

Abstract: *the new ICT global strategy rely on micro-economic foundations of innovation. Those elements are concentrating in ICT Clusters. Previous research on competitive advantage of ICT Clustering strategy focused on geographic location of innovation and talent, institutional and economic issues. Today, competition and ICT Clusters rely on ICT jobs that shifted from location to another. In this paper we try to explore how ICT jobs are shifted from developed countries to developing countries on the basis of ICT Clustering strategy. ICT Job shifts assessment is a new concern for ICT Clustering strategy. Propositions and conceptual model for this study are applied with an exploratory study on El Gazala ICT Cluster in Tunisia. We find that Tunisian ICT cluster is on the way to establish a competitive advantage with ICT Job shifts, despite some weaknesses.*

Keywords: ICT Job shifts; competitive advantage; innovation; developing countries; ICT Clustering.

1. INTRODUCTION:

Information communication technologies (ICT) are driving the new economy. Many regions around the world become centers of technopreneurial activity and has achieved global strategies that rely on ICT clustering (Porter, 1998a). During four decades, worldwide success of Silicon Valley (Saxenian, 2000) in the United States and the emergence of ICT industry had led to other global success on other regions (De fontenay & Carmel, 2002). Previous research on ICT clustering strategy focused on locations (Florida, 2002a; Porter, 1998b) and institutional purposes (Koh et al, 2003; Scott and Sender, 2002). Today competition is changing the way strategy is built, especially with ICT. Global scope of ICT clustering strategy is relying on reaching the best of human resources and talents (Venkataraman, 2004; Steve, 2007). The ICT job shifts is a new idea that attempt to explain how ICT clustering strategy should be assessed and what are the part that multinationals, governments and universities are up to do for that concern (Andersen and Christensen, 2005; Chen, 2005).

2. LITERATURE REVIEW:

2.1 ICT Clusters and strategy : why human resources matters ?

ICT Clusters are a competitive tool of competition. In Porter's general definition "Clusters are geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition". (Porter, 1998a). Geographic location of industry (Florida, 2002b; Kenney and VBurg, 1999), institutional purposes of ICT clusters location (Koh et al, 2003) and talent location are inter-related with ICT Clusters. According to some reports and research, ICT jobs are located in regions that support intangibles of technology innovation. Ideas, risk taking culture and breakthrough ideas are transformed into business ventures. (Florida, 2002a; Venkataraman, 2004; Steve, 2007). ICT clusters' assessment is important. First because all intangibles of technology innovation are concentrated in one region, second because it shows the way any location is competing with another and what type of competitive advantage it has. Today, talents, locations and social networks are important to develop an ICT cluster strategy (Thornton and Flynn, 2003; Kenney and Dossani, 2005). Human resources and talents are very important for that regions and yet for ICT Clusters. Their importance is related to entrepreneurship and innovation and to knowledge producing centers, such as universities, incubators, business angels and entrepreneurial culture of risk taking. In general, ICT clusters pursue two central roles which are (1) enhancing productivity and (2) fostering innovation and technology entrepreneurship (Porter, 1998a; Scott and sender, 2002; Florida, 2002b; kenney and Dossani, 2005). De Fontenay and Carmel (2002) illustrate that forces behind the Israeli cluster are (1) Human resources and (2) institution of support, such as Teknion and research's state funding, Scott and sender (2002) explain the consequence of ICT clustering at Austin Texas and how this region has become one of the direct competitors of Silicon Valley in the US. The success or the failure of ICT clustering strategy depends on many issues. First, material resources, such as ICT infrastructure, laws, institutional support of government, all are characterized by tangibles (Venkataraman, 2004). Then, embedded resources are related to human capital, such as ideas, quality of higher education and culture of risk. Numerous efforts are made by governments to build up ICT industry and to accelerate way into ICT global markets that create high skilled jobs. Developing countries are attracting multinationals through ICT clusters (Andersen and Christensen, 2005, Chen, 2005). Moreover, some developing countries become more competitive with their human resources and talents. Israel, Dublin, Taiwan becomes regions that attract ICT investments

and use them to produce innovative entrepreneurship. The next competition age will focus on employment, jobs and skills that are able to create innovative ideas and transform it to a global product, by which they generate an economic growth.

2.1.1 Innovation, entrepreneurship and ICT clusters: how to assess level of competitive advantage?

Recent studies on ICT employment and technology innovation display that the pace of delocalization of ICT activities is on its peak in European countries, but is stabilizes in the US (Bernhard,2007 ; Schramm and al, 2008). Silicon Valley dynamics of job's creation and its success relies on technology business location of talents. (Porter, 1998a; Florida, 2002a) . Many firms grow and evolve due to competitive environment and high productivity offered by best human resources. As developed countries are looking to attract foreign investments and technology transfer, they are facing some threats. A misapprehension of ICT strategy, incapacity of idea's transformations and lack of reward systems impede entrepreneurial process. Developing countries are investing in institutional infrastructure, legal systems and injecting seed capital in an attempt to create technopreneurial synergies through ICT Clusters. As consequence, many of those developing countries failed to gain competitive advantage.(Kenney and Vburg, 1999 ; Saxenian and al, 2001, Venkataraman, 2004 ; Audia and Rider, 2005 ; Chen, 2005). In his model for competitive advantage, Porter(1998a) illustrate that clustering is important to go global. For a specialized industry, such as ICT clustering it starts with people. Unconventional ideas, projects and people are interconnected to government support. However, ICT strategy review is well-related to people, entrepreneurial activity and innovative technology creation.

The ICT job shifts are a ground-breaking fact that impact developing and developed economies. It relies on global attainment of strategies. Drivers of the new economy both, regional and national, are ICT's (Thornton & Flynn, 2003). Technology development is related to innovation and to creative destruction of entrepreneurship process. The historical emergence of Technology in the US for the last four decades is due to clustering strategy (Porter, 1998a); Venkataraman, 2004). Moreover, inter organizational relations (Chesbrough & al, 2006) are about to be shifted from developed economies to developing one via multiple sources, especially with multinational companies (Audia & Rider, 2005). In recent survey, Schramm and al, (2008) discussed innovation measurements in the USA. They argued that innovation level is understudied. Obviously, previous research on innovation measurement did not integrate ICT jobs. Analysis of the relationship between: (1) innovations and (2) occupational employment at micro level of firm (Porter and Stern, 2001). This could be the corner stone of cluster strategic analysis. The shortage of workers in ICT and occupations are a serious issue. Government, firms and universities are about to reinvent the way they cooperate into a specialized location. (Thornton & Flynn, 2003; Kenney and Dossani, 2005). The lack of empirical evidence for global ICT jobs. Generally, ICT jobs are technical and managerial jobs and they are highly concentrated with a specialized industry and with special environment of business ventures. (Bernhard, 2007).

These reviews lead to a fundamental question: why ICT clusters are assessed with subjective measures, and why ICT job shifts should reach the gap with this issue?

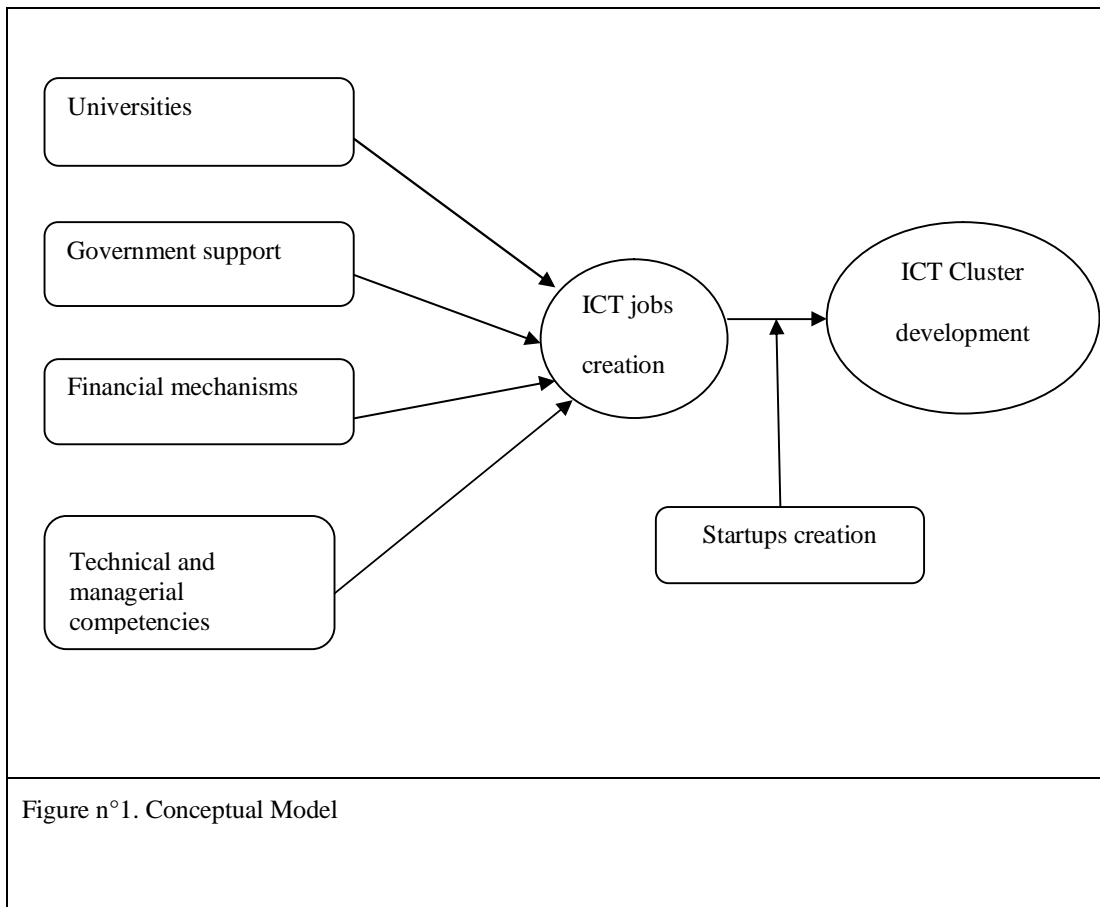
Assessing competitive advantage through an ICT cluster strategy (Porter, 1998b) is a significant issue, due to the various objectives targeted by ICT Clusters. Furthermore, strategy is lock to technology globalization (Porter and Stern, 2001; Schramm and al, 2008). ICT strategy is now dealing with job's creation and technopreneurial process among innovative environment. ICT clusters around the world are attracting venture capital, brightest scientists and creating ICT jobs, that foster innovation, technology entrepreneurship and yet economic growth (Thornton & Flynn, 2003; Koh and al, 2003; Andersen & Christensen, 2005; Schramm and al, 2008).

2.1.2 ICT jobs and ICT Strategy: Toward networks of innovation:

Geography and entrepreneurship definite that concentrations of business ventures are established in many industries and especially with the ICT's (Thornton & Flynn, 2003; Audia & Rider, 2005). The rise of creative class is owed to factors that are related to proximity and yet to knowledge that spill over a location (Porter, 1998a; Florida, 2002a). Location and interrelations between organizations lead to entrepreneurship ventures and start-up creations. Furthermore, an organizational product that evolve in a location that increase innovation is common to specialized industry, in which rivalry and competition depend on ideas and innovation that can be easily transformative to a successful business venture.

Networks and innovation are related to technology entrepreneurship in an ICT cluster. According to Venkataraman (2004) networks can be found on social ties that encompass a location and goes beyond intra-firms connections (Chesbrough and al, 2006). Technology innovation is a matter that relies on organizations, thus ICT clustering strategy is the way governments and institutions should forecast the future (Audia & rider, 2005).

3. CONCEPTUAL MODEL:



3.1 Theory constructs' definition and design:

In order to perform this research and according to some literature reviewed previously, ICT clustering strategy depends on key elements and those are: (1) Universities,(2) financial mechanisms, (3) government support and (4) technical and managerial capabilities. We propose a moderator variable (5) Startups creation.

Those elements are important to evaluate ICT cluster with this new approach: the ICT job shifts.

3.1.1 Universities:

University role is dominant in fostering technology entrepreneurship with innovation support. Schramm & al (2008) illustrate that university is the first place in which invention arise and lead to innovation. Story of the Silicon Valley demonstrates that the foundation of innovation are (1) university research & development centers and (2) academic support for technology entrepreneurs (Kenney & Vburg, 1999; Saxenian and al, 2001; Thornton and Flynn, 2003).

3.1.2 Technical and managerial competencies:

The rises of talents around ICT clusters are key elements that create the human capital in that area. Coming from universities and organizations around (Porter, 1998a; Florida, 2002a; Chesbrough & al, 2006) ICT cluster, human resources, build and sustain their initial academic background with experiences in multinational organizations. Andersen & Christensen (2005) make obvious how multinationals are trying to target embedded knowledge inside their human potential and how they are investing in it, in order to create new ideas and stimulate their old products (Venkataraman, 2004). The most important in an ICT cluster are human capital; No more than the flow of that capital is the key that establish ICT cluster success or failure.

3.1.3 Financial mechanisms:

While innovating and inventing new business models or new technology is academic and talent issue, bringing financial support is a complex matter. First, to innovators because they will need that capital to start their business, second for the investors that will need to see what financial gains are attributed to ICT products. (Audia & Rider, 2005; Schramm, 2008). Many financial support exist one of the most common of them is joint venture, or business angel (Thornton & Flynn, 2003; Koh & al, 2003). Kenney & Vburg (1999) studied how Silicon Valley evolved with that financial support, first by government funds then with private equity funds (Saxenian & al, 2001).

3.1.4 Government support:

Government support is very important issue at earlier stage of ICT Cluster building (Saxenian, 2000). Scott & Sender (2002) display the role of institutions and political support to achieve, in the 1980, Austin-Texas ICT Cluster. Also, government support deal with protective laws for copyrights in technology and tax incentives for new entrepreneurs. Francis and al (2003) illustrate that Taiwanese government attracted former national Taiwanese origins form Silicon Valley by affording them educational services for their kids and by offering financials spurs.

3.1.5 Startups creation:

Ideas, innovation and business creation is the target of any regional development (Saxenian and al, 2001; Porter and stern,2001). ICT Cluster around the world are targeting business development through innovation. Shift of ICT jobs is one of raisons that firms create a technopreneurial process (Andersen and Christensen, 2005) and gain competitive advantage. The creative destruction progression is conducted with structural change on (1) business models and (2) management of innovation and technology. (Venkataraman, 2004).

4. RESEARCH METHODOLOGY AND DESIGN:

4.1 Case study research:

To conduct this exploratory study we use a qualitative research methodology which focuses on case study approach. Palvia and al (2003) illustrate that research on management information systems are shifting from quantitative to qualitative, because of the nature and the high pace of technology changing. Organizational side of technology is fundamental because of the aim is to find how ICT jobs are generated through ICT cluster (Benbassat and al, 1987). Qualitative research methodology is motivated for two reasons: (1) there is no empirical evidence of that phenomenon, (2) information richness for new theory approach (Eisenhardt, 1989; Yin, 1981; Yin, 1989). According to Eisenhardt (1989), case study research can be defined as “*a research strategy which focuses on understanding the dynamics present within single settings.*” Case study research is often supposed to be mainly appropriate for research seeking to answer “how” and “why” questions (Yin 1981; 1989). Case study research is often of a qualitative nature: A limited number of cases (sample of firms and persons upon ICT Cluster [ElGazala](#)) are investigated in depths often by means of observation or interviews, in order to draw a detailed picture of qualitative particularities. The goal of the case study method is to describe as precisely as possible the fullest, most complete description of the case.

This research is an exploratory one. Yin (1981; 1989) illustrate that there is several types of case study research. Exploratory research is conducted to define research questions and hypotheses or propositions. This study will try to reach the gap between theory and practice in strategic ICT cluster management. Grounded theory is motivated at this level for two reasons. On the one hand, formulating propositions based on conceptual ideas and on the other hand , comparing conceptualized data emerging from deductive propositions comparisons. (Glasser and Strauss, 1967 ; Glasser , 2001). According to Yin (Ibid) the case study design must have five components: (1) the research question, (2) propositions, (3) unit of analysis, (4) a determination of how the data are linked to the propositions, and(5) criteria to interpret the findings.(Miles and Huberman, 1994)

4.2 Research propositions:

This methodology (qualitative) is used with the help of our conceptual model and this set of propositions.

4.2.1 Proposition1: *ICT clustering strategy is focusing on ICT jobs. Thus elements and ICT cluster components are supporting this issue.*

4.2.2 Proposition2: *ICT cluster rely on ICT job shifts. Technical and managerial jobs with similar worldwide background are the source of innovation and entrepreneurship creation.*

4.2.3 Proposition3: *ICT jobs are created from academic and professional effort along with the government support.*

4.3 Context of the research and data collection: The context of this research is **ElGazala ICT cluster in Tunisia.**

4.3.1 Context presentation:

ICT cluster of El Gazala¹ is located in suburb of Tunis capital. ICT clustering strategy is built to achieve those goals: (1) host innovating companies in the field of communication technologies,(2) develop the synergy between Industry,(3) Research and Higher Education, (4) promote innovative ideas (5) establish a network of cooperation , especially with Mediterranean sea countries. There are two universities and governmental research agencies in telecommunications field. Supcom² and Iset com³ are the two universities that ensure academic teaching and trainings. Also, we find two research agencies(National Agency for electronic certification⁴ and Center for telecommunication's Research & studies⁵) which are focusing on certification and research in telecommunication at the Tunisian ICT cluster.

¹ www.elgazalacom.nat.tn

² www.supcom.mincom.tn

³ www.isetcom.mincom.tn

⁴ www.certification.tn

⁵ www.cert.nat.tn

4.3.2 Data collection:

We used semi-structured interviews, documentary research of information with interviews grid (Yin, 1989; Eisenhardt, 1989). According to the grounded theory approach (Glaser & Strauss, 1967), data collection should amplify and be conducted without support of with-in case analysis that we are conducting (Miles & Huberman, 1994). At the same time we used a multiple sources for data collection.

Graduate students, government's responsible, university professors, banking managers and new technopreneurs. while we are using the grounded theory approach within case study analysis (Yin,1989), on site analysis is conducted over iterative process: collection ↔ analysis ↔ collection. The inductive process of this research and its exploratory scope are to build another approach rather than a new theory (Yin, 1981).

4.3.3 Data analysis:

Miles and Huberman (1994) define data analysis, "as consisting of three concurrent flows of activity: (1) Data reduction, (2) Data display, and (3) Conclusion drawing/verification". We used this approach to conduct our exploratory study. First data collected about conceptual model elements show up some new facts. Interviews conducted through ICT Cluster Startups give us three preliminary results : (1) Startup creation depend on special relation between professional experiences and business model , (2) Technology Innovation and entrepreneurship are underestimated by companies other than startups, (3) university's spin-offs keep on lab prototyping due to the lack of financial support and physical infrastructure.

4.3.3.1 Descriptive matrix :

The qualitative analysis attempts is to put structure to data (as exploratory quantitative techniques). Interaction between data collection, data reduction, data display and concluding interpretations is in tight relation with our research question and type of data collected (Miles & Huberman, 1994). Our matrice tries to explain type and scope of the relations between our conceptual model. Those relations are based on (1) information flows, (2) supporting mechanisms, (3)demand, (4) funds and (5) evaluation. We used the cross tabulation matrix to analyze this interaction.

Elements	Evaluation	Codes	Supports	Information	Funds	Demand	Interpretation
<i>Universities</i>	+ -	<i>Uni</i>	<i>Weak</i>	<i>Theory teaching</i>	<i>No financial support for the technopreneurs students</i>	<i>Demand of multinational</i>	<i>Performing their classical goals of teaching. No talents emergence.</i>
<i>Government support</i>	- -	<i>Gov</i>	<i>Weak</i>	<i>Preparing infrastructure</i>	<i>Administrative</i>	<i>Demand of government funding</i>	<i>Infrastructure and administrative problems</i>
<i>Financial mechanisms</i>	- -	<i>Fin</i>	<i>Weak</i>	<i>Funding new ideas</i>	<i>Financial support difficult for access.</i>	<i>No financial supports</i>	<i>Difficulty to find funds for new ideas</i>
<i>Technical and managerial competencies</i>	- +	<i>TechMan</i>	<i>Strong</i>	<i>Professional and academic background</i>	<i>Trainings and ICT theory teaching are almost good and up-to-date.</i>	<i>Demand of multinationals</i>	<i>Technical and managerial competencies are highly trained but underestimated.</i>
<i>ICT jobs creation</i>	- -	<i>ICTjob</i>	<i>Weak</i>	<i>Jobs created by established ICT firms</i>	<i>Difficulty to access funds and to create ICT jobs</i>	<i>Demand of classical ICT jobs</i>	<i>ICT jobs are created are underrated.</i>
<i>Startups creation</i>	- -	<i>Startup</i>	<i>Weak</i>	<i>ICT Startups</i>	<i>Access denied for new ideas and small projects.</i>	<i>Demand of few graduates.</i>	<i>Startups are struggling with the lack of financial support and real global markets connections.</i>
<i>ICT Cluster development</i>	- -	<i>ClustDev</i>	<i>Weak</i>	<i>Developing ICT</i>	<i>Government funds are not sufficient.</i>	<i>Outsourcing multinational firms</i>	<i>ICT jobs are not the source of ICT cluster development.</i>

- Descriptive Matrix with interpretative codes(Miles and Huberman, 1994).

5. RESULTS & DISCUSSION:

This research tries to bring and conceptualize a new idea (Yin, 1981 ; 1989 ; Eisenhardt, 1989 ; Miles and Huberman, 1994). As interviews are going straight forward, we discover that ICT jobs are not only a developed countries production. Indeed, ICT jobs, both technical and managerial side, are evolving with high speed around El Gazala ICT cluster. Moreover, we find that every multinational company has similar jobs in the country of origin. According to literature review, this study aim is to evaluate strategy regard to people, talents and human resources (Florida, 2002a). Location, inter-organizational level of open innovation (Chesbrought and al, 2006) play a central role in assessing a strategy that relies on ICT Clustering. At this stage ICT job shifts assessment afford a new ideas and results on how ICT strategy and clustering is conducted. These study strengths' are (1) new tool for assessing ICT clusters, (2) theory advances about ICT strategy and clusters, (3) bypassing classical approach based on location, geography and institutions. Earlier limits of this new approach are (1) as with-in case study approach (Miles & Huberman, 1994) field study is not explored in comparison with other cases. (2) Late theory findings reveal that ICT jobs are related to location and regional economic shifts (Porter and stern, 2001). (3) Need to comparative study with developed countries (leveraging the sample and the scope of the study).

6. Conclusion: ICT job shifts are related to micro economic foundation of innovation (Porter and Stern, 2001). This exploratory study of ICT cluster in an emergent country (Tunisia) gives us, along with the new approach of ICT Cluster's assessment, a new explanation of how ICT clustering strategy should be built. Qualitative research methodology is used to formulate our proposed conceptual model with some propositions (Yin, 1981; Benbassat and al , 1987; Eisenhardt, 1989;Glaser, 2001). Starting with a new research problem this paper aim is to exhibit that ICT jobs are created through ICT clusters and according to this idea we have (1) Technopreneurial activity is surrounded by and roughly the ICT Cluster and (2) ICT jobs are the new driver of this strategy both for multinational firms and startups (Andersen and Christensen, 2005). Data collected from multiple sources (interviews, documentary research) are analyzed through descriptive matrices (Miles and Huberman, 1994). We discovered that (1) ICT jobs are not university made, (2) Government support is very weak due to administrative rules and to the competence of ICT Cluster administration, (3) no financial mechanisms are supporting new ventures, (4) many on lab products stay at their prototype stage, (5) university link to global markets is a serious problem, (6) startup creation is a very slow process due to infrastructure and financial problems. Assessing ICT cluster in an developing country by the intensity of ICT jobs created and technopreneurial process related, is multidisciplinary mix of theory building (Gasler, 2001). In this study we find out that ICT jobs are not taken into concern in the technopreneurial process. El Gazala ICT cluster is pathetic in generating innovative ICT business through ICT jobs that shift from multinationals and similar organizations (Audia &Rider, 2005). Furthermore, technical and managerial competencies are not attracted to reach any new idea, or to craft a new venture. Cross-cultural raisons are behind those weaknesses. This lead to accomplish more studies on this side, in order to give a real measurement with ICT job shifts approach. Finally, the Tunisian ICT cluster is well conventional with academic support to students, academics and professionals. This can be the foundation of competitive advantage with ICT Job shifts along with some government support.

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