

## Key Success Factors of Entrepreneurial Engineering School

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**Abstract:** The aim of our research is to highlight the determinants of **entrepreneurial engineering** school's success. Therefore, we will refer to previous literature dealing with entrepreneurial university and we will carry out our empirical research in an engineering school. As it is an exploratory study, it was decided to opt for a qualitative approach. We conducted 18 interviews with engineers that are professors and members of laboratories within national engineering school of Morocco. Our findings indicate that entrepreneurial culture is a major determinant of entrepreneurial university's success since it determines the students' predisposition to undertake entrepreneurial activities. Also, funding is considered by engineers as key success factor of entrepreneurial universities. It emerges that inventors are not risk taking. Even if they have financial resources, they rely on governmental funding to found their own enterprises. Moreover, our results emphasized the role of legislation in protecting intellectual property which prevent imitation and encourage researchers to commercialize their inventions. Our findings also indicate that entrepreneurial university's success depends on the access to information and the communication between university and industry. Finally, our results emphasize that interfaces such as incubators and technology transfer offices

encourage universities to undertake entrepreneurial activities by incubating and developing inventions.

**Keywords** University business model, entrepreneurial university, key success factors

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### 1. Introduction

In addition to the traditional mission of teaching and research activity, universities are pursuing interaction by transferring knowledge to industry [1]. This integration between researchers and business units led to the term "entrepreneurial university" [2]. This novel concept is based on the alignment between the missions of teaching, research and technology transfer [3]. Nowadays, the role of entrepreneurial universities is not simply generating knowledge, but also disseminating it to industry and society. Thus, university has expanded its role from its original mission of preservation and dissemination of knowledge, to producing new knowledge and recently to putting knowledge to use [4]. In particular, entrepreneurial university is a response to generate knowledge based startups. Indeed, entrepreneurial university provides a culture and appropriate

atmosphere for encouraging academics to disseminate their inventions through traditional channels as well as through activities that are more entrepreneurial in nature. Universities are undergoing this cultural shift in order to enhance regional development and to play a significant role in founding a knowledge-based society. Many prior studies focused on the contribution of entrepreneurial university in economic growth. However, little is still known about the determining factors of universities' entrepreneurial orientation [5].

Kalar and Antoncic [1] note that many countries are taking different measures to encourage entrepreneurial universities. Thus, we believe that examining the determinants of entrepreneurial orientation is crucial to transform traditional research university to entrepreneurial university that contributes to economic development. Therefore, we will try to identify the factors that encourage universities to undertake entrepreneurial activities. We will try throughout this research to answer our research question: What are the key success factors of entrepreneurial engineering schools ?

To have a fair answer of our research question, we will study literature dealing with the evolving university business model and we will conduct an empirical research to assess the entrepreneurial university's key success factors in general.

## 2. Materials and Methods

Miller and al. [6] suggest a perspective of university-industry technology transfer stakeholders and they presented the changing university business model.

First of all, they studied the traditional university business model which is implicit in nature. Its missions were teaching, research and dissemination of knowledge into society. "Universities also contributed indirectly to technology transfer by providing highly educated and qualified personnel to the industry" [6]. In this phase, enterprise is the key actor of the technology transfer process. Then, from the 1960s, the relationship between higher education and industry was emphasized. In this phase, government was funding both universities and businesses. Therefore, government was orchestrating the content and the structure

of the university business model. Later, legislations dealing with intellectual property like (The Bayh-Dole Act) enhanced collaborative relationships between academia, government and industry within a triple helix model [7]. The triple helix configuration reflects the change in the governance of the university business model whereby universities play a more prominent role in transferring technology [6]. In the same vein, Philpott and al. [3] consider the technology transfer as the third academic mission of universities after teaching and research. This third mission does not weaken the traditional missions. It rather improves the university's capabilities and ensures the synergetic relationships with government and businesses. The alignment between the missions of teaching, research and technology transfer (or economic development) is indispensable to build an entrepreneurial university [3].

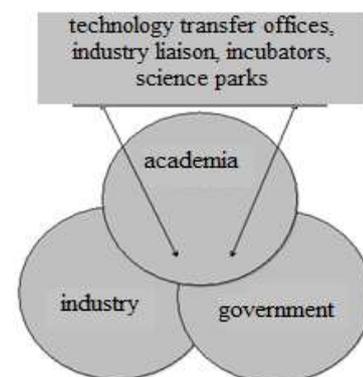


Figure 1. The Triple Helix model

Source: Adapted from Etzkowitz and Leydesdorff [7] by Miller and al. [6]

According to Salamzadeh and al. [8], The 'Triple Helix' phenomenon (Figure 1) reflects the universities' contribution in innovative and entrepreneurial activities of their regions. This concept connotes the relationship between university-industry-government and the interaction between these institutions trying to promote the innovation cycle. In fact, the triple helix model highlights the novel concept of "entrepreneurial university". The role of entrepreneurial universities is "to create new businesses, ventures and commercialization where it previously did not exist, or at least to increase the amount of technology transfer from the

university to private and not-profit firms and organizations” [9].

Consequently, an entrepreneurial university is a promoter of multiple support measures for entrepreneurship as well as a developer of administrative techniques, strategies or competitive postures [10].

Philpott and al. [3] define entrepreneurial university as “a university that embraces its role within the triple helix model and adopts the mission of contributing to regional/national development is referred to as an ‘entrepreneurial university’”. Furthermore Etzkowitz and al. [7] consider the entrepreneurial university as “any university that undertakes entrepreneurial activities with the objective of improving regional or national economic performance as well as the university’s financial advantage and that of its faculty”. Guerrero & Urbano [11] add that “entrepreneurial universities play an important role as both knowledge-producer and a disseminating institution”. Thus, on one hand, entrepreneurial university provides a workforce and value added by creating and transforming knowledge. On the other hand, it improves the attitudes and the individual’s values towards these issues.

Many researchers such as Kalar and Antoncic [1] and Todorovic and al. [5] consider entrepreneurial orientation as a key success factor of university-industry technology transfer. Therefore, Kalar and Antoncic [1] carried out a cross cultural study in four European universities (University of Amsterdam, University of Antwerp, University of Ljubljana and the University of Oxford) to assess the determinants of entrepreneurial universities. He used the model of Todorovic and al. [5] (see Figure 2). His results revealed that disciplines may determine the entrepreneurial orientation of a university.

In our study, we will try to assess some determining factors of entrepreneurial universities in developing countries.

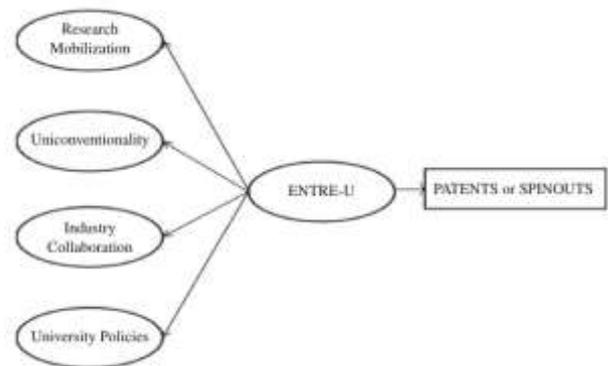


Figure 2. Structural model of Todorovic and al. [5]

To answer our research question, we opted for a qualitative research. First, it allows focusing on uncovering deeper phenomenon in individuals, teams, and organizations [12]. Second, it facilitates the representation of peoples’ views and perspectives [13]. We carried out an exploratory study to assess the viewpoints of Moroccan professors within an engineering school. 18 semi-structured face to face interviews were conducted with academic researchers.

We determined a sample size ensuring sufficient credibility for qualitative research and a satisfactory internal validity. According to Yin [14], two different principles determine the sample size: Replication and saturation. In this research, the sample size was determined on the basis of theoretical saturation. As suggested by Royer and Zarlowski [15], "it is up to the researcher to estimate if it has reached the point of saturation. Typically data collection stops when the last observation units analyzed did not provide any new element".

The interviews were recorded and transcribed. We opted for a manual coding that allowed us to structure the interviews and to analyze the content [16]. We chose not to use a computer software program because the volume of our data seemed to us compatible with manual treatment. Also, we wanted to analyze in depth our interviews’ data through multiple readings and proofreading of our transcripts. Then crossing data and triangulation that involves different data sources [17] allowed us to confirm the results [18]. Thus, internal validity has been ensured.

In fact, the literature review allowed us only to orientate the research and to collect data without structuring it. However,

the data of this research is both rich and heterogeneous. Therefore, we tried following Dumez [19], to "organize and reorganize" it in order to precise the results of our research.

In the next section, we describe the results obtained by assessing the determinants of entrepreneurial university in academics' point of view.

### 3. Results and discussion

Only one of our respondents is undertaking entrepreneurial activities, which reflects a low level of entrepreneurship among Moroccan academics. However, four of our interviewees tried to undertake entrepreneurial activities but they were inhibited by several barriers such as the high patenting costs, the lack of coaching and incubating, the lack of funding and the intellectual property issues.

Indeed, we asked our eighteen interviewees to suggest some drivers that may facilitate entrepreneurship. Their responses revealed different factors that may enhance the success of entrepreneurial university, namely, entrepreneurial culture, funding, legislation, access to information, communication with business units and interfaces between university and industry.

In fact, the interviewees consider the entrepreneurial culture as an important key success factor of universities' entrepreneurial activities. Correspondingly, Van Burg et al. [20] recommend that "universities shape a university culture that reinforces academic entrepreneurship by creating norms and exemplars that motivate entrepreneurial behavior" [5]. Indeed, one of our respondents indicated that influential professors are a key element to enhance entrepreneurship through a supportive environment since they play a critical role in developing entrepreneurial culture among students. Likewise, an IT engineer indicates that engineering school should provide a constructive learning that enhances and incubates students' projects. One of our respondents suggested that entrepreneurial culture should be developed among teenagers in high schools in order to enhance future students' creativity and ambitions. Also, a professor indicated that a key element of entrepreneurial university's establishment is to highlight the success of entrepreneurs

developed in entrepreneurial culture and to present them as idols to encourage the future developing entrepreneurs. Likewise, Korca and Spilling [21] emphasized some key aspects of education for entrepreneurship, namely,

- "Entrepreneurship in primary and secondary school;
- Training of teachers on the subject of entrepreneurship;
- Cooperation between schools/universities and businesses aimed at the promotion of entrepreneurship;
- Entrepreneurship chairs and activities at university level"

Our interviewees also consider funding as a critical driver of entrepreneurial universities. They suggest investigating in students by creating entrepreneurship clubs or running start-up workshops on campus. The interviewees also emphasize the importance of promoting university-industry relationships that involves paid student entrepreneurship interns in order to carry out fruitful entrepreneurship researches. Moreover, they highlight the importance of resource allocation and government funding in encouraging entrepreneurial university and they consider economic recession as a barrier to academics' entrepreneurial activities. A respondent add that private sector funding also encourage universities to undertake entrepreneurial activities.

Furthermore, our interviewees emphasized the role of legislation in promoting entrepreneurial activities. For instance, they indicate that patents protecting intellectual property encourage scientists to venture out. One of our respondents notes that intellectual property protection determines the inventor's decision to undertake entrepreneurial activities. He notes that preventing imitation may encourage academics to spin-off their inventions. Moreover, our interviewees highlight the role of information in facilitating entrepreneurship, specifically, information on business features, information on governmental strategies encouraging entrepreneurship and information on procedures of spin-offs foundation. Also, respondents mention the importance of communication with enterprises in order to understand the business's expectations, the market's conditions and the strategies of rivals.

Additionally, technology transfer offices have been found to play a critical role in establishing entrepreneurial universities. A professor indicates that TTO contributes to the patenting activities as well as the creation of spin-offs and start-ups. Incubators were also considered by the engineers as a determinant of entrepreneurial universities since they promote the commercialization of new inventions and the establishment of entrepreneurial universities. Indeed, a respondent highlights the increasing efforts to incubate academic entrepreneurial projects in Morocco. She mentions the foundation of a Moroccan association named "Research and Development Morocco" which is established in Casablanca and specialized in funding and enhancing patenting activities.

#### 4. Conclusion

The objective of our research was to bridge the gap between engineers' academic research and industry. We believe that entrepreneurial university reflects the close links between science and business. Therefore, we tried throughout our research to answer our research question: what are the key success factors of entrepreneurial universities?

We studied literature dealing with entrepreneurial universities. Then, we opted for in depth interviews as the data collection tool. We conducted 18 interviews with professors, members of laboratories within national engineering school of Tetouan.

Our findings indicate that entrepreneurial culture is a key success factor of entrepreneurial engineering schools since it determines the students' entrepreneurial intentions. Funding is also considered by our interviewees as a determining factor of entrepreneurial universities in general. The respondents note that inventors do not rely on their own financial resources to commercialize their new technologies because it is too risky. Therefore, entrepreneurial activities in Morocco depend on governmental funding. Moreover, our findings highlighted the important role of legislation in protecting intellectual property. Moroccan Legislation prevents imitation and encourages researchers to found their own enterprises. Our findings also indicate that the access to information and the communication between academic

research and industry determines engineering schools' success. Finally, our results indicate that incubators and technology transfer offices enhance universities' entrepreneurial orientation.

To conclude, entrepreneurial engineering schools in Morocco would be encouraged by entrepreneurial culture, funding, legislation, interfaces such as incubators and technology transfer offices, access to information and communication between university and industry.

The findings of this study should be considered to have limitations, such as, the limited number of respondents and the focusing on only one country. Also, the limited number of questions may be another limit of this study. Therefore, our research may be considered as a first step towards other researches. A fruitful line of future research would be to conduct a cross-cultural generalization of our findings.

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