to support the commercialization of the technology. Innovation culture should be established and maintained all over the university structure (e.g. staff, researchers, employees, students and others). For example, the university can prepare competition spaces for encouraging the participation of all stakeholders for building the innovative thinking and environment. This will generate new ideas and allow for the spreading of the innovation mentality all over the university. Enhancing the university absorptive capacity is important and will allow the utilizing of external technologies. Venture capital programs to help start-up companies will generate new inventors and enhance the quality and the quantity of the university graduated students. Additionally, establishing a service program for students to learn innovation and to provide them with the resources and information needed to achieve successful commercialization of the technology.

b. *A dynamic mechanism to change the university's culture*

i. Understanding OI processes

OI processes are dynamic and university' managers have to understand the characteristics of these processes. Assessing, protecting and marketing are the main functions for commercializing of the university technologies. As mentioned before, OI processes consist of four components: 1) Idea generation tools. 2) Dynamic iterative innovation cycle, 3) Target market paths and 4) Dynamic feedback from stakeholders. Managers have to focus at the big picture. For example, enhancing the tools for generating new ideas and building the scientific data-bank of the university is the first step. Additionally, they have to establish an innovative environment which will allow enhancement of the Innovation Cycle. They have to find new paths for developing technology and open new markets to improve the transformation of the commercialization of technologies. Coherent partnership and incubation facilities will improve the conditions so as to establish new start-up companies and develop joint projects. At the same time, agile feedback from all stakeholders should be appreciated

and analyzed to correct the strategy and adjust it according to any changes. A university's managers have to identify required resources for each stage of the Innovation Cycle. Protecting Intellectual Properties of developed technology is important but without obstructing the smooth transformation of the technology.

ii. Training and development

OI needs an entrepreneurial structure to allow the development of innovative ideas and critical thinking. Training is highly important because it provides a university's stakeholders with a strategic weapon and tool to understand not only basic commercialization skills but also establishing an entrepreneurial environment. The university has to prepare consultation services and formal classes for teaching innovation and entrepreneurial approach all over the ecosystem. Adopting the approach of "Walking the talk" which allows the university's members to learn by doing instead of mere talking, will be a good methodology for establishing innovative members. Establishing new programs provide students and other stakeholders with new commercialization techniques and approaches. Hiring experts and facilitators who have the entrepreneurial mindset and innovative thinking is another requirement for the development of the OI strategy. Another alternative is to provide a university's members with regional development concepts, networking, career development and placement. It is a high priority that the university has to recruit and enable high quality faculty researchers to enhance its status and market position. By realizing the importance of this priority, the university will strengthen its capability to generate a lot of money every year. There are some factors that increase the university ability to recruit and retain the highest quality faculty members such as: competitive compensation, funding for initiation of new research programs, quality of research facilities and infrastructure and, increasingly, university policies, culture and technology commercialization infrastructure.

8.5.5. Linking the university's ecosystem components

Dynamic and well connected ecosystem is a requirement for OI and technology commercialization. A university as a living organism has to be connected with other components of the society. Agile and iterative relationship between all components is needed and will allow broadening of the network. The growth of entrepreneurial activity has to be supported by a coherent entrepreneurial ecosystem. There are three components for linking the ecosystem:

Using connectors

The new OI strategy needs well talented and educated connectors to decrease the gap between the ecosystem components and link ideas, inventors and people. Those

connectors should be able to use tangible and intangible resources to help university's inventors to develop advanced technologies. Connectors should be proactive, professional, tolerant and highly passionate. They have to provide excellent advices and experiences in order to help understand commercialization concepts (e.g. start-ups, licensing, partnership and consulting). Additionally, they have to help inventors in finding financial resources and external supporters.

Employing university internal members

Spreading the entrepreneurial and OI approach between all university's members is an excellent approach to maximize the added-value of the strategy. A synergetic approach for innovation is crucial to help establishing this strategy. This approach consists of three main methods (e.g. all technological and non-technological elements, university's stakeholders as a source for innovation and encouraging innovation in all times and all spaces). Facilitating the participation of all stakeholders will enrich the university with new ideas and enhance the loyalty of the members. The university has to provide adequate incentives for participation to broad the contribution, (Menke et al., 2007).

Potentiality of students' participation

A university is a science generator and incubator and the quality of graduate students is the main tool for measuring the success of the university strategy. Students are important source for technological ideas and utilizing their dynamic enthusiasm and passionate will help the university advances the research and development activities. Students are risk taking and have less caution about failing which will support the new trend of OI as a dynamic tool that needs courage and skills. Students can help in launching technology-based venture and marketing new technology. Senior students can be mentors for junior students to help them in their research and to enhance the technology experience exchange. Attracting best students in the country will be a good approach to leverage the level of the educational system and environment. Additionally, establishing some competitions spaces for students to participate in is an important approach to help them show their technological contributions and their experiential learning.

8.5.6. Perfecting Innovation processes

Hiring Professionals and expertise

According to (Thompson et al., 2005), clever amateurs and professional expertise are highly essential for the advancement of the university commercialization processes. Dealing with professional is a requirement for building trust with external collaborators and allow saving the university resources. Therefore, a university has to hire genuine experts who have the ability to leverage the university members' capabilities at all key

points. Technology commercialization professionals must embrace the uncertainty and the need of other stakeholders for legal compliance and maintain the integrity of the process. Those professionals should have the following characteristics: 1) Appropriate technical background and experience in technology commercialization, 2) An excellent knowledge of different forms of intellectual property, their protection and exploitation (e.g. patenting, licensing, and commercialization activities), 3) In-depth comprehending of university research IP issues and industrial collaboration mechanism, 4)Adequate experience in mentoring students / inventors to allow smooth transition of the developed technology to the suitable path and market, 5)High capabilities in networking and establishing rapports with external partners and stakeholders and 6)Problem solver, risk-taking, passionate and willing to teach and transfer their experiences.

Advancing the role of private sector

OI strategy means expanding the university network with other external partners. Private sector plays a crucial role in financing the technological research of the university through donation, partnership - contracting, licensing and other OI tools. Empowering the university's network with different suitable collaborators will enhance the position of the university and will introduce a potential source for ideas and finance. Partnership with large corporations allows for the establishment of large projects and permits university researchers to gain valuable practical experiences and find budgets for their scientific researches. At the same time, collaboration with large organization reshapes the university image and enhances the marketing position. Large industrial collaborators could be considered as potential customers for developed technologies. Additionally, a university has to work closely with other partners like SMEs which are more willing to utilize new technology and have flexibility in adjusting their business model quickly and easily. Successful OI strategy should have the ability to embrace entrepreneurial private sector partners and entrepreneurs and provide them with adequate technology.

Measurements of success

A successful strategy must have a suitable way to measure its effect. Therefore, establishing transparent measures for commercialization efforts will build credibility with all stakeholders. These measurements should address the right output and transitional outcomes. Qualitative goals are needed specifically in the early phases of developing technology commercialization plan such as: quality of developed technology regarding usage, (Etzkowitz, 2008). Additionally, quantitative measurements should be used to clarify the success of the strategy. For example, numbers of licenses, copyrights, sold patents; total amounts of the commercialized contracts are important measurements of the strategy. Moreover, total budget of

research, amount spent in technology incubators and start-up companies and number of jobs that are generated by the university will be a well economic indicator for the success of the strategy.
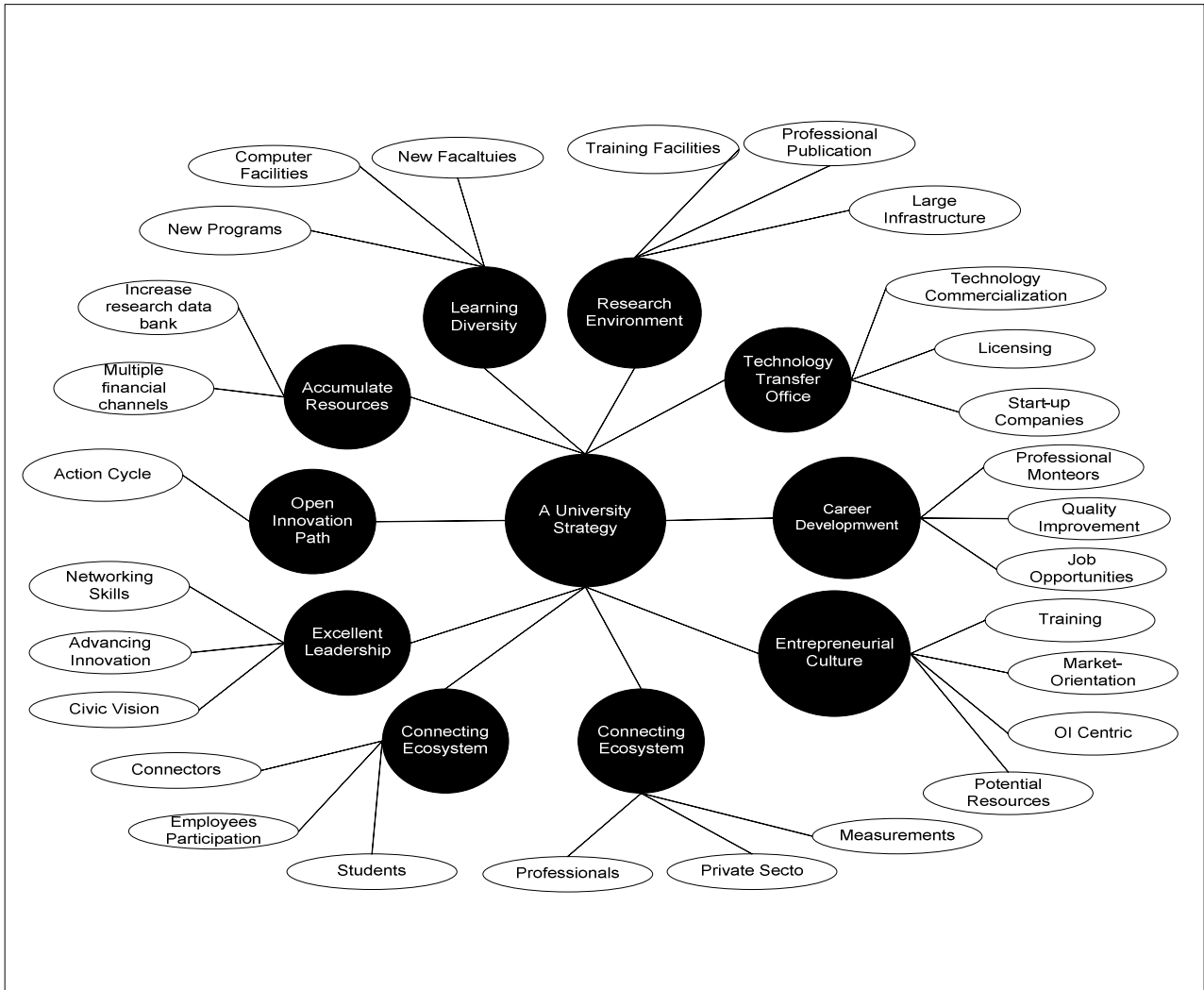
Figure 22: A university Activity Map to represent the new strategy
Source: Author's work

8.6. Developing

Depending on the new map that describes the new strategy, the organization can then write the vision, mission statements that reflect the current activities situation and has to be communicated to other parties. Iterative revision of the strategy and its components is highly imperative to enhance and adjust it according to the market and the economic changes. It has to be modified from time to time to be a real

representation of the university strategy. Using the previous mentioned measurement is highly important to clarify the success of the strategy.

8.7. Comments on the proposed strategy:

OI professionals agreed that the proposed strategy is realistic. A Professor of OI said "*…This is an interesting idea that I have not seen addressed in the literature, where the university is not simply engaged in teaching and basic research, but undertakes applied research with a view to it being transferred to industry through a technology transfer office (TTO) (or directly from the faculty) in return for a royalty or through a partnership arrangement perhaps involving equity etc.* This is essentially a one Way Street in which technology generated in the university is transferred to industry. He added "*…This strategy opens the road for a university to utilize internal and external capabilities and resources*). A Professor of Economics mentioned that university as a traditional organization has to be careful while implementing this strategy. Additionally, he suggested a step by step implementation. For example, establishing entrepreneurial culture is a long-term and complicated task. So, this is the starting point for a university.

Most of the respondents from TBU found that the suggested model is useful and helpful for university development. OI can be considered as an instrument for the success by most interviewees. The comments from TBU concluded that they see TBU has the infrastructure (e.g. Technology Innovation Center, financial and human resources and business sector clusters) to implement this strategy. This strategy is important for the development of TBU and Zlin region. But, there are some changes are required (e.g. culture and building trust). Some respondents think that the most important factor is the development of the business sector to allow TBU to commercialize its technology. Respondents think that it is necessary to initially do three steps (e.g. changing of management style, improvement of education, increase effectiveness of research activities).

In PU, respondents agreed that the model is effective but there are many changes have to be done first. As a private university, building the required facilities to implement this strategy is essential (e.g. TTO, accumulating resources and enhancing innovation processes). They see the model as a long-term strategy that needs strategic planning. One respondent said "*…PU is qualified to implement OI but it needs a lot of work to implement the new strategy*". Meanwhile, other respondents viewed some parts of the strategy are beneficial to PU to be implemented now such as: TTO, development center, competition spaces and innovation websites.

CHAPTER NINE

RECOMMENDATIONS AND APPLYING THE PROPOSED STRATEGY

"Adjust and customize designed strategy to be applied in the target universities"

This chapter provides a brief discussion of how both universities, (TBU) and (PU), can benefit from applying the OI strategy. In this chapter, activities of both universities will be analyzed and investigated to identify differentiation capabilities that allow every university to achieve a unique competitive advantage. Additionally, some recommendations will be suggested to advance the applied strategy and achieve the sustainability of the competitive advantage.

9.1.   The Tomas Bata University

Tomas Bata University in Zlin (TBU), the Czech Republic, is used as an example of a public university to apply the OI approach. It is selected because it is considered as a dynamic growing higher education institution comprised of six faculties offering students the possibility of studying humanities, natural sciences, technology and art. It is one of the most prominent centers of research in the Czech Republic and, in many respects, also abroad. With about 13,500 students, TBU ranks among medium-sized Czech universities. TBU follows the forty-year tradition of the Faculty of Technology, which was founded in Zlín in 1969 and since then has educated hundreds of highly-qualified professionals. The University is named after the originator of the shoe industry in Zlín and a world-famous entrepreneur Tomáš Baťa (1876 – 1932). The offer of its degree programs taught in English has been continually extended. Maximum support is given to all forms of international cooperation, i.e. student exchanges, lectures and teaching internships, joint research projects, etc. The University offers a three-level study based on a credit transfer system compatible with the European Credit Transfer System. Its graduates are issued the Diploma Supplement, the aim of which is to enhance their position in the European labor market. It is recognized all over Europe. This year, the University has been awarded the prestigious Diploma Supplement Label by the European Commission (for the second time now), which has raised its reputation among other higher education institutions in Europe. TBU is a member of numerous international organizations. Its membership in the EUA (European University Association), which associates over 800 universities from 46 countries in Europe, is one of the most prestigious ones. It enables the University to participate in all the EUA's significant activities aiming to support higher education in Europe and so to present itself to the whole of the European academic community (TBU, 2011).

9.1.1. A University Profile

This section portrays a detailed description of the unique activities of each university and tries to give a complete picture of the desired university. These activities are distinctive and if managed effectively, it will provide a self-sustainable competitive advantage for the university. These activities are:

1- Effective Education System: Teaching is the first and main task of TBU. Establishing joint degrees with European countries (e.g. Universite Balise Pascal in France (Polymer material processing) and Huddersfield University Business School in Great Britain (Bachelor's program in Business)) is an essential step for providing up-to-date education. Lifelong learning Programs to enable participants to gain, increase and renew the knowledge, skills and qualifications necessary to perform specialized activities. These programs are designed for graduates from Bachelor's and for those interested in broadening their knowledge in: Management, Marketing, Enterprise Economics, Industrial Engineering, Finance, Public Sector administration and Regional Development.

2- Qualified Academic Staff: TBU as a public university depends on its staff-pool of resources and it tries to attract talented professors from outside. The level of qualification of the academic staff is constantly being increased with the emphasis on increasing the numbers of Professors, Associate Professors and researchers. Employees holding the degree of Professors and/or Associate Professors represent a one-third of the academic staff and researchers. 80% of the academic staff is employed full-time. In 2009, a training program of the staff of TBU was carried out within the development project of the MEYS. Additionally, the Faculty of Management and Economics organized two courses focusing on authorship and tutoring of E-learning courses. There are some foreigners professors working in TBU from different countries (e.g. Russia, Poland, India, China and Japan).

3- International Education Cooperation: The Erasmus project is the largest program of European cooperation in the sphere of higher education. Since 2008, TBU has been participating in three year program Erasmus Munds. CEEPS (Central European Exchange Program for University Studies) is a central European program focused on regional cooperation within university networks. FM/EHP Norska (Other projects)- The financial mechanism of the European economic area provides financial assistance to ten new members countries of the European Union and also to Spain, Portugal and Greece. The aim is to reduce social and economic inequalities in the European economic area. The International Visegrad promotes the development of closer cooperation between the Czech Republic, Hungary, Poland and Slovakia. Additionally, the government of the Czech Republic offers to foreigners from developing countries scholarships aimed.

4- Advancement of Research: Research, development, art and other activities are carried out at the relevant faculties and at the University Institute (UNI). Emphasis is laid on the support of applied research conducted with industrial companies of Zlin region and established clusters. A significant research unit focusing on basic research is the Polymer Center at the Faculty of Technology. The Strategic Development Center that is part of UNI provides information and services related to the preparation of project applications aimed at state as well as European subsidies and grants provided to support science, research and development and preparation of applications for grants and subsidies. The Department of Applied Research focuses on two research areas: Medical Polymers and Food Processing material and technologies. The Center of Applied Economic Research (CAER) was established to focus on the development and implementation of R&D strategy at FaME. Its aim is to improve the position of FaME and increase prestige, internationalization and research and project cooperation with other universities. Additionally, in 2009, the Internal Grant Agency was established at TBU aimed at supporting research activities done not only by PhD students but also by talented students in Master's programs.

5- International R&D Programs: Involvement in international projects and creating networks of excellence are some of the significant priorities defined in TBU strategic plan. Researchers' Night aims at acquainting the general public with the research activities carried out at TBU. Innovation Treatment of Food Disorders (INNOFOOT), Service for SMEs and Polymer Supply Chain (Ener-Plast) are examples of European framework programs. In 2009, TBU participated in the 7th EU framework program called: Independent Living for Today's Society: Understanding the Elderly and Disabled for Tomorrows Inclusive Smart Home Solution" (Promoveo). Additionally, TBU participated in two projects: 1) Coordination of R&D&I Policies and their Coherence with other Policies in NAG countries (COGNAG) and 2) Central European Research and Development Area (CERADA).

6- Information System Infrastructure: Teaching complexes and university buildings are all interconnected with a fiber-optic backbone network with a connection speed of 1 Gbit/s. The university Wi-Fi network with 61 access point in selected spaces of eight TBU enables students and employees to connect their mobile devices to the European Eduroam network. There are many information systems are running in TBU such as (SAP, IS/STAG, Aleph, OBD, and LexDATA)

7- Effective Library: TBU as an excellent higher education institute has a public library to provide students with information and knowledge form different resources. It is a member of the ALUC (Association of libraries of Czech Universities). The library involves in the national consortium "INFOZ" projects which ensure the availability of top-level electronic information resources in the

Czech Republic. Students and employees can draw information from 68 databases, 50,000 electronic periodicals and more than 2000 electronic books accessible through the university computer network.

8- Regional Development: TBU has a contribution in regional development educationally, economically, and culturally. It has contributed in training most of the region labor force (e.g. teachers, managers, entrepreneurs and innovators). TBU has a Technology Innovation Center that is responsible for technology transfer, establishing start-up companies, works as a business incubator and participate in joint projects with the Zlin region authorities. Innovation vouchers are a tool for promoting business cooperation with TBU research institutions. This program provides up to 100,000 CK to entrepreneurs and innovative companies. It is a proven tool for promoting technology transfer and commercialization of innovative ideas and projects.

As mentioned before in research methodology chapter, analysis means creating a detailed map of organizational activities to identify the current situation from the action point of view. It represents the real strategy that the organization is carrying out and already embedded in action. The following figure provides a detailed activity map of TBU.
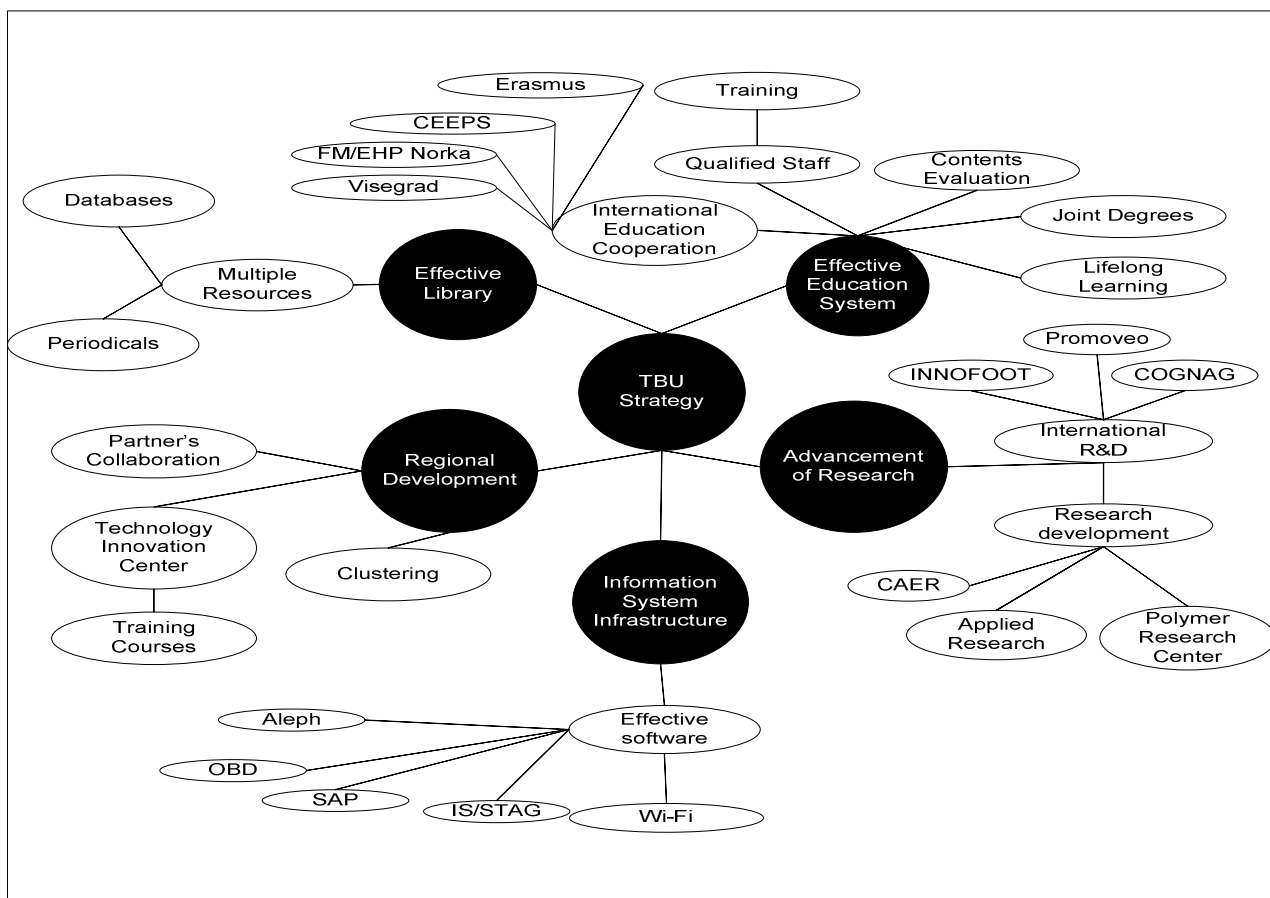
Figure 23: TBU activity map
Source: Author's work

9.1.2. Recommendation for TBU to apply Open Innovation Strategy

These recommendations have to be implemented in cooperation between TBU, Technology Innovation Center and Zlin authorities.

- *Replacing current culture with entrepreneurial and Innovation culture by establishing*:
  a. Competition spaces:
  i. A competition between high school students (from 9-15 years old) in order to raise the awareness of parents and students of innovation and technology inside TBU.
  ii. A competition across Zlin and surrounding regions to attract talented students and to give them a strong message about the university innovation environment
  iii. A competition across the Czech Republic and Europe to grasp the attention to TBU. This competition will work s a long-term incentive for promoting and advertising the role of TBU in building a technology base.

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b. Conferences: TBU has to embrace the Students Entrepreneurs Conference as an introductory conference for aspiring entrepreneurs and to provide an overview of programs and available innovation opportunities that are available by TBU.

c. Building innovation websites:

i. Teach-me Innovation Portal: this portal is to discover useful innovation tools and gain inspiration from cases and articles to enhance innovative thinking and practices. The goal is to provide adequate information about the concepts (e.g. creativity, innovation and open innovation). This information will allow staff, employees and students to know how to foster creativity and experience the different phases of the innovation processes (e.g. search, selection research and development ideas

ii. Help-Me website: the aim is to create a community of support where the members can help and encourage each others in research and development ideas, apart from making friends and socializing. This virtual community also promotes positive and proactive actions to be creative and innovative by sharing new stories and best practices. Any researcher who has a problem in his/her research can access the community and find help from other members. The aim is to change the university into a learning organization that share and integrate knowledge. In this website, it is possible to write blog posts, exchange ideas in discussion forums and share photos and videos considered useful and informative.

d. Creating innovation and entrepreneurial courses to support spreading the innovation thinking between all TBU members.

- *Building Trust with ecosystem components*

There are many tools to build trust and encourage external partners to cooperate with TBU:

a. TBU-Ideas for you:

This website is to allow TBU to upload and announce the on-the-shelf ideas those are not used by TBU. This portal has two sections:

i. First section: for selling ideas that can be commercialized and can create an added value for both the buyer and TBU.

ii. Second section: for publishing ideas that are not used by TBU and cannot be commercialized by TBU.

This portal allows entrepreneurs around TBU to use these ideas to flourish or enhance and implement them in new ways which will allow the building of an entrepreneurial culture and open new paths for university ideas. Commercialization of ideas could bring a large return to all ecosystem components.

b. TBU-pedia Website:

This interactive website will allow stakeholders (employees, staff, students, parents, suppliers, governmental agencies, competitors, entrepreneurs, public institutions and financial agencies) to upload new ideas, best practices and experiences. TBU will rate them and comment them. In the long-term perspective, this generic idea sharing platform will be available for use by all the people TBU. This platform will enable the discussion and development of ideas arising within TBU, encourage support of innovation culture and allow a wider contribution of stakeholders. Prizes can be given to the best idea.

    c. Industry and SME's Annual Conference

TBU has to establish annul conference to gather industrial corporations and SMEs in Zlin region in cooperation with Zlin authorities with the name "What do you need from TBU?"- The goal of the conference is to search for customers' needs and preferences. It has to focus on identifying all requirements to change curriculum to be up-to-date and compatible with their requirements.

- *Accelerating and advancing technology commercialization processes*:
  a. Increase the number of developed technologies and ideas by using Crowd-sourcing tool to allow the society's participation in generating new ideas for the university (out-in tool).
  b. TBU has to depend on a shorter innovation cycle. This means TBU has not to control all the innovation processes. Now, TBU starts with generating idea and complete all the processes hoping to establish a start-up company. OI trend is to shorten this cycle by selling ideas to customers.
  c. TBU has to utilize aggressive marketing strategy to promote the developed technology and allow scanning the market for the customers' requirements.
  d. Creating a professional catalogue that includes all the technologies available for commercialization with a brief description, information about these technologies has to be balanced. So, it can provide a suitable knowledge for investors to encourage them choose the required technology. Meanwhile, it has to be in a professional way that protects TBU intellectual property rights. This catalogue should be delivered to all companies and business entities in the area.
- *Fund raising campaign:*
  a. TBU can exploit the appreciated image by its community to increase its resources by increasing annual and alumni fund raising campaigns, new donor acquisition and internal family support.
- *Research center:*
  a. TBU has a center of Polymer Systems. There is a need to establish additional research center to solve problems of the available clusters (e.g. Footwear and Wood and Furniture).

- *Foreign expertise:*
  a. TBU should also encourage the coming of scientists from the entire Czech Republic and also from worldwide.

The following figure represents the recommended activity map. The gray circles show these recommendations.
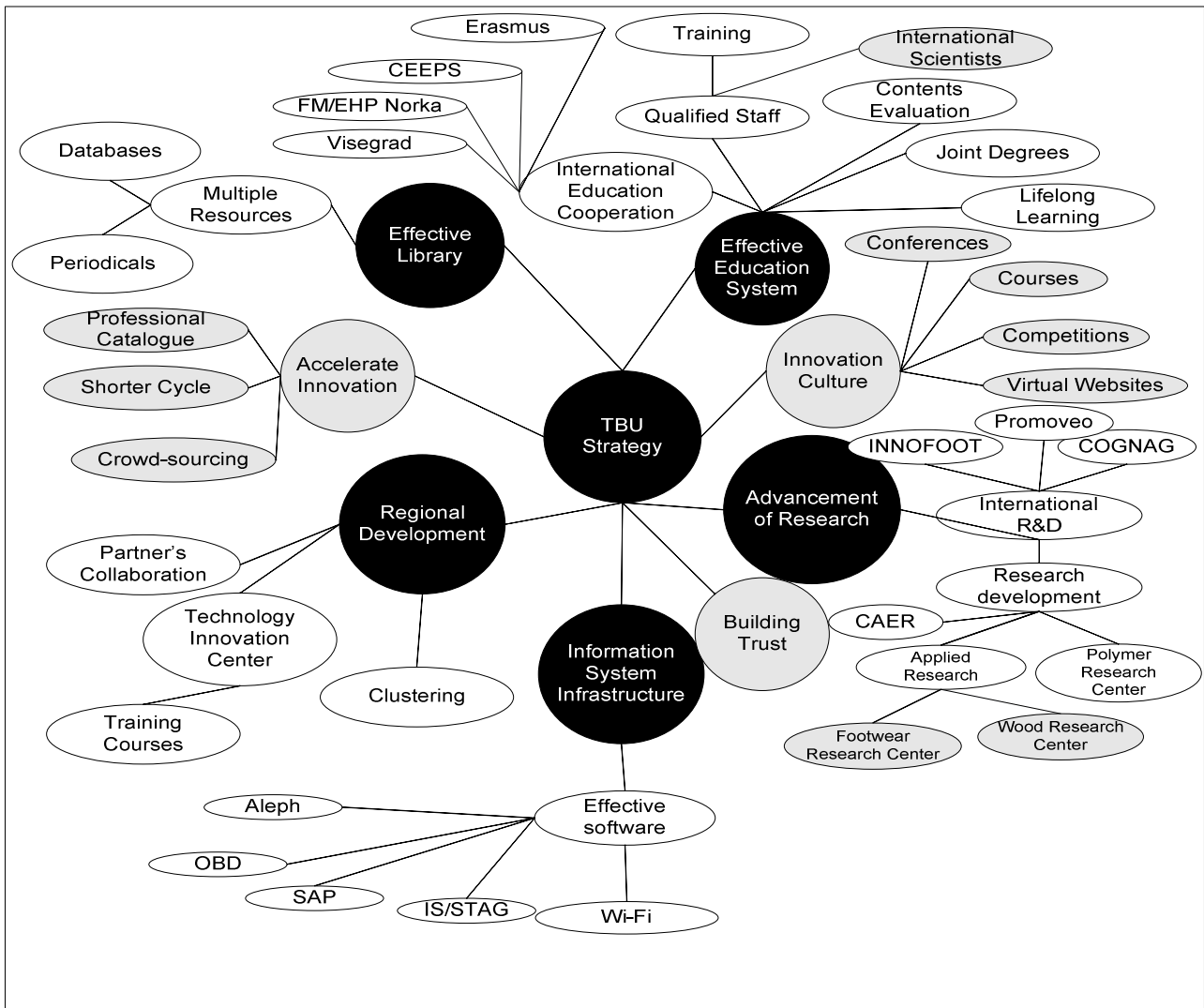

 Figure 24: Activity map of TBU with recommendations
Source: Author's work

9.2. Pharos University (PU)

It is a private university, established in Egypt on 2006. It is a new university aiming to be a leading one in the region as well as in the world. This university consists of seven faculties in different fields such as (Dentistry, Pharmacy, Engineering, Language and

Translation, Legal Studies, Financial Sciences, and Tourism). Its goal is to aspire to meet the needs of the community, cope with the continuing technological development and prepare its students for inspired leadership, personal fulfillment and lifetime learning. The main resource for funding is the students' tuition fees. To ensure best governance and ensuring core values, a Board of Trustees has been selected comprising prominent academic and social figures. Pharos University has adopted a traditional strategy approach which starts with vision/mission statements. In order to avoid failing in the talking- doing gap and to build a knowledge based strategy, it is important for Pharos University to adapt a new generation of strategy formulation process to add new competencies and to gain a competitive advantage, (PUA, 2011).

9.2.1. Pharos University Profile

- *Research Environment*: PU is a higher education institute which focuses on teaching. Faculty members preserve and regularly contribute to their field knowledge area with scientific publications. Therefore, PU supports its staff with financial support for faculty research and conference expenses. Adequate funding is available for training and support for instructional technologies.
- *Multi-disciplinary Learning*: on one hand, PU looks for new programs in specific fields. PU investigated the surrounding society through consultations and marketing research to identify community needs that are unmet. Therefore, it started creating required additional faculties such as: Art and Design, Allied Medical Sciences, Mass Communication and Physical Therapy. On the other hand, PU current programs are revised and evaluated to be leveraged to better educational level. The university has signed an agreement between Dublin institute of technology and the Faculty of financial and administrative sciences to accredit its program and to provide double degrees for the graduate, one from the Egyptian university and another from the European university.
- *The Quality Assurance System*: PU has established a comprehensive model to evaluate the performance and productivity. The evaluation processes develop information required for quality development, responsibility and strategic decision-making.
- *The Technology capacity:* to maintain a high quality of services, a recent model of computer and laser printers are available for every member of the university. An integrated network covered the PU site. Faculty members have the opportunity to sustain progress in developing on-line and multi-media enriched courses. Interactive technology is widely used and enables exchange of instructions. Standard software is available with required training opportunities. The following figure represents the activity map of Pharos University:
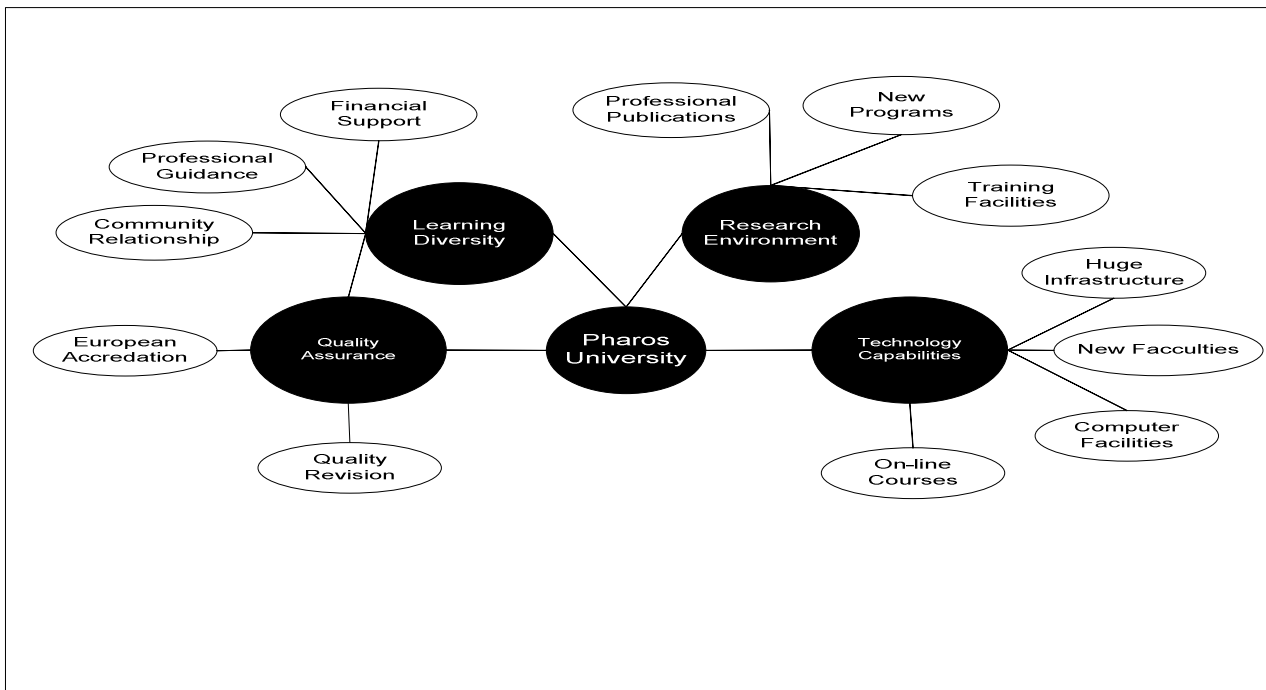
Figure 25: Activity map of PU
Source: Author's Work

9.2.2. Recommendations for PU to apply OI strategy

- *Building a Technology Transfer Office (TTO)*

  The purpose of the TTO is to help facilitating and enhancing the transfer of university IP, resources and information. TTO helps in fostering and accelerating research partnership with the business sector and other collaborators. The main role of TTO is to foster the implementation of new technologies, establishing entrepreneurial thinking within the university, creating new job opportunities for students and graduates, adding value for economic development. TTO has a potential understanding of industry language, familiar with market's needs, development processes of new technology. Besides this, TTO has the ability to effectively manage IP issues (e.g. generation, disclosure, protection, and legislation).

- *Building an Innovation Center*

  This center will help in preparing unique programs for innovation consultation and advising inventors. It could provide educational and training activities for inventors and entrepreneurs. It can help in establishing group of websites that allows enhancing innovation experiences and understanding. As explained before "OI Dynamic Framework", the first portal is to identify useful innovation processes and gain new

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knowledge from cases and articles. This portal can foster creativity, innovation and OI. Second is an interactive web that allows all stakeholders (business, employees, staff, students, parents, suppliers, governmental agencies, competitors, entrepreneurs, public institutions and financial agencies) to upload new ideas, best practices, and experiences to enrich the university databank. Third is a social interactive website that allows all students to share ideas and gain new experiences from each others. And finally, additional website for commercialization of the technology and allow companies to have the opportunity to discover the university technologies.

- *Strategic Management Center*

It is an important device to help in strategic decision-making, control and monitoring to help the university react to internal and external changes. University commercialization strategy should be designed and formulated according to the regional needs. Strategic measurements are essential tool to measure the strategy output and quality of the management system.

- *Career Service Center*

PU can establish a Career Service Center to provide professional guidance and resources to undergraduate and graduate students and alumni for their lifelong learning needs. Programs and services should be designed to educate, counsel, and engage students and alumni in career-planning and decision-making, experiential learning, continuing education, and/or employment search activities. By providing these programs and services, the Career Services Center will establish a mutually beneficial relationship with students, alumni, employers, faculty, staff, and the community. Through this center, PU will try to support its graduates to plan their future and to improve the employability rate.

- *Collaborative system*

As a result of its large infrastructure, PU can increase the collaboration and sharing of resources with its community partners. PU can initiate a collaborative system to serve the region. For example, one of PU's faculties is Petroleum Engineering Faculty which allows a collaboration and partnership with petroleum and petrochemical companies that are located in the same region.

- *Library enhancement*

There is a need for increasing the efficiency and effectiveness of the Library in order to support serious scholarly research through on-line database, external resources and other means of drawing on the resources of larger libraries.

- *New educational programs*

  In this region of Egypt, there is an increasing demand for credit and non-credit education at an advanced level as a career-long reality. This type of education must be delivered to students with limited time and mobility. PU's technology infrastructure can greatly assist to outreach these efforts. The following figure provides an example of PU's new activity map that consists of black circles that present the high order strategic themes, their corresponding activities in white circles and gray circles are for new activities that have been added to the current strategy.
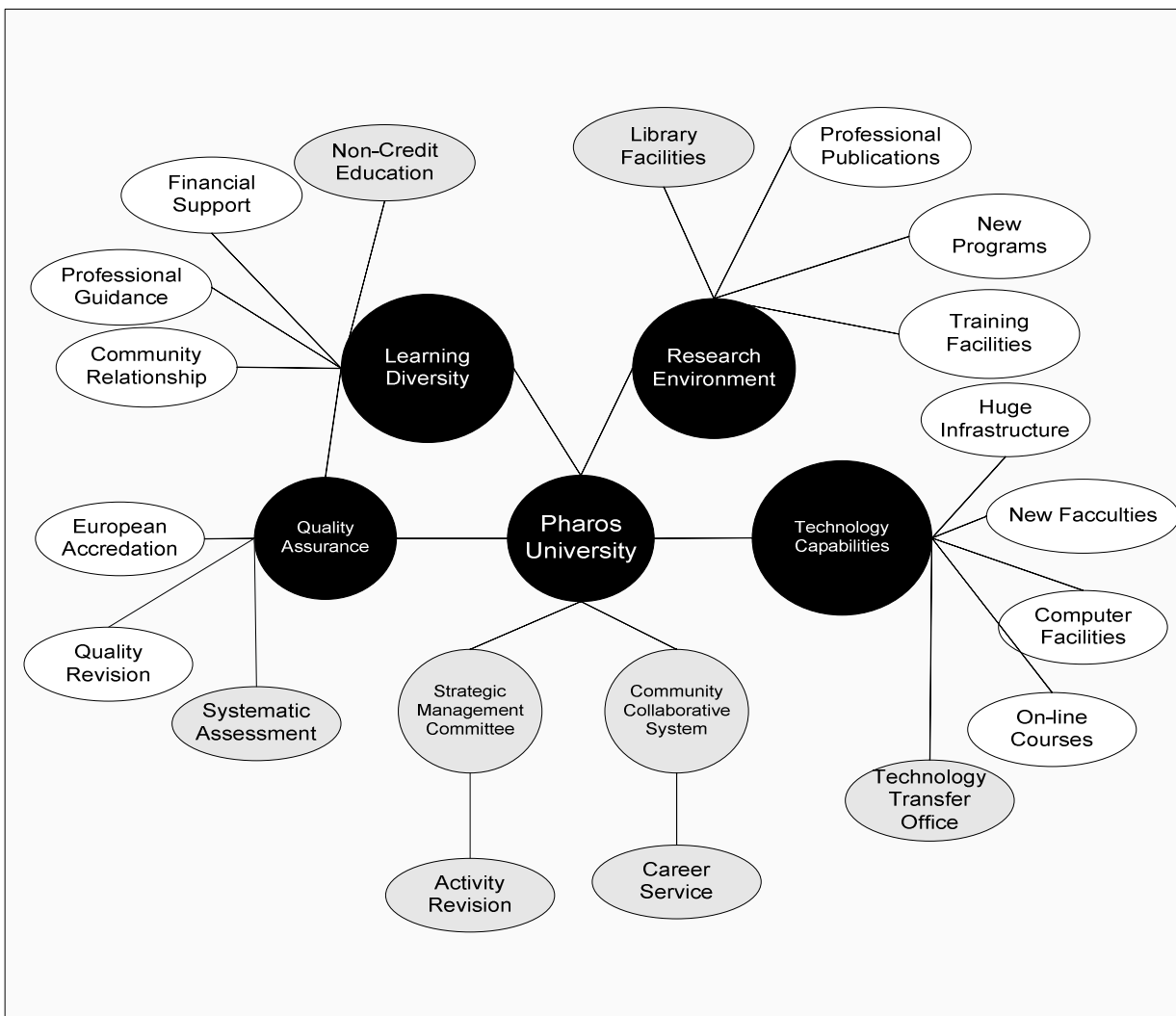

Figure 26: Activity map of PU with recommendations
Source: Author's work

CHAPTER TEN
THE ESCHER CYCLE- SETTING ALL TOGETHER

"Fine-tuning and explain source of self-reinforcing competitive advantage"

In this chapter an explanation of the Escher Cycle will be explained and the sources of self- sustainable competitive advantage will be discussed. This chapter has been prepared based on (Jackson, 2004). This dissertation started with a practical question:" *How can a university build an OI strategy to create a self-sustainable competitive advantage?"*- The answer is that a university can create a self-sustainable competitive advantage by adapting OI activities (e.g. building a Technology transfer office, choosing OI strategy path, building a generous environment, and building an entrepreneurial culture etc.) that can differentiate university's activities from its competitors. Balancing and aligning these core functions will advance the commercialization of university's technologies and enhance the performance of the university as a whole. This balance needs to be maintained and updated overtime.

Each activity introduces the opportunity for a university to do its main functions (teaching, research and regional development) better than its rivals. So, each activity offers the opportunity to create competitive advantage. When large numbers of public/private universities, and for-profit organizations come together to form a competitive market, each institute needs to become good at the activities that give it the best fit with its particular part of that environment/market. This clarifies what is called OI strategy. All of these so far have provided a simpler explanation for a university's ecosystems and about the dynamics that naturally arise between them. It has shown that all successful universities have to be excellent in three activities: teaching, research and regional development. These things require to be done simultaneously, they need to be balanced, they need to be updated overtime, and they need to be fine-tuned and adapted to match the target market where the university is operating.

This chapter shows how a university can connect and integrate its designed strategy with its ecosystems and networks. Enhancing university's key activities to improve the natural flows of innovation will allow a university to accelerate its own evolution and create self-reinforcing competitive advantage. The way to understand this mechanism is to recognize forces that act upon a successful university as it tries to expand into other parts of the ecosystem.

10.1. Understanding the Alternatives

In order to understand what it takes for a university to expand and diversify, there is a need to recognize what its alternatives are. The author thinks of a strategy as a wheel within other wheels. The first wheel is a strategy that consists of unique activities to

differentiate a university from its competitors. The second wheel is a network of networks. The university's ecosystem includes different organizations (e.g. industry, SMEs, government etc.) that are able to collaborate and cooperate with the university to achieve a self-reinforcing competitive advantage. The third wheel contains the advantages that a university can achieve as a result of applying OI strategy (e.g. competitive advantage, regional development, advanced research, qualified graduates and technology commercialization etc.). The following figure shows this "wheels within wheels" quality:
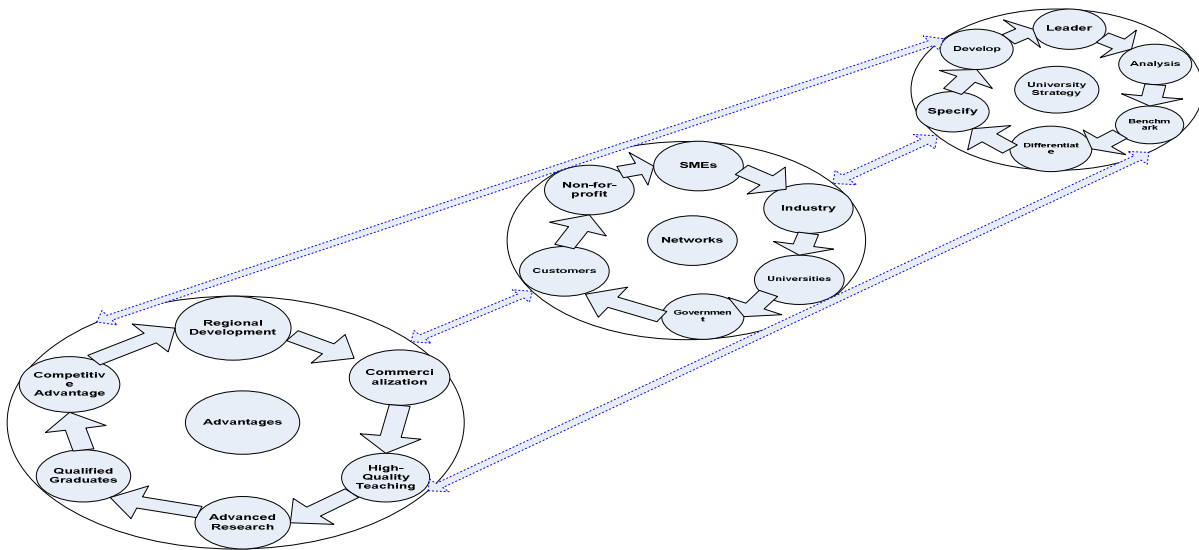

Figure 27: Wheels within Wheels to create self-reinforcing competitive advantage
Source: Author's Work

In this way, the market is a hologram of itself: every university is a part of the larger ecosystem processes and so contains information about the larger process into which it fits. The specifications of different university's activities depend on the part of the market to which it will serve. This way of thinking helps a university to expand either horizontally or vertically. This pattern can be repeated over and over again. A university that needs to expand has to think at two levels: first at the level of its strategy cycle located within the university itself; and second in terms of the strategy cycle of the larger ecosystem that it supports.

On the following map, the 'footprint' of each university shows the set of needs that it is competing with rivals to satisfy – anything outside the footprint is the so-called "white space" of needs that the university could expand to provide. The simplest way to grow is by increasing and enhancing the existing services to new customers. For example, a university can increase the number of enrolled students, research outcomes, and startup companies. This would normally be counted as a differentiation, but it does

not change the footprint on the map and is shown as "0" in the following diagram. This makes the footprint deeper, strengthening the university hold on its existing space.

The first way to diversify that changes the footprint is by creating more-or less differentiated version of its services. For instance, a university can prepare new and up-to-date courses for graduates and young managers to advance their capabilities to be ready to face fast changes, unpredictable market and financial crisis. These might be introduced to new customers or to the same ones. Additionally, university managers can consider the potentiality of integrating the employees, students and staff capabilities to the OI strategy to advance and accelerate commercialization processes. These vertical differentiations are shown as "1" on the following diagram. For example, a university can create competition spaces and suggestions system for employees' participation to enrich ideas databank, differentiate university's activities and increase loyalty to the university. Similarly, a university can open new faculties and departments to provide new specialties that are not available in other competitive institute and satisfy customers' needs.

The second way is to expand horizontally. This is shown as "2" in the diagram. Understanding of collaborators' needs will facilitate both forward and backward integration by removing barriers and building trust. For example, SMEs are essential part of the ecosystem and can help a university accelerate its commercialization processes. Collaboration with SMEs can help a university to gain practical experiences that are important for researcher to mitigate the gap between theory and application. At the same time, collaboration with large industrial corporations merits a university to finance its R&D and gain a real competitive advantage. Furthermore, collaboration with governmental agencies allows a university to gain additional financial support and accreditation for scientific publications.

Horizontal differentiation effectively works by understanding more of the internal process of the co-operative partner. Extending this far enough will even take the university into completely different phase of the competitive advantage, shown as "3" in the following diagram. For example, university researchers might work more closely with their partners to understand their larger innovation processes and perhaps design a unique technology for each partner. Additionally, a university can form a team to help implement its recommendations to each partner. In any case, this way of thinking will help a university to broaden its perspectives on what part of the market it is in and that will help it to think out of the box:
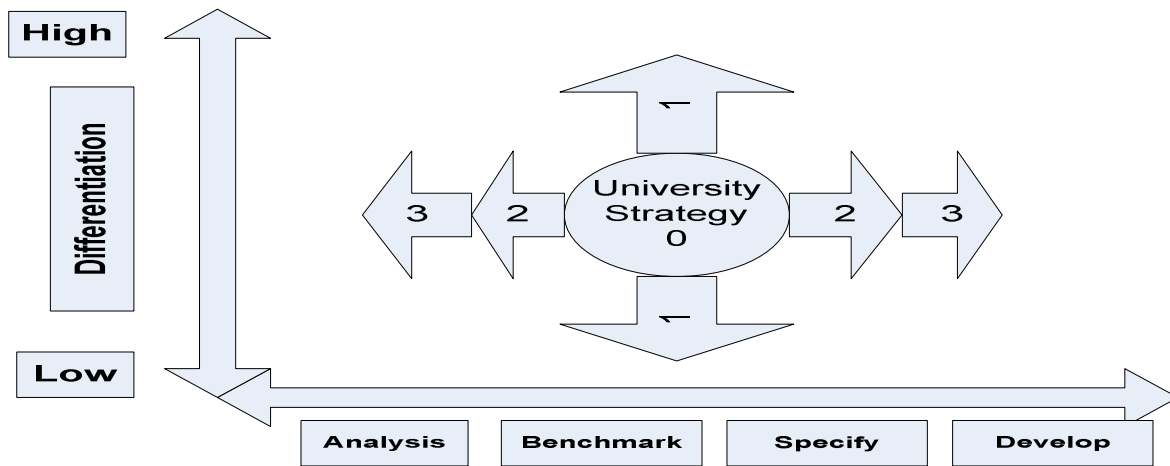
Figure 28: University's Differentiation Alternatives
Source: Author's Work (adapted from Jackson, 2004)

Successful university can effectively carry out three core activities (e.g. teaching, research and regional development). Now, it is clear how an individual university can diversify and we are now going to look at whether it is easier for it to expand in some directions than others. In doing so, it is essential to think in terms of the sources of advantage- not only in the university's market, but also in the larger innovation processes that its services form a part of. This will reveal the natural flows of innovation and improvements that exist within and between ecosystems, which affect which directions are easier for a university to expand in, and more importantly, affect its ability to improve performance at the core functions or activities that provide strategic business advantages.

10.2. Sources of competitive advantage

As mentioned before, a university has to be excellent in performing three core activities: teaching, research and regional development. The following diagram shows four quadrants.

Figure 29: The Escher Cycle (Self-reinforcing Competitive Advantage)
Source: Author's Work

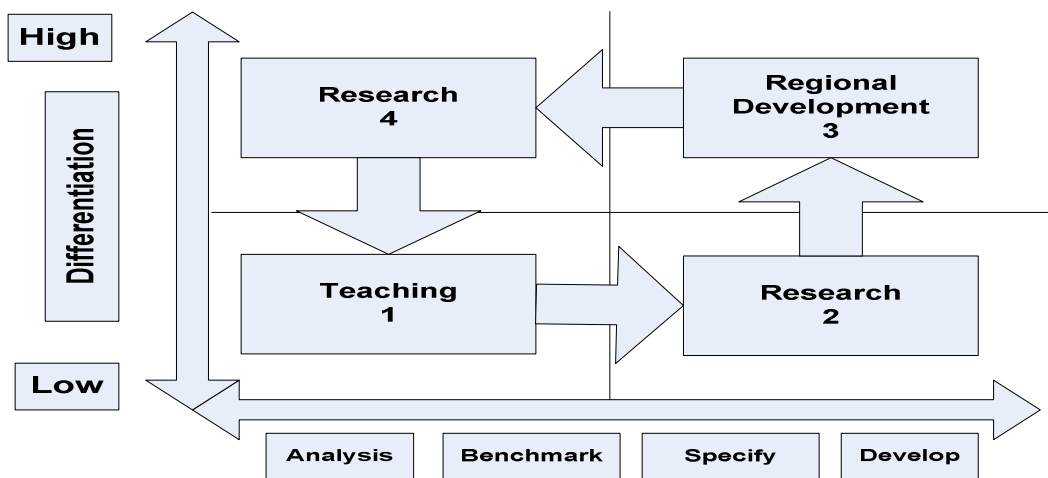   Different skills are needed for a university to be successful in each quadrant. The first quadrant (Lower left quadrant) is teaching. A university has to provide excellent teaching services by utilizing its resources in an optimum way (e.g. Staff, employees, financial funds, infrastructure and students). Effective and efficient teaching will allow a university to gain enough experience to be good at using its resources and satisfying its customers. Analysis of the market's needs and benchmark with competitors to differentiate university's courses and curriculum are essential activities for diversifying teaching activities. Gaining practical experiences in teaching services will merit a university to decrease the cost of these services and create the first source of competitive advantage (teaching diversity with low cost).

   Then, a university can move to the second quadrant (Lower - right quadrant)-research. Being successful in the (lower-left quadrant)-teaching, helps a university to do a better job in the research quadrant. That means -a university that decides to expand from teaching quadrant to research quadrant has to specify new core activities to advance its research activities and develop innovation processes to differentiate its research outcomes. This university has a competitive advantage over any university that tries to do the opposite because teaching up-to-date courses required by university's customers helps building a concrete platform and knowledge for research activities. This knowledge can be used to customize and differentiate research activities and to make this move –from teaching to research- to be done smoothly. The experience gained from teaching large numbers of students in multidisciplinary scientific fields can be used to advance research in the same fields.

Simultaneously, a university can move to the third quadrant (Top-Left quadrant) that is called regional development. By enhancing research activities and design a technology that helps in developing surrounding region (e.g. copyrights, licensing, start-ups and commercialization processes) - a university can create the third source of its competitive advantage. In this case, a university can use its gained experience and innovation to achieve a leading-edge at satisfying customer needs, not only using its resources. This time the innovation is in terms of what the customer wants, rather than how to deliver it. At this time, instead of controlling all of the innovation processes by itself, a university can also delegate its IPs to other ecosystems partners, while remaining focused on what it does best. And this quadrant formulates the third source of competitive advantage.

By advancing these core activities (teaching, research and regional development), a university can gain a huge amount of knowledge and experience that allow it to re-analyze and re-understand the market to identify and adjust its strategy according to new changes and requirements. Updating a university strategy is essential to complete the iterative cycle and achieve the Escher cycle or the self-reinforcing competitive advantage. So, a university can move to the fourth quadrant (Top-Right Quadrant) research with more diversified activities to differentiate the university from its competitors.

CHAPTER ELEVEN
CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

This thesis focuses on building a new mechanism that called "OI Strategy" to help the university to build a self-sustainable competitive advantage. It attempts to explore how the university's senior managers can apply this new strategy to advance the technology commercialization processes to achieve the desired market position. The study is guided by a dynamic theoretical framework beside a group of research questions. This final chapter is arranged as the following. First is a brief description of the research findings. Second is the contribution and managerial implications of the thesis are summarized. Third, limitations of the thesis are discussed. This is followed by suggestions for future research.

11.1. Research Findings

The results of examination and analysis showed in the preceding chapter have answered the research questions mentioned in the analysis layer (chapter one-introduction):

Q1: Is the creation of a guideline / protocol to apply OI strategy in the university important to gain a self - sustainable competitive advantage?

Q2: What is OI? And what are alternatives of OI strategies available for the university?

Q3: What is the university's self sustainable competitive advantage?

Q4: What are the success factors/obstacles that support/ hinder applying an OI strategy?

Q5: What is the mechanism for applying the OI strategy at the university?

The main findings of this dissertation are structured and organized around the research objectives placed in the analysis layer - (Coding system is included in Appendix 2).

The first research objective referred to exploring whether OI is applicable to the university. It was found through the respondents of interviewees that OI is an excellent approach that could be flexibly adjusted and applied at the university. Most of respondents emphasized that OI is to open the university boundaries and to allow enlarging the ecosystem. It needs university's managers to support this implementation through changing policies and establishing an entrepreneurial culture. The next part of this objective was to discover the driving forces that create the need for applying OI and the benefits and importance of this OI strategy to the university and other stakeholders. As stated in the analysis layer (introduction), the driving forces could be divided into globalization, power of technology, technology consortium, new business model, importance of knowledge, and new form of business. These changes enforce the university to find new sources for commercializing its technology and new paths for marketing its findings. Additionally, the advantages of applying OI at the university

have been presented in the *understanding layer* (Chapter-four). They can be summarized and categorized as follows: Gaining competitive advantage, gathering practical experiences, enhancing R&D processes; commercialization of university technology, development of regional economic and enriching a university IP bank OI is based on exchange utilities between the university and other ecosystem components. Networking all partners, creating business opportunities and jobs, licensing and creating start-up companies to support entrepreneurs in the region are highly essential advantages.

The second research goal was to provide a new dynamic framework for OI and to identify the OI tools and techniques that the university can apply. The author provided in the *understanding layer* (Chapter four) a dynamic OI framework that transfers the OI approach from its static situation into a more dynamic and iterative model. This model changes the concept of OI by combining dynamic tools for generating ideas, enhancing the innovation processes, finding new paths to the market and others for receiving a dynamic feedback. Besides this, the author identifies four functions for the university knowledge transfer: knowledge dissemination, creation, association and agreements. Each function has its specific tools (e.g. licensing, start-up, corporate venture, and selling IPs).

The third research goal was to define and investigate the source of competitive advantage in an integrative approach and then define the way that the university can move from competitive advantage to a self-sustainable competitive advantage. In the *Understanding layer* (chapter four), In order to answer this question, the author considered a university as a living organism, and provided some suggestions in how to transfer a university into a living organism. Then, the author suggested a new business model that is compatible with the OI strategy for commercialization of a university research. Finally, the author provided an explanation of the competitive advantage and introduced some suggestions to university's senior managers to create self-sustainable competitive advantage.

The fourth research goal was to identify the barriers/success factors that can hinder/support the application of OI in the university. It was shown in chapter five through the interviews that there are three categories of the barriers that prevent or diminish the implementation of the new approach (e.g. internal, external and mix). Interviewees identify in details problems for each category. For example, external barriers contain problems such as: business model, strategy and management, reward system and contracting. Internal barriers include partners, networking and regulations. Finally, mixed barriers contain culture differences, IP management, OI concept, people and trust. On the other hand, the interviews identify many success factors that can support the implementation of the new model. These success factors can be divided

into three main types (e.g. research infrastructure, research planning and development and connecting the ecosystem).

The final goal was to identify an OI strategy to allow a university to achieve a self-sustainable competitive advantage. The proposed mechanism suggests six main phases (e.g. leadership, analyze, benchmark, differentiate specify and develop) to apply the new model. According to the interviews' findings, a university's OI strategy to achieve a self-sustainable competitive advantage consists of seven components (e.g. leadership, TTO, OI tools and path, accumulating resources, entrepreneurial culture, connecting ecosystem and perfecting innovation processes). Additionally, this strategy is a circumstances based-view. This means that it has to consider the differences between each university regarding resources, structure, shared values, skills, styles and staff. This strategy is based on the concept "plug and play" which means it is applicable for any university with some modifications and adjustments. This strategy has been evaluated by interviewees "pioneers in OI" such as: professors, professional, experts, technology transfer office managers). The response was highly positive. It is important to mention that some suggestions have been provided to enhance the design of the strategy. One of the suggestions is that in developing countries, governmental support is highly important for the guarantee of the success of the new strategy. Another one is to provide more autonomy for the university staff in choosing their research field which will allow more advancement of the developed technologies. Third was to prepare a reward system for researchers as a motive for increasing their efforts. Additional suggestion was to establish a marketing strategy that allows the smooth commercialization of developed technology.

To sum up, the above discussion, this dissertation aims at creating a new mechanism for the university to facilitate the commercialization of its technology and to build an entrepreneurial culture that supports the differentiation of the university. This thesis views the university as a living organism that has to be linked and connected with its ecosystem components. The university has to replace its short-term competitive advantage with long-term self-sustainable competitive advantage that is based on dynamic capabilities and skills. Finding new resources and partners are highly valuable to open the boundaries of the university.

11.2. Contribution to Science

The goal of this dissertation is to bring OI strategy research a step further. This is achieved by the following major and minor contributions:
   a. To provide a mechanism to gain a competitive advantage that allows universities to differentiate themselves through applied OI strategy
   b. To introduce a good definition of university competitive advantage.
   c. To identify the major changes required for applying OI strategy.

d. To specify the major success factors that support applying OI strategy.

11.3. Contribution to Practice and Education

a. Some parts of the doctoral thesis include several empirical research projects that will bring practical advices to university participant about applying OI strategy serving as consulting projects.

b. It will raise the awareness about the current opportunity of using the principles developed in the study for the successful implementation of the innovation strategy model.

c. It will be possible to use the materials, conclusions and suggestions of the research project to improve Higher Educational Institutions, their innovative activities and participation in OI paradigm

d. It will emphasize the importance of many scientific concepts such as: Innovation, OI, Knowledge Economy, Entrepreneurial University and Strategic Management.

11.4. Limitations and future research

There are few limitations in this study and suggestions for future research. The first limitation is related to the statistical generalizabilty of the research. In multiple-case studies, it is possible to improve reliability and validity. However, generalization to population is unlikely. Further research that replicates this study could increase the confidence of the results obtained by this dissertation. In addition, the case universities are few and there is a need for additional studies with larger number of universities. Nevertheless, based on practical data obtained by interviewees, this study is able to describe and explain the steps to design a dynamic strategy for the university.

The second limitation is the risk of demonstration bias. The main data was collected by interviews, which largely depended on the retrospective recollection of the participants. Demonstration bias is possible because some professors and managers try to legitimate causes of university success or failure through reconstruction and interpretation of the past discussion and actions. Using documentary data and interviews from multiple sources helped to reduce retrospective bias. The longitudinal approach should be considered in the future research.

This doctoral work will give a lot of basis for further research. There is a need for measuring the effect of implementing OI strategy at a university. Therefore, a longitudinal study is required to measure these effects. Additionally, a university's knowledge transfer function has many tools. Each one has specific steps, advantages, and disadvantages. There is a need to study each method and to analyze its characteristics, requirements and effects. Furthermore, the human side of OI needs more clarification and investigation such as: characteristics of OI leaders, the role of leaders in OI and team building and motivation.

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APPENDICES

Appendix 1: Interviews' questions

a) Importance of Open Innovation and its compatibility with the university

1. Could Open Innovation Strategy be implemented in the university? Why?
2. Are there any important reasons for universities to have a competitive advantage? Why?
3. What are the characteristics of the university that able to apply open innovation strategy?
4. What are the benefits/side effects, for university to apply OI strategy?
5. What are the ways in which this strategy could be implemented?
6. What are the most dangerous obstacles that could hinder applying Open Innovation strategy- (Governmental- economical – Cultural - social or financial)
7. What are the major changes that are required for applying this strategy (Structure, Culture, or Human resources)
8. What is the role of local government for applying OI strategy? What kind of support should local government introduce to the university?
9. Do you think the suggested strategy is an effective tool to create a self-sustainable competitive advantage? Explain for each component?
10. Any other comments?
11. Your suggestions

b) Open Innovation Barriers and success factors

1. What is your understanding of the term open innovation?
2. What has been your experience of open innovation in the past?
3. Who have you worked with – other public sector/private sector?
4. What models worked for your organization? (Technology Transfer Office- Licensing- Start-up companies- Consultancy)
5. What are the most important reasons for success?
6. What have been the barriers to success?
7. Biggest Complaints/Barriers from both sides?
8. Suggestions to break down those barriers?
9. What incentives/penalties would help?
10. What would be the biggest area of support that could be provided to assist in creating open innovation?
11. What could help open innovation models to be more effective?

c) Technology Transfer Office Managers Interview

1. When was the origin of the center and its progress during last year?
2. What are the components of your Ecosystem?

3. Open innovation is a strategy and there are some tools such as: Networking, Collaboration, Entrepreneurship, IP Management, and External R&D, Which of these tools do you use and how?
4. Did you face any culture, financial, governmental barriers and how you mitigate them?
5. What are the external paths do you use for marketing university research?
6. What are the external paths do you use for enriching university research? Such as: contests, customers and users involvement and user toolkit?
7. Do you use intermediaries for marketing your research? Why?
8. Did you have a chance to read the suggested strategy? Please comment each component?

Appendix 2: Barriers, Success factors, tools and techniques, Strategy Components coding list

Level one	Level two	Level three	Code
Barriers to Open Innovation	Intellectual Property	Generation	BAR-IP-GEN
		Management	BAR-IP-MANG
		Evaluation	BAR-IP-EVA
		Marketing	BAR-IP-MAR
		Publication	BAR-IP-PUB
		Intermediaries	BAR-IP-INTERM
	Culture differences	Orientation	BAR-CD-OR
		Mission	BAR-CD-MIS
		Time	BAR-CD-TIME
		Language	BAR-CD-LANG
	Defining the problem	Goal	BAR-DF-G
		Conflict in interests	BAR-DF-CI
		Personal Relationship	BAR-DF-PR
	Finding the Right Partner	University Bureaucracy	BAR-FRP-UB
		Collaboration Incentives	BAR-FRP-CI
		Lack of Acceptance of Results	BAR-FRP-LAR
		Size of the Network	BAR-FRP-SN
		Decision Maker	BAR-FRP-DM
		Online Partnering	BAR-FRP-OP
	Trust	Internal	BAR-T-I
		External	BAR-T-E
		Individuals	BAR-T-I
		Processes	BAR-T-P
		Key Persons	BAR-T-KP
Open Innovation Tools and	Networking	Social	OPITT-N-SN
		User Participation	OPITT-N-F

Techniques		Customer Involvement	OPITT-N-I
	Collaboration	Formal	OPITT-C-F
		Informal	OPITT-C-I
	University Entrepreneurship	Corporate Ventures	OPITT-UE-CV
		Entrepreneurship	OPITT-UE-E
		Spinning-off	OPITT-UE-S
	IP Management	Patents	OPITT-IPM-P
		Trademarks	OPITT-IPM-T
		Copyright	OPITT-IPM-C
	Research & Development	Internal	OPITT-RD-I
		External	OPITT-RD-E
		Absorptive Capacity	OPITT-RD-AC

Success Factors and Enablers	University Inside-Capacities	Business Model	SFE-UIC-BM
		Information and Knowledge Management	SFE-UIC-IKM
		Preparing a Technology Road-map	SFE-UIC-PTR
		Absorptive Capacity	SFE-UIC-AC
		Ambidexterity	SFE-UIC-A
		Marketing Strategy	SFE-UIC-MS
	Applied Research Progress	Financial Incentives	SFE-ARP-FI
		Results Management	SFE-ARP-RM
		Standards	SFE-ARP-S
		User Innovation	SFE-ARP-UI
		Customer Relationships	SFE-ARP-CR
	Connecting Components of Ecosystem	Innovative People	SFE-CCE-IP
		Partners Interaction	SFE-CCE-PI
		Harmonization of plans	SFE-CCE-HP
		IP Marketing System	SEF-CCE-IPMS
		Intermediaries	SEF-CCE-I

Level one	Level two	Level three	Code
Strategy Components	An Excellent Leadership	Vision	Str-L-V
		Action	Str-L-A
	Technology Transfer Office	IP Management	Str-TTO-IPM
		IP Evaluation	Str-TTO-IPE
		Negotiation	Str-TTO-N
	Open Innovation Path	Centralized	Str-OIP-C
		Decentralized	Str- OIP-D
	Required Resources	Generous Environment	Str-R-GE
		Critical Mass	Str-R-CM

		Market-orientation	Str-EC-M
	Entrepreneurial Culture	Potential Resources	Str-EC-PR
		Understand OI	Str-EC-U
		Training	Str-EC-T
	Linking University Ecosystem	Connectors	Str-LUE-C
		Student Participation	Str-LUE-SP
	Innovation Processes	Hiring Professional	Str-LUE-HP
		Measurement	Str-LUE-M

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University's Open Innovation Strategy:
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pro vytvoření samo-udržitelné konkurenční výhody

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