The Cross-cultural impacts on technology entrepreneurship: a comparative case study between France and Tunisia: toward a technology park development transfer index

by

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INTRODUCTION:

The change in economic and managerial directions in recent years has led into questions about the context of entrepreneurship on the light of the radical change in the global economy and the development of science and technology. These have opened up new opportunities and restated the principles of prosperity based on a new vision of a global economy. Porter (1990, 1998a, 1998b) made famous the global competition strategy (i.e. *the competitive advantage of nations*) by recognizing that clustering strategy lead to gain a competitive advantage in a globalized economy. The transition from macro to micro level, induced by technological advances, resulted in a revised competitive strategy with a global scope (Porter and Stern, 1999). Competition is now based on the concept of global city regions (Scott, 2001). Economic opportunities associated with technology parks has become global because of the high added value provided by the ICT industry. Several authors suggested criteria's by which an area creates attractive environment for technology entrepreneurs, (Saxenian & al 2001; Florida, 2002a, 2002b; Kenney and Vburg, 1999). These ICT incubator areas reflect and focus on human skills (Venkataraman, 2004; Bernhard, 2007). Based in the fact that innovation location and technology entrepreneurship process are interlinked to talents and competencies then location of the technology parks can impact their success (Steve, 2007; Saxenian & al, 2001; Srinivas and Scott, 2002; Athreye, 2002, Francis & al, 2003; Aavari & al, 2004).

A new phenomenon has emerged from the outsourcing activities related to technology parks which is the ICT job shifts. Decades ago, jobs[1] are being outsourced from developed countries to developing ones in the basis of costs savings and efficiency. Now, ICT jobs are being shifted on the basis of (1) talents and competencies, (2) location attractiveness and (3) economic efficiency. According to Forrester research Inc., by 2015, at least 3.3 million white-collar jobs and $136 billion in wages will shift from the U.S. to low-cost countries. It is important to see the impact of this phenomenon, the ICT job shifts worldwide and particularly on developing countries. Multinational companies used to favor countries where economies of scale can be achieved. However, their preference criterion has grown to include the presence of managerial and technical skills aside from the financial gains brought by lower labor costs (Francis & al, 2003; Andersen and Christensen, 2005; Steve, 2007). This allows them to establish direct

[1] http://www.businessweek.com/magazine/content/03_05/b3818001.htm

links with the talents with which synergies (social, cultural) can develop innovation (Chesbrough & al, 2006; Rowen and Toyoda (2002). For instance Silicon Valley contributed to 13.1% in the US GDP with only 5.9% of technology jobs.

In this paper we aim to identify how cross cultural factors are impacting the technology entrepreneurship transfer within technology parks on the basis of ICT job shifts. In the literature review we will focus on technology entrepreneurship process and its transformation with the ICT job shifts and cross-cultural impacts into a competitive strategy tool for technology park's decision makers.

1. THE LITERATURE REVIEW :

In this literature review we seek to make a collection of analysis and approach, related to the technology entrepreneurship and how the cross cultural effects impact the technology development transfer. The limited evidence we have through literature review about developing countries led us to investigate on this issue. Technology based entrepreneurship faces several obstacles in the cultural and societal contexts. Various countries developed their own models for economic development based on investments in technology and science. Although some countries have achieved some degree of success, others migrate from one failure to another (Kenney and Von Burg, 1999). As technology parks are an institutional tool to combine strategy and resources for which some of developing countries are considering it as a key to technology transfer success. There are several cases of technological parks in the world. The most famous is, of course, Silicon Valley in the United States. Other parks in the world followed this pattern. These include the Silicon Wadi in Israel, Bangalore Valley in India, and Hsinchu park in Taiwan (Maguire, 2003; De Fontenay and Caramel, 2002; Srinivas and Scott, 2002). It is very difficult to state about real success or failure of this strategy but reasons behind this must be elucidated. Some research suggested that cross cultural effects are significant factors , others argued that innovation ecosystems that nurture entrepreneurship is somehow unique to developed nations (Schramm and al, 2008).

1.1. THE ROLE OF TECHNOLOGY ENTREPRENEURSHIP IN CREATING COMPETITVE ADVANTAGE:

Technology entrepreneurship has a great impact on developed countries and receives a special interest from developing ones as the technology access and availability spread with digital economy. Many factors are influencing this process, especially, the globalization of mechanism and standards, which, previously were in a specific country or region (Scott, 2001; Florida, 2002a). The linkages between (1) universities, (2) talents and competencies that can bring ideas and products to market and (3) joint venture capital that support financially the entrepreneurial process. The success of developed nations toward this strategy led some developing nations to follow this model. However, to follow this strategy doesn't imply to replicate as it is because what happened in the US won't be the same as it is in China or any developing country. It is well recognized that success or failure of this strategy doesn't depend on

institutional or regulatory decisions that would take place in a specific area rather than creating a special ecosystem in which can emerge with economic development. Sociological and scientific entrepreneurship are keys in the strategy that relies on technology parks to help gain competitive advantage through the development of entrepreneurial activity (Porter, 1990, 1998a, 1998b; Poutsma, 1997, Van der Linde 2003, Schramm & al, 2008; Athreye, 2010).

To implement the clustering strategy developing countries have to take into consideration their social and cultural environment and not only the economic gains (foreign direct investments). One phenomenon that is being emergent in this decade is the shift of technology jobs from developed to developing countries. The rise of white collar jobs or technology jobs and the race for best talents and competencies around the globe by multinational companies (Hulsink and al, 2008) imply for the developing countries a new strategy. This one is not based to attract FDI's but to gain a competitive advantage and to manage this new phenomenon as a key for clustering strategy success. Therefore, considering that implementation strategy don't rely not only institutional factors (Athreye, 2002; 2010) but also societal and cultural ones.

1.2. ENTREPRENEURSHIP AND TECHNOLOGICAL LOCATION OF INNOVATION :

Today's global competition relies on access to two key resources (1) natural resources and (2) human talents. In his study of technology parks, Van der Linde (2003) recommended that the correlation between the location of innovation and entrepreneurial speed remains dominant. Firms no longer have to compete for access to natural resources but need to exploit their ability to be present in a given location (Andersen and Christensen, 2005). The location of innovation is very important which is as important as the intangible asset of knowledge (Rowen and Toyoda, 2002, Andersen and Christensen, 2005; Audia and Rider, 2005). The intangible nature of knowledge can be seen in the basic model of a technology park (Chesbrough et al, 2006). Each location has a set of assets enabling to develop activities that combine innovation, creativity, and entrepreneurship. For example, Hewlett & Packard chose California through the recommendation of their Professor Fred Terman. Their stay on the west coast of the United States earned them several years of success in the global technology sector (Kenney and Vburg, 1999). This demonstrated the importance of territorial choice in gaining scientific and technological advantage. It can be noted that other intangible factors that build competitive advantages include : (1) culture and entrepreneurial risk taking, (2) the anticipation of new needs (the opportunistic approach (Zoltan & al, 2006; Lazear, 2004, Muller & al, 2005), (3) governance, (4) leadership style and the unique qualities of individuals (Preston, 2001), (5) capital and social factors (Granovetter, 1985; 2005; Ruef and al, 2003, Saxenian & al, 2001), and (6) financial and critical mass of talent (Florida, 2002a, 2002b). having all of these factors can be difficult (Porter, 1998b) as one region may have an advantage on one factor and vice versa (Steve, 2007, Bernhard, 2007).

Porter (1998a, 1998b) argued that the global economic map is dominated by the clusters of parks which are geographically concentrated around business linked together in a specific domain (Florida, 2002a).

Technology parks are considered to be at the core of the national innovation (Avvari and al, 2004). To study the relationship between entrepreneurial activity and innovation, the strategic objectives of technology parks must be considered.

1.3. ENTREPRENEURSHIP AND TECHNOLOGY PARKS DEVELOPMENT / TOWARD A STRATEGIC USE OF HUMAN CAPITAL.

Entrepreneurship is a catalyst for innovation and talent (Richtermeyer, 2003; Parnell. 2006) and it is a sensitive area for the various market forces and competition. According to Joseph Schumpeter, the entrepreneur embodies the challenges of innovation and the dynamism to ensure its success. In his own words Schumpeter said, "The entrepreneur is a man whose economic horizons are vast and whose energy is sufficient to disrupt the routine and the propensity to make innovations."In this sense, entrepreneurs are people who have ideas, talent, and the will to take risks for their technical and financial plans Entrepreneurship is considered the path by which individuals, companies, and countries tread for growth, sustainable economic development, and competitive advantage over other nations in the world (Porter, 1990, 1998b; Zahra and Gerard 2002, Kauffman and al, 2008; Eesley and Roberts, 2009; Athreye, 2010).This concept has received attention in recent years with the development of information and communication technologies (ICTs) which have enabled many countries to become producers and exporters in this field. The strategy which stemmed from technology parks (Avvari and al 2004, Francis and al, 2003; Athreye, 2002, 2010) is seen as a tool to take advantage of the high scientific potential in a geographical region as a result of the existence of various institutions such as universities, banks, and multinational companies (Kenney and Von Burg, 1999; Andresen and Christensen, 2005).Aggarwal and Esposito (2001) noted that technological entrepreneurs can make huge benefits. However, there are five criteria by which each entrant in this field must take into consideration: (1) only a spin-off of 6,000 experienced a commercial success, (2) less than 1% of business plans are selected to be funded by agencies JVC (joint venture capital), (3) 60% of companies financed by funding agencies specializing in high-tech advertising fail during their first year of operation, (4) founders hold only 4% of the shares on their projects, and (5) companies that have succeeded have to wait three to five years to make a profit and be recognized on the equity market such as the NASDAQ in the U.S. Therefore clear that entrepreneurship in technology is not a simple matter and whose success is far from easy even for Americans. However, companies can continue to innovate and try to gain or consolidate a place in a market where competition is increasingly fierce (Zahra and Bogner, 2002).

Another concept of the entrepreneur described him as a "person who tries to solve a problem on the market. Entrepreneurs come from both developed and developing countries such as India and China (Chen, 2005) and they have products capable of competing with U.S. and European products. Findings show that these products were the result of an institutional policy aimed at developing ICT activities through technology parks (Saxenian & al, 2001; Athreye, 2010). However, the main challenge for the development of technology parks is in the accumulation of human capital and the knowledge spill over (Thornton and Flynn, 2003).

In this literature review we spotlight on three aspects of technology entrepreneurship evolvements (1) the cross cultural impacts on technology clustering strategy, (2) the role of technology parks in shifting high

skilled/technology jobs and emerging human capital through it, (3) the developed/developing countries technology development transfer and (4) the adaptation of the clustering strategy with the special context of developing countries in order to gain a competitive advantage.

2. THE CONCEPTUAL MODEL :

In the literature review has showed that the general elements composing a technology park include (1) universities, (2) governments and their agencies, (3) financial institutions, (4) managerial skills and techniques, and (5) infrastructure (ICT). Socio-cultural variables which affect creative entrepreneurship include: (1) ethnicity, (2) race, (3) sex, (4) the strength of weak ties and strong among individuals and organizations, and (5) communication. The conceptual model of the globalization of trades has two components: (1) globalization and (2) trades in (ICT). This model is based on socio-cultural factors that influence the movement of trades (ICT) in technology parks. These reflect the organizational considerations of technology and the influence of the context of innovation (Chesbrought et al, 2006; Benbassat et al, 1987).

In the literature review, the following points were highlighted and emphasized:

(1) The government and its agencies represent regulatory factor of entrepreneurial activity. This factor is also concerned with the development of the related infrastructure and institutions (Preston, 2001, Scott and Srinivas, 2002; De Fontenay and Caramel, 2002; Maguire, 2003; Venkatraman, 2004; Athreye, 2010).

(2) The funding mechanisms developed by banks and financial institutions specializing in the field of ICT provide the needed financial support for start-up companies and their innovative projects in ICT (Kenney and Sohn, 2005; Dossani and Kenney, 2005; Saxenian et al, 2001; Fuller, 2006; Steve, 2007).

(3) The ICT infrastructure is an important leverage in the globalization of business. It provided the competitive advantage (Porter, 1990.1998) that led to the success of several regions in the world (Maguire, 2003; Jan and Al, 2005; Andersen and Christensen, 2005; Bonet, 2007; Byers, 2007; Schramm et al, 2008).

(4) Managerial skills and techniques are central elements in this research. These are organizational resources help elevate the role of entrepreneurship by working for a renewal of human resources technological innovations (Saxenian et al, 2001). For example, in Silicon Valley and other technology parks in the world, the technical and managerial skills have contributed to the boom in the ICT industry.

(5) Technology parks have evolved through the academic support of the universities (Florida, 2002a; De Fontenay and Caramel, 2002; Venkatraman, 2004) as was in the case in Austin, Texas, (6) Socio-cultural factors include ethnicity, race, sex, and the strength of weak and strong ties.These factors are embedded with the traditions of business and international relations within firms (Shane, 1993; Tiessen, 1997; Preston, 2001, Hofstede 1980, 2001; & Al Hofstede, 2004, Granovetter 1985, Granovetter, 2005; Kortemann, 2005; Morris, 2005; Byers, 2007). Socio-cultural factors are fundamental in explaining the model of entrepreneurship in technology parks. The globalization of trades in (ICT) and entrepreneurship in the creation of technology parks are directly related to factors such as

race, social class, and ethnicity. Saxenian (2000) and Saxenian et al (2001) demonstrated that relationships between the same ethnic backgrounds allow certain groups to emerge in technology parks particularly where there is rich human potential and market outlook. This aspect has proven its effectiveness in technology parks in Asia (Francis et al, 2003).

(7) Communication and social networks are crucial in the development of entrepreneurial ideas especially in technology. The success of an idea and its transformation into a successful project is dependent on communication of timely information (Granovetter, 1985, 2005). McDonald (2002) also showed that that communication is an asset in the flow of critical information for entrepreneurs in science and technology (Poutsma, 1997).

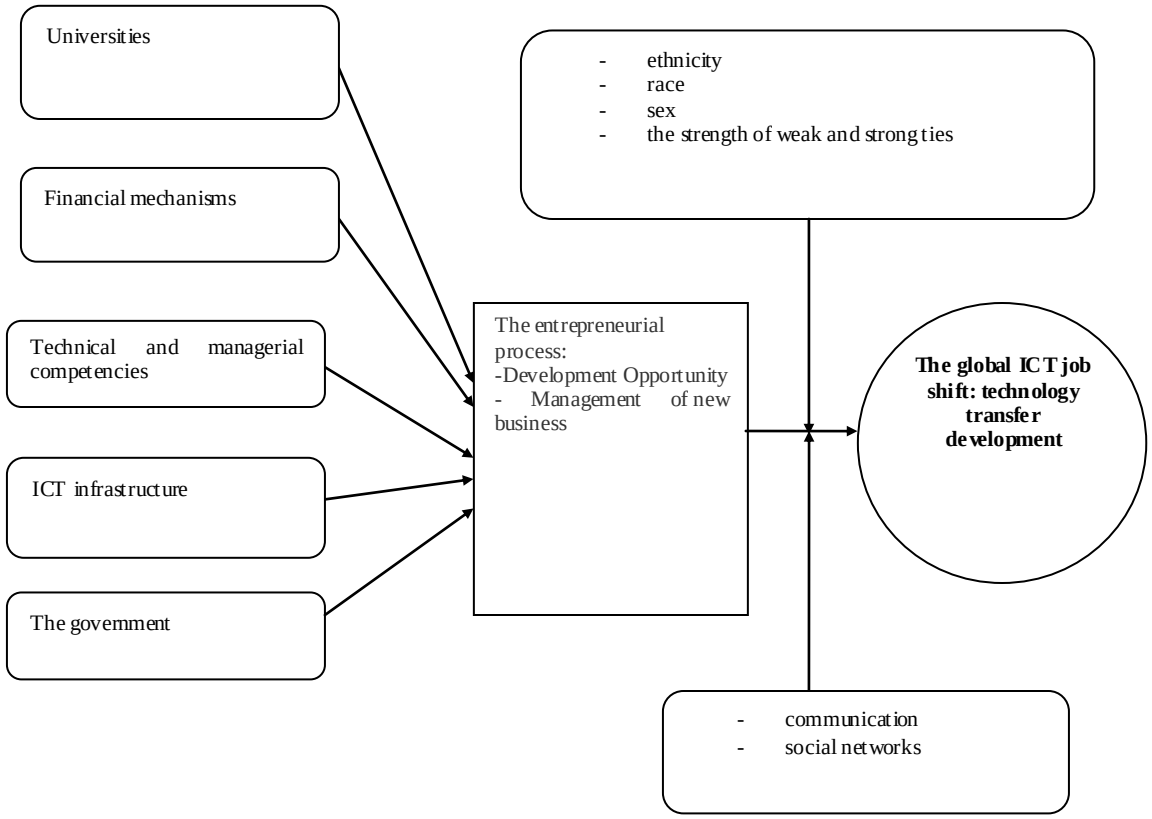

Figure 1.2. The conceptual model for the global ICT job shifts and cross cultural effects on technology entrepreneurship

8) *The ICT job shifts as the core of this conceptual model.*

This model is aimed at establishing a link between cross-cultural variable and the ICT jobs shifts phenomenon. With empirical study, a mathematical model is developed to explain how ICT jobs are shifted from ICT clusters to another and how they contribute to sustain a competitive advantage in the basis of technology entrepreneurship. The model is used to determine Technology Entrepreneurship Park Development Transfer Coefficient, which can be represented as "a", while Cross – Cultural Development Transfer Coefficient, is represented as "b". The mathematical model that describes this relationship can be expressed in form of a power model that can be used to extrapolate and validate the level of technology entrepreneurship park characteristics factor for development (Q) and for management (M) measurements to the defined (given requirement) cross-cultural levels with time "T" in order to estimate the number of skillful and talented persons, designated as "N". The model would therefore have the form:

…

$Yi = a.Y_{i-1}{}^{b}$ …….. (1)

Where, Yi represents the final Technology Entrepreneurship Park Parameters, while Y_{i-1} represents the initial Technology Entrepreneurship Park Parameters. "ai." and "bi." are model parameters to be solved for in terms of park characteristic development and management through regression analysis. Once the model parameters are estimated for each sample "i", a Cross – Cultural Factors (Xi) or in terms of time "T" , can be extrapolated that corresponds to the defined cross-cultural levels, through "a." and "b." in order to estimate the number of skillful and talented persons,"N", and the optimum model parameters. At this point, it is necessary to note that, as "a." and "b." increase or decrease with time and the number of skilled/talented persons, so is the improvement in the development of all the technology entrepreneurship elements and the entire cross-cultural characteristics factor. The optimum model parameters "a.", "b." and computed data, (N, Q, and M) can then be used to set points and levels to plot graphs in subsequent development and management data analysis as well as for the validation of the model and requirements. Q and M represent the levels of technology entrepreneurship park characteristic development and management respectively. When "b" reaches maximum or minimum, the skilled/talented persons (N) of the two cases (El – Gazala in Tunisia and Sophia Antipolis in France) also attain its maximum or minimum values respectively. Also, when "a" gets to maximum or minimum, the levels of technology entrepreneurship and management will reach minimum or maximum values.

3. THE RESEARCH METHODOLOGY :

The research methodology adopted in this research relies on multiple disciplines and diverse research question associated with it. Research in management information systems is related to the advancement of technology but also related to organizations and individuals. Management information systems research focus on (1) nature of the design of information technology and communications or ICT artifacts, (2) the development and use of technology artifacts and (3) context for the emergence of ICT artifacts (Benbasat and Zmud, 2003). This research is concerned with the emergence of technology artifacts in a specific environment. (Palvia and al, 2003; Yin, 1989; 2003)

3.1 DETERMINATION OF TECHNOLOGY ENTREPRENEURSHIP PARK DEVELOPMENT TRANSFER INDEX*:*

The Determination of Technology Entrepreneurship Park Development Transfer Coefficient, "a" will be used as the optimization parameter of the mathematical model selected for this study.

a. Technology Entrepreneurship Park Elements

The Technology Entrepreneurship Park Elements are as follows:

- ICT Infrastructure
- States' Agencies

- Financial Mechanisms
- Universities
- Talents and Human Competencies

b. Technology Entrepreneurship Park Parameters

The Technology Entrepreneurship Park Parameters (Yi) are as follows:

- ICT Infrastructure, Y1
- States' Agencies, Y2
- Financial Mechanisms, Y3
- Universities, Y4
- Talents and Human Competencies, Y5

c. Technology Entrepreneurship Park Characteristics Factor

Technology Entrepreneurship Park Characteristics Factor, (Q) is the function of the different Technology Entrepreneurship Park Development Transfer Coefficient, "a" for the different Park parameters (Yi).

d. Determination of Cross – Cultural Characteristics

The Cross – Cultural Elements are the moderator variables from the two following ICT cluster case studies:

- El Gazala ICT cluster in Tunisia
- Sophia Antipolis in France

e. Cross – Cultural Characteristics Transfer Index

The Cross – Cultural Characteristics Transfer Coefficient, "b" is the optimization parameter the Cross – Cultural Characteristics (Xi), which implies that:

$$bopt = f(Xiopt.) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

f. Cross – Cultural Characteristic Factors

The Cross – Cultural Characteristic Factors, (Xi) are as follows:

- Race, X1
- Ethnicity, X2
- Gender, X3
- Strength of weak and strong ties, X4
- Communications and Social Net-works, X5

3.2. OPTIMIZATION OF TECHNOLOGY ENTRENEURSHIP PARK PARAMETERS WITH CROSS-CULTURAL CONDITIONS:

The development and management influence of cross-cultural conditions on the technology entrepreneurship park parameters, and also the optimization of the conditions are carried out with the help of mathematical – experimental design and mathematical statistics methods. A central composite design uniform plan of the second order can be applied in both cases of El – Gazala in Tunisia and Sophia Antipolis in France. The development and management interview conditions for the cases of El – Gazala in Tunisia and Sophia Antipolis in France are shown in Tables 1.3 and 2.3.

Table 1.3. The Development Interview Conditions of El – Gazala in Tunisia (Case 1)

Developmental Levels	Race, X1	Ethnicity, X2	Gender, X3	Strength of weak and strong ties, X4	Communications and Social Net-works, X5
-2	-2XI1	-2X21	-2X31	-2X41	-2X51
-1	-1X11	-1X21	-1X31	-1X41	-1X51
0	0X11	0X21	0X31	0X41	0X51
+1	+1X11	+1X21	+1X31	+1X41	+1X51
+2	+2X11	+2X21	+2X31	+2X41	+2X51

Table 2.3. The Development Interview Conditions of Sophia Antipolis in France (Case 2)

Developmental Levels	Race, X1	Ethnicity, X2	Gender, X3	Strength of weak and strong ties, X4	Communications and Social Net-works, X5
-2	-2XI2	-2X22	-2X32	-2X42	-2X52
-1	-1X12	-1X22	-1X32	-1X42	-1X52
0	0X12	0X22	0X32	0X42	0X52
+1	+1X12	+1X22	+1X32	+1X42	+1X52
+2	+2X12	+2X22	+2X32	+2X42	+2X52

The results of these Interviews through the matrixes of the central composite rotatable uniform design of the second order have computed with the generated values, while the regression coefficients and the confidence level of the regression equations checked.

The mathematical models (Y1 – Y5), that determines the characteristic relationship of the Technology Entrepreneurship Park parameters (Yi) with the different cross-cultural conditions (Xi) for case1 and case2 are derived from the equations below:

$$Y1 = c1 + a1X1 + a2X2 + a3X3 + a4X4 + a5X5 +$$

$$+ a12X1X2 + a13X1X3 + a14X1X4 + a15X1X5 +$$

$$+ a23X2X3 + a24X2X4 + a25X2X5 + a34X3X4 +$$
$$+ a35X3X5 + a45X4X5 + a1X1^2 + a2X2^2 + a3X3^2 +$$
$$+ a4X4^2 + a5X5^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(2)$$

$$Y2 = c2 + a1X1 + a2X2 + a3X3 + a4X4 + a5X5 +$$
$$+ a12X1X2 + a13X1X3 + a14X1X4 + a15X1X5 +$$
$$+ a23X2X3 + a24X2X4 + a25X2X5 + a34X3X4 +$$
$$+ a35X3X5 + a45X4X5 + a1X1^2 + a2X2^2 + a3X3^2 +$$
$$+ a4X4^2 + a5X5^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(3)$$

$$Y3 = c3 + a1X1 + a2X2 + a3X3 + a4X4 + a5X5 +$$
$$+ a12X1X2 + a13X1X3 + a14X1X4 + a15X1X5 +$$
$$+ a23X2X3 + a24X2X4 + a25X2X5 + a34X3X4 +$$
$$+ a35X3X5 + a45X4X5 + a1X1^2 + a2X2^2 + a3X3^2 +$$
$$+ a4X4^2 + a5X5^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(4)$$

$$Y4 = c4 + a1X1 + a2X2 + a3X3 + a4X4 + a5X5 +$$
$$+ a12X1X2 + a13X1X3 + a14X1X4 + a15X1X5 +$$
$$+ a23X2X3 + a24X2X4 + a25X2X5 + a34X3X4 +$$
$$+ a35X3X5 + a45X4X5 + a1X1^2 + a2X2^2 + a3X3^2 +$$
$$+ a4X4^2 + a5X5^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(5)$$

$$Y5 = c5 + a1X1 + a2X2 + a3X3 + a4X4 + a5X5 +$$
$$+ a12X1X2 + a13X1X3 + a14X1X4 + a15X1X5 +$$
$$+ a23X2X3 + a24X2X4 + a25X2X5 + a34X3X4 +$$
$$+ a35X3X5 + a45X4X5 + a1X1^2 + a2X2^2 + a3X3^2 +$$
$$+ a4X4^2 + a5X5^2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(6)$$

4. RESULTATS AND DISCUSSION :

The determination of Technology Entrepreneurship Park parameters (Yi) for both cases and the influence of the different cross-cultural conditions (Xi) on (Yi) as well as the optimization of the cross-cultural conditions can be done with mathematical models derived from eqn.2 - 6 using the methods worked by the theory of experimental design. (Kaplan and Duchan, 1988).

4.1. QUALITATIVE ANALYSIS AND RESULTS :

The graphical representation of these mathematical models for both cases is carried out with the help of single curves of the different Yi. With a single mathematical model representing all the different parameters (Yi), it requires that, the regression equation must contain two variables, which are the determinant parameter and the testing or interview factor, while the rest variables remain constant at zero level for that particular matrix.

The above statement is graphically carried out from eqn.2 - 6, which are expressed as:

$$Y1 = a1 + a1X1 + a1X1^2 \quad \text{.....(7)}$$

$$Y2 = a2 + a2X2 + a2X2^2 \quad \text{.....(8)}$$

$$Y3 = a3 + a3X3 + a3X3^2 \quad \text{.....(9)}$$

$$Y4 = a4 + a4X1 + a4X4^2 \quad \text{.....(10)}$$

$$Y5 = a5 + a5X1 + a5X5^2 \quad \text{.....(11)}$$

With the above eqn. 7 – 11, the graphical representations can be plotted for the different (Y1 – Y5), with the limited conditions of extrapolation (–2 to +2, which represents the different levels of development and management of the cross-cultural conditions for both cases.), using the known regression coefficients and constants. If the Ymax. = 1 and Ymin. = 0, the obtained data of Yi can be scaled within 0 – 1. The single graphical representation as shown in Fig. 1. Will show the distribution function and the degree of influence of the different conditions on the Technology Entrepreneurship Park characteristics factor. The level of development represented as "a" will be determined within the limits of 0 and 1, which can be shown with the help of the graph as seen in Fig. 1.4.

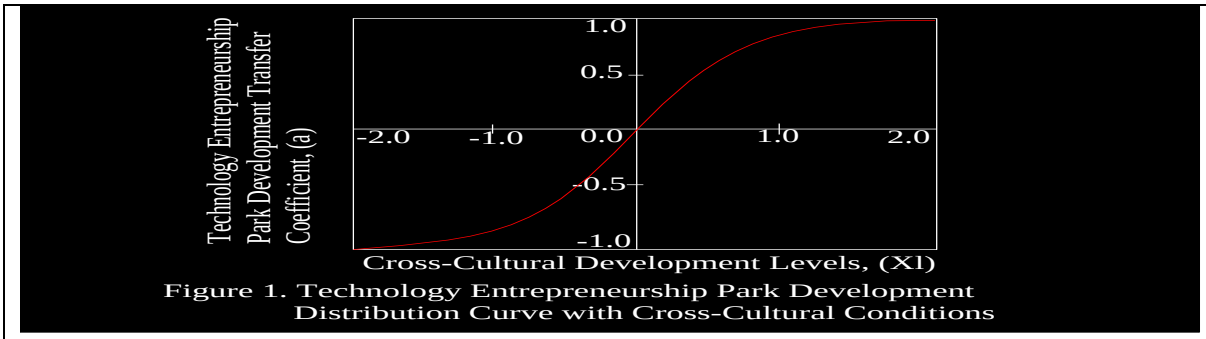

Figure 1. Technology Entrepreneurship Park Development Distribution Curve with Cross-Cultural Conditions

Fig.1.4. Technology Entrepreneurship Park job shift is seen to increase and decrease with Cross-Cultural development of the both cases.

A positive increase in development would require the optimization of the development conditions of both cases using the first quadrant. An example of the influence of Cross Cultural conditions of both cases on the Technology Entrepreneurship Park as seen in Table 1.4 can be used for evaluation and comparison.

Table 1.4. The Influence of Cross Cultural Conditions on Technology Entrepreneurship Park

Cross-Cultural Conditions (Xi)	The Degree of Influence on Y1, (%)	The Degree of Influence on Y2, (%)	The Degree of Influence on Y3, (%)	The Degree of Influence on Y4, (%)	The Degree of Influence on Y5, (%)	Grade of Influence
Race, X1	5.53	8.96	13.17	2.73	0.41	5th
Ethnicity, X2	13.90	40.67	24.37	9.28	8.16	4th
Gender, X3	22.52	11.94	19.03	28.96	30.34	3rd
Strength of weak and strong ties, X4	33.85	25.37	13.77	14.76	25.99	2nd
Communications and Social Net-works, X5	24.20	13.06	29.66	44.27	35.10	1st

From the data analysis in Tab. 1.4 It is seen that the cross-cultural conditions (Xi) differently influence the Technology Entrepreneurship park parameters (Yi). The degree of influence has been presented in percentages to high light the order of influence with decrease in their significance shown as: X5 – X4 – X3 – X2 – X1. The development and management of both cases of study is also greatly influenced and this can be verified with the help of the mathematical model, which is used to determine the optimum conditions of the development and management of both cases.

4.1.1. THE DETERMINATION OF THE OPTIMUM CROSS-CULTURAL CONDITIONS FOR EL GAZALA IN TUNISIA AND SOPHIA ANTIPOLIS IN FRANCE.

The determination of the optimum Cross-Cultural conditions for El – Gazala in Tunisia and Sophia Antipolis in France can also be used to solve the problem of the optimization of the multiple Technology Entrepreneurship Park parameters. The exhaustive methods of selecting different variants is applied, because it helps to solve the compromising problems of finding conditional extremes (-1, 0, +1, representing the different developmental levels) of the multiple mathematical models for the multiple optimization parameters (Yi) as seen in Fig.1.4. The level of development is scaled to suit the values of "a" and "b", where 1 corresponds to maximum development and 0 is the minimum development, which can be determined from the extreme points of the curves as well as with the use of models. Fig.2.4 shows that 0.8 – 1.0 represents Developed cases like Sophia Antipolis in France and 0.5 – 0.8 represents Developing cases like for El – Gazala in Tunisia. In real term, maximum development moves towards 1.0 and 0.8 respectively, but does not reach the points. Therefore there is the need to search for the optimum points for both cases.

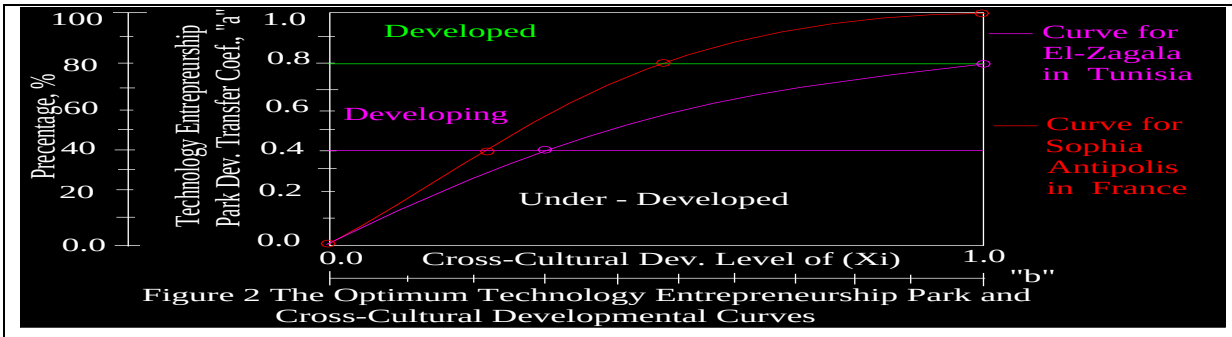

Figure. 2.4. The optimum technology entrepreneurship park and cross cultural development curves.

In order to validate the interview data, the use of an existing performance model, $Yi = a.Y_{i-1}{}^{b}$, that suits the development distribution curve is selected, since the performance and development increases and decreases with time or with corresponding increase and decrease in the number of skilled/talented persons in both cases. (Kaplan and duchan, 1988).

4.2. QUANTITATIVE ANALYSIS AND RESULTS:

The data collected from the questionnaire is fitted into the mathematical model, $Yi = a.Y_{i-1}{}^{b}$ for the quantitative analysis of a Technology Entrepreneurship park in the two cases. Given specified skilled/talented persons of 50 – 60 in numbers (Ni) at a certain time (Ti) of any cross-cultural conditions along with a desired confidence level of development, the required test or interview units (given number of persons) is determined to meet the required skilled/talented persons and Technology Entrepreneurship Park job shift. With the mathematical model in equation (1), it will be possible to determine the maximum and minimum levels of development for technology entrepreneurship park characteristics factor, (Q) and management factor,(M) as well as analyze the interview or test data, using the graphic curves (Fig.2.5) Calculating the required number of persons or level of development or test units is fairly straightforward if the number of persons, level of development and test time is equal to the maximum time, number of persons and level of development or management. If this is not the case, the variation from normal distribution (maximum and minimum) needs to be assumed so that the calculations can be completed.

This work presents a mathematical model, $Yi = a.Y_{i-1}{}^{b}$, that can generate an accurate result of Technology Entrepreneurship Park and cross-cultural characteristics data for both cases. When Yi is maximum (Ymax.), "a" is also maximum, (amax.) and "b" is maximum, ("b"). At this point, Ymax. = Qmax. = Mmax., where Q is the

technology entrepreneurship park characteristics factor, while M is the management factor. Since it is possible to calculate for Q, through the "a", of the different parameters (Yi), this implies that:

Q = aY1 aY2*.....*aY5……(4).,* where "a" is the Technology Entrepreneurship development transfer coefficients.

With Ymin. "a" is also minimum, (amin.) and "b" is minimum, ("bmin."). At this point, Ymin. = Qmin. = Mmin., Within the maximum and minimum values, it can therefore be set as the control limits of development and management of the technology entrepreneurship park, where "amax" = 1 and "amin." = 0, which also implies that Qmax. = 1 and Qmin. = 0. The same approach is applicable to Xi and b.

When Xi is minimum, (Xmin.) "b" is minimum, (bmin.) and at this point, Xmin. = Nmin. = Tmin., and also when Xi is maximum, (Xmax.) "b" is maximum, (bmax.) and at this point, Xmax. = Nmax. = Tmax. *N = bX1* bX2*...* bX5……(5).*

The control limit of the cross – cultural condition can be set within minimum and maximum values, which can also be scaled between 0 and 1, where 0 represent the minimum and 1 represent the maximum.

From the model, $Yi = a.Y_{i-1}^{b}$, when the cross-cultural case at maximum level development, b = 1 and the model becomes; $Yi = a.Y_{i-1}^{b}$……(6), and when b = 0, the model will be Yi = aopt. ……..(7). The optimum values of "a" for both cases can be obtained from Fig.2.5. In the case 1, aopt. is from 0.8 to 1.0, case 2 falls within 0.5 to 0.8.

4.3. QUALITATIVE ANALYSIS AND RESULTS :

The study shows that two cases were interviewed for technology entrepreneurship park development for job shifts under cross-cultural conditions. The interview units could be inspected at every regular interval for a developmental increase from minimum to maximum as well as job shifts from maximum to minimum. Maximum developmental increase is defined by 100 skilled and talented persons, while the minimum is 0 persons. The initial technology entrepreneurship park development and job shift starts from maximum and may continue to deteriorate or shift until it gets to minimum. It can also start from minimum until it gets to maximum. The expected interview results with mathematical model, $Yi = a.Y_{i-1}^{b}$, are presented in Table 2.4. While technology entrepreneurship part characteristic development and management curves is shown in (Fig.3.4.). From the curves, the values of development, job shifts, the number of skilled/talented persons, rate of development and other characteristics can be assessed.

The graph shows Sophia Antipolis in France developing and job shifting at a higher level and faster rate than El-Gazala in Tunisia.

Table2.4. Technology Entrepreneurship Park Characteristics Factor Data with a Mathematical Model					
Cross-Cultural Conditions, (Xi/bi)	Number of Skilled/Talented Persons (N)	Case Grade	Technology Entrepreneurship Park Development transfer Coefficient "a"	Technology Entrepreneurship Park Parameters (Yi)	Technology Entrepreneurship Park Characteristics Factor, (Q)
Xi(max.)/b=1	10	Poor	0.1	0.1*Xi(max.)	0.1*0.2*0.3*0.4
Xi(max.)/b=1	20	Poor	0.2	0.2*Xi(max.)	0.1*0.2*0.3*0.4
Xi(max.)/b=1	30	Poor	0.3	0.3*Xi(max.)	0.1*0.2*0.3*0.4
Xi(max.)/b=1	40	Poor	0.4	0.4*Xi(max.)	0.1*0.2*0.3*0.4
Xi(max.)/b=1	50	Average	0.5	0.5*Xi(max.)	0.5*0.6*0.7
Xi(max.)/b=1	60	Average	0.6	0.6*Xi(max.)	0.5*0.6*0.7
Xi(max.)/b=1	70	Average	0.7	0.7*Xi(max.)	0.5*0.6*0.7
Xi(max.)/b=1	80	Good	0.8	0.8*Xi(max.)	0.8*0.9*1.0
Xi(max.)/b=1	90	Good	0.9	0.9*Xi(max.)	0.8*0.9*1.0
Xi(max.)/b=1	100	Good	1.0	1.0*Xi(max.)	0.8*0.9*1.0

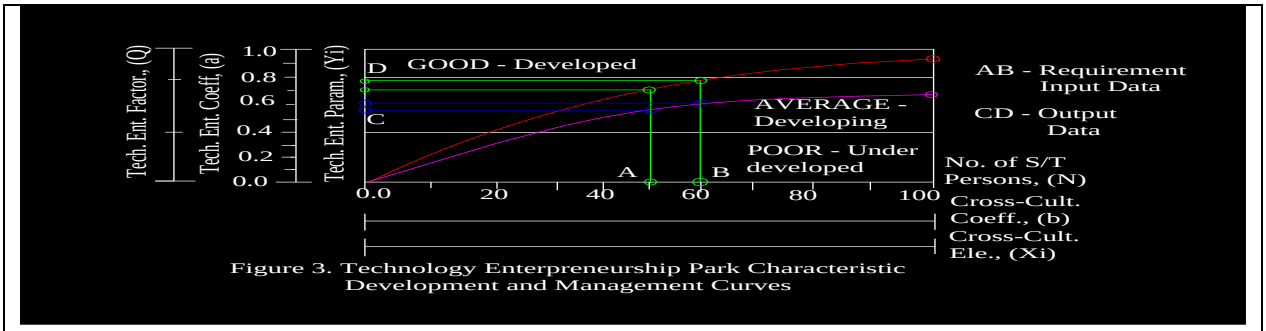

Figure 3.4. Technology entrepreneurship park characteristic development and management curves

CONCLUSION:

Technology entrepreneurship is evolving in both developing and developed countries but not with the same pace. In this paper we try to demonstrate how the cross cultural effects impact the technology parks development by comparing a developed and developing country. We can split the results in three parts. First with the direct impact of cross cultural variables of the conceptual model, second with technology entrepreneurship park and cross cultural development curves and finally with the development and management side of the technology parks. The technology parks transfer index is derived from this study to demonstrate the importance of the human and social factor in developing technology entrepreneurship with those phenomenon's (1) the ICT job shifts and (2) the technology parks or ICT clusters. For the developing country (Tunisia) the impact of cross cultural effects are very important. The nature of this country and people interviewed in this study has a huge impact on how technology transfer and entrepreneurship can be assessed. We argue that Tunisia need to improve its (1) university programs with a pragmatic view on technology, science and entrepreneurship and (2) ICT building capabilities are struggling while financial sector supporting technology entrepreneurs is missing. For the developed country (France) the cross cultural effects on technology development are not as much as significant as Tunisia. However, the cultural mixture of Sophia Antipolis region and its Mediterranean technology path dependency with its social attractiveness gives it a competitive advantage over its counterpart in Tunisia. This not only due to the technology gap but also to institutional barriers that make Tunisia (with its technology park el gazala) very dependant of Sophia Antipolis.

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