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Towards Understanding the Relationship Between Information and Communication Technology and Competitive Advantage in a Developing Economy

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The purpose of this research was to explore the relationship between the use of information and communication technology ICT and its impact on Competitive Advantage CA within the context of Jordanian manufacturing industry. In addition, to discover the factors that affect ICT diffusion and CA in this context. This study has used the grounded theory method GTM to generate a theory of effective utilization of ICT and its impact on CA in the context. The main tools of data collection were interviews and document analysis. The theory that is presented in this research is divided into five categories and eight hypotheses have been formed. This study revealed that ICT diffusion and application is still in the early stage and the rate of diffusion of ICT is still low. Also the results indicate that ICT utilization is influenced by internal and external factors. Moreover, the results show that CA is a matter of concern for companies which use ICT. Most companies follow four strategies to achieve CA: cost strategy, speed strategy, quality strategy and flexibility strategy. Finally, the result indicated that there is a positive relationship between ICT applications and CA.

Keywords: Information and communication technology, Competitive advantage, Grounded theory method.

1. Introduction

Information and Communication Technology ICT is clearly considered as a key growth area in this century, specifically, in a dynamic business and highly competition environment which requires utilizing advanced ICT to improve efficiency and cost effectiveness, and to present high quality products and services to their customers. Most of researchers, for example, Jennex & Amorose, 2002; Li-Hua & Khalil, 2006; Li-Hua, 2004, have referred to ICT as a term that contain basically software, hardware, networks and people. Other researchers, such as, Carr, 2003; Haag et al, 2000, have identified ICT as a process which includes sequences of phases to treatment and transform the data into information, which is useful for decision makers. Also, ICT is considered as a key enabler for globalization, facilitating world wide flows of information, capital, ideas, people and products.

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Some researchers have tried to combine the previous definition by considering ICT as a group of elements that should be working together in the process to present the benefits to the organization in the form of information, product or services and so on Li-Hua & Khalil 2006. It is considered as a subject of expertise that links ICT's networks, that lets people and computers interrelate irrespective of physical location. The researcher concludes that the ICT term contains hardware, software, networks and people that should be integrated as a one unit by linking each one to the other in a clear process to generate the information that helps the decision makers, producing product and services presenting, and for achieving the organization's goals.

The utilization of ICT tools has an important influence on the organization and all of its elements including people, culture, structure, process and tasks Leavitt & Pondy, 1964. Thus, for this paper the researcher tries to focus on these aspects and how they affect ICT application in context. Moreover, Marchand et al 2004 recommended four dimensions for describing ICT practices: operational support, business process support, manages support and innovation support.

A- ICT Diffusion in Developing Countries

The literature showed that ICT diffused rapidly in developed industrialized countries, but slowly in developing countries, which led to the ICT gap, or digital divide between developed and developing countries and most Arab countries still have a long way to go before being able to fully realize the benefits of ICT tools Gholami et al, 2004; Aladwani, 2003, that is because of insufficient ICT infrastructure, governmental policies, small size of companies, lack of ICT experience and low level of ICT maturity, these factors seriously affect the adoption decision Huang & Palvia, 2001. According to Straub et al, 2000; Huang & Palvia, 2001, have highlighted the most important factors that determine ICT diffusion process in developing countries such as social and cultural and economic factors. Robertson & Barrar, 1992; Yang, 1999; Nelson & Rottman, 1996, considered financial resource as an important factor that determines new ICT adoption.

B- Competitive Advantage

Competitive advantage is a continuous concern for all companies. The researchers recognized the ICT change and its role to modify the relative

importance of the various key factors for success in a given industry and its role to affect the competition in the industry. According to Dussauge et al 1992 technology could be considered as the core element that enables the company to identify the two major generic strategies: cost leadership and differentiation. Porter defined CA as the heart of a company's performance and it's reflects companies' ability to offer consumers greater value, either by means of lower prices or by providing greater benefits and services that justifies higher prices Porter, 2000. Order-winning criteria include rate of innovation, fitness for purpose, volume flexibility, variety, extreme customization and, above all, rapid responsiveness Berawi, 2004; Porter, 2000. In addition, companies can create CA by achieving or discovering new and better ways to compete in an industry and taking them to the market, which is ultimately an act of innovation Abdul-Rahman & Beawi, 2002; Porter 2000. Moreover, Porter 2000 stated that, recently, companies try to build up distinctive strategies that result in realistic profitability. Thus, he recommended a continuous development in products and in approaches to competing by the innovative use of technology. Strategic innovation is considered as the basis for CA Grant, 2005; it is recognized as a source of CA Porter, 1980. Porter 1980 identified a different source for CA. They argue that CA is derived from the unique competitive position, clear tradeoffs and choice vis-à-vis competitors, activities tailored to the company's strategy, a high degree of fit across activities.

2. Research Methodology

The research method adopted is qualitative research that utilized the GTM Glaser & Strauss, 1967 to generate a descriptive and explanatory theory of the actual utilization of ICT in context and, also, to understand the impact of ICT on CA in the context. GTM is becoming one of the most widely accepted research approaches in the ICT field Smit & Bryant 2000, because qualitative research techniques are needed to capture holistic real-world answers to real world problems and provide a fresh slant on existing knowledge Neuman, 1991. In GT, concepts are derived from empirical data, linked and, if necessary, modified through constant comparison with other data. Therefore, the method incorporates induction, deduction and verification in the same process Glaser & Strauss, 1967. Strauss & Corbin 1990 defined GTM as a qualitative research method that uses a systematic set of procedures to develop an inductively derived GT about a phenomenon, emphasizing that GTM is an analytical approach based on grounding the analysis in the data that have been gathered and inductively reaching conclusions from these data. Grounded theory which is inductively derived from the phenomena represents and must satisfy four central criteria: fit, understanding, generality and control Strauss & Corbin, 1990. This approach was adopted here for many reasons:

- There is a lack of theoretical foundation;
- GTM presents a single, unified, systematic method of analysis;
- GT approach allows a degree of flexibility in both the selection of instances for inclusion in the sample and the analysis of the data;

Data were collected through a variety of methods: face-to-face interviews, open-ended questions and documentation review at the first stage which is called initial field work, followed by semi-structured interviewing and a documentation review at the second stage of this research.

This study was carried out in manufacturing companies as listed on the Amman Bourse at the end of the year 2004. The sample used in this study did not follow the principles of statistical sampling, but followed the principles of maximum variation sampling, as defined by Strauss and Corbin 1990, i.e. sampling on the basis of concepts that have proven theoretical relevance to the evolving theory.

The Research Process

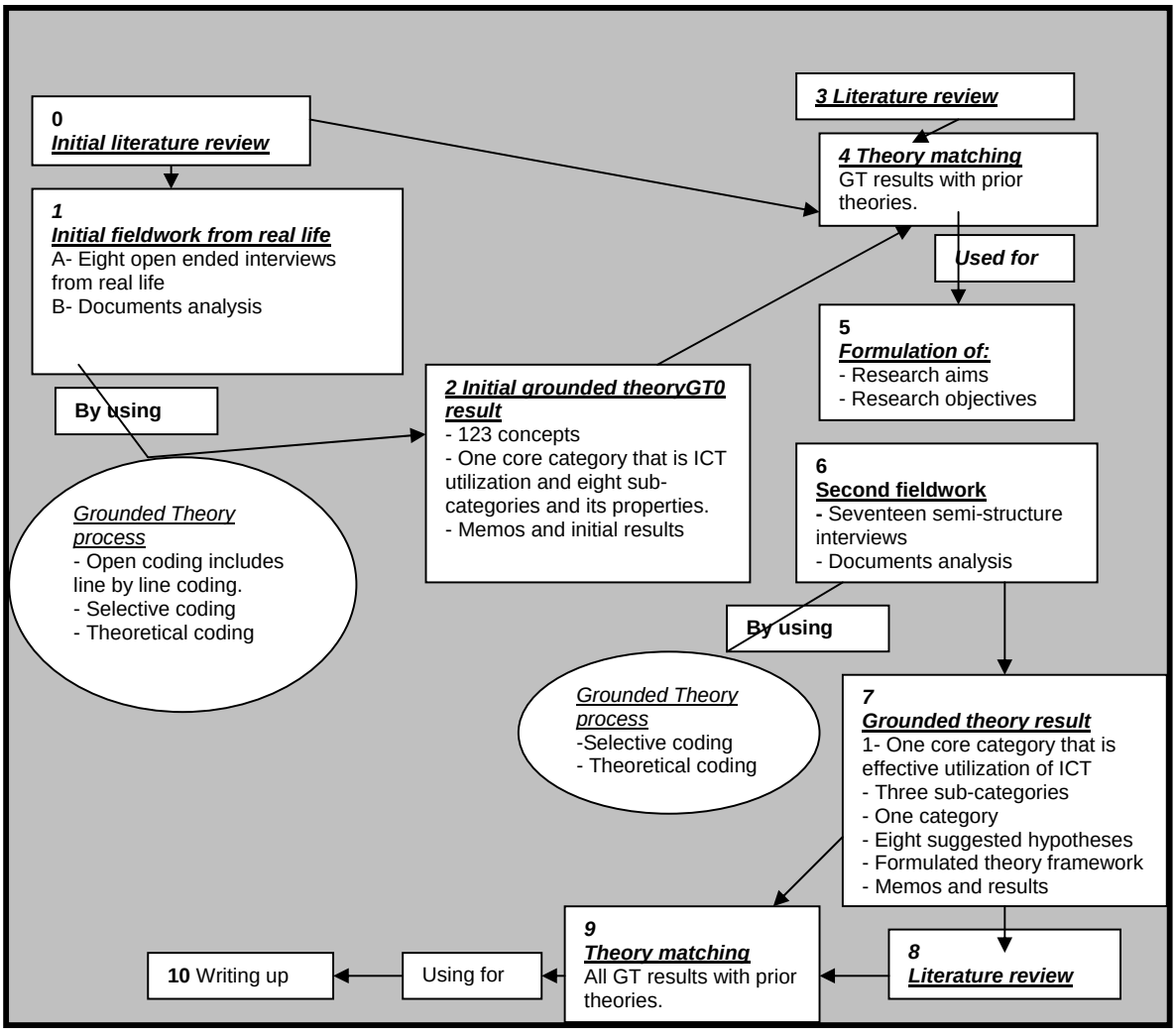

Figure 2: The Research Process

3. Analysis Process

The researcher collected the data and analyzed them immediately after each interview to generate codes and to see where to sample next. The interview was transcribed and analyzed, and the key points in each interview were identified, labelled and marked ready for analysis and coding in this research context. After that the codes were analyzed and grouped together related to a common concept; after that these concepts were grouped to give a higher order of commonalities called categories. The categories that emerged from coding the phenomena have been transformed into variables and connected to form a GT. In addition, memos were written immediately after the data collection so it was a continuous process during the research process.

1- Open Coding

Open coding was considered in the initial phase of analysis of the researcher's interviews. Charmaz 2006 observed that openness of initial coding should help the researcher to think and allow new ideas to emerge. During this stage the interviews were analyzed by using line by line coding. The researcher tried to find the actions in each segment of data and coded them by using simple, short and active words which reflect these actions Charmaz, 2006.

Then the codes were analyzed and those relating to a common theme were collected together to give a higher commonality, called concepts. Finally, the concepts were grouped to find yet higher commonalities called categories. The following examples are key points from initial interviews and indicate the incidents that were identified and given a code.

*"**I don't know** how to use ICT tools"* **C: 3.**
*"**I don't like** using automation systems"* **A: 8.**
These incidents were given the code: using ICT

At the beginning the researcher found 123 concepts, but she minimized these concepts by labelling them by a continuous comparison analysis process to see the similarities and differences between them and grouping them in initial categories. The initial categories are: restructuring process, CA, development, effective information, external factors, internal factors, cost benefit and human behaviors.

2- Selective Coding

Selective coding is considered as the second stage of GTM that includes an increased depth of focus. Selective coding stage, as Strauss & Corbin 1990 said, requires the selection of the focal core code; that is, the central phenomenon

which has emerged from the axial coding process. All other core codes derived from that axial coding process must be related in some way to this focal core code, either directly or indirectly Strauss & Corbin, 1990. The most important point here is that after the first stage of this research the approach was centered on specific issues.

The initial framework has been changed because of new data that was collected and analyzed in the second stage. From the initial field work the core category was ICT utilization. In the second field work this continued as a core category with more tools added for ICT and it was called effective utilization of ICT tools. The human behavior and the cost benefit sub-categories have been combined with the category of internal factors. The external factors sub-category has been changed to be external challenges, including two main concepts: business environment and development of external technology. In addition, the development and effective information and restructured sub-categories have been combined with a new sub-category, communication improvement; to be called performance development. In addition, CA category kept its name, but it changed from sub-category to category.

How Initial Categories have been Changed

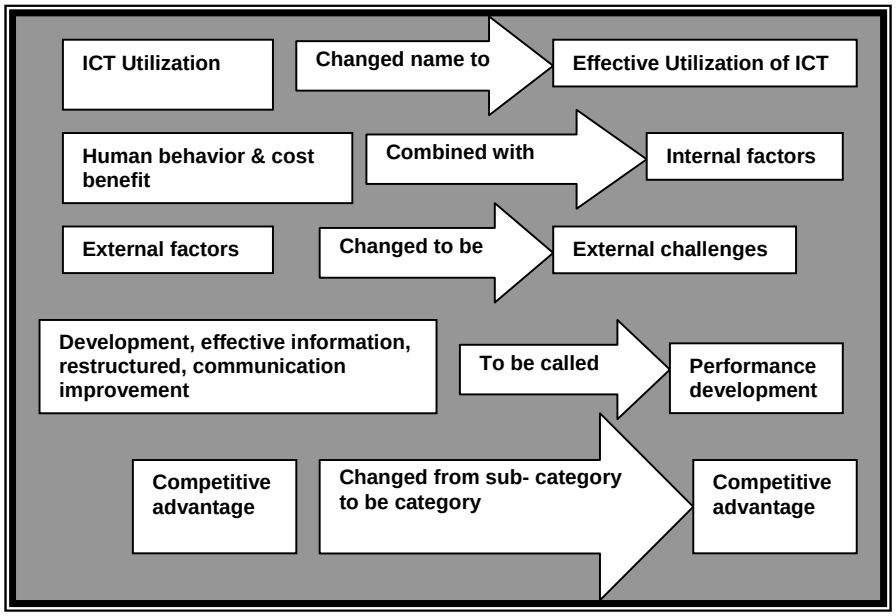

Figure 2: How initial categories have been changed

4. Theoretical Coding

The researcher followed Glaser 1992 by using theoretical coding, so that, when she had finished the second stage of this research, which was selective coding, she tried to connect and explore the relationship between categories and their

properties to develop the hypotheses leading to a theory. This was done according to the collection data and its analysis, and the memos which were created continuously during field work. As Glaser mentioned in Charmaz' book 2006 theoretical coding is a conceptualization of "how the substantive codes may be related to each other as hypotheses to be integrated into theory.

The Theory

The impact of effective utilization of ICT on CA in the manufacturing companies theory includes one core category which is effective utilization of ICT tools and three sub-categories which are internal factors, external challenges, and performance development; also, it includes CA as category. All theory elements are described in the form of hypotheses. They are:

- Hypotheses 1: There is an effective utilization of ICT tools in Jordanian manufacturing companies.
- Hypothesis 2: There is a relationship between the effective utilization of ICT tools and internal factors.
- Hypothesis 3: There is a relationship between the effective utilization of ICT tools and external challenges.
- Hypothesis 4: There is a relationship between the effective utilization of ICT tools and performance development.
- Hypothesis 5: there is an actual application of the CA issues in Jordanian manufacturing companies.
- Hypothesis 6: There is a relationship between the effective utilization of ICT tools and CA.
- Hypothesis 7: There is a relationship between the CA and internal factors.
- Hypothesis 8: There is a relationship between the CA and external challenges.

Within each of the theory elements there is a set of theoretical concepts that connect to the element of theory in which they exist as well as to each other. These theoretical concepts serve to explain the vital elements of the proposed theory in more detail.

The core category, which is the **effective utilization of ICT tools,** is characterized by three theoretical concepts that are presented as the dimensions of an effective utilization of ICT. **Firstly, the level of ICT tools** which can be measured by the number of employees per PC, the kind of software and its development which refers to the company's ability to use and update its software, and extent of networks utilization. This can be measured by the number of internet and intranet users in comparison with the number of employees in the company. **Secondly, the ability of utilization** which can be measured by the availability of knowledge, skills and experiences that helps to use ICT tools.

Finally, the purpose of ICT tools utilization for what refers to the aims of ICT tools utilization.

The **internal factors** sub-category is characterized by three theoretical concepts that are presented as the dimensions of internal factors: namely, **human factors** which refer to individual factors that influence the ICT application that includes resistance**,** behaviors, beliefs, skills**,** experiences, and educational level. The other dimension is **financial factors;** this dimension refers to the company's financial ability to use ICT tools, which includes the cost of investment, cost of training programmes and expenditure for motivations policies. The last dimension of internal factors are **organizational factors** which can be measured by the management style and philosophy, cultural, motivation policy, and training programmes.

The theoretical concepts of **external challenges** which influence ICT application, indicates all the factors which are outside the organization that may help to determine in directly or indirectly the ICT utilization in the companies. These includes **business environment,** which involves the customer, who the company has responsibility to serve them. Also, it includes the suppliers who provide the company with the materials for producing its products. Finally the business environment involves the competition which refers to the company's activities to compete with two or more businesses to gain customers and to present better value than its competitors. The second dimension of external challenges are **indirect factors** which are considered to be the development of external technology, including tools and process development, which in an indirect way affect the effective utilization of ICT tools in the company.

The performance development sub-category is considered as the primary benefit from ICT by improved financial performance, employee development, speed of service and activities, improvements in quality, process and organization flexibility, and innovation. However, the performance development can be achieved by obtaining **effective information** which is described by currency, availability, and security. The second way is **communication improvement** which refers to internal communication that is between the company's parts, and external communication which is between the company's parts and the external environment including, suppliers, customers, competitors. The third way is the **restructuring process** which includes the factors that are changed after ICT utilization with the aim of producing improvement in performance by saving time and costs.

Lastly, the theory contains one category, a competitive advantage, which refers to the company's activities to achieve distinct value and help it to be more successful than its competitors. This can be achieved by using a variety of strategies including: **cost strategy** which refers to producing a product and/or presenting a service at the lowest cost; **speed strategy** which refers to the organization's ability to respond quickly to its customers; **quality strategy** which

produces its product and presenting its service, via a complete system that knows the customer needs and presenting; **flexibility strategy** which refers to modifying its products and services according to the customers' demands.

Grounded Theory Framework

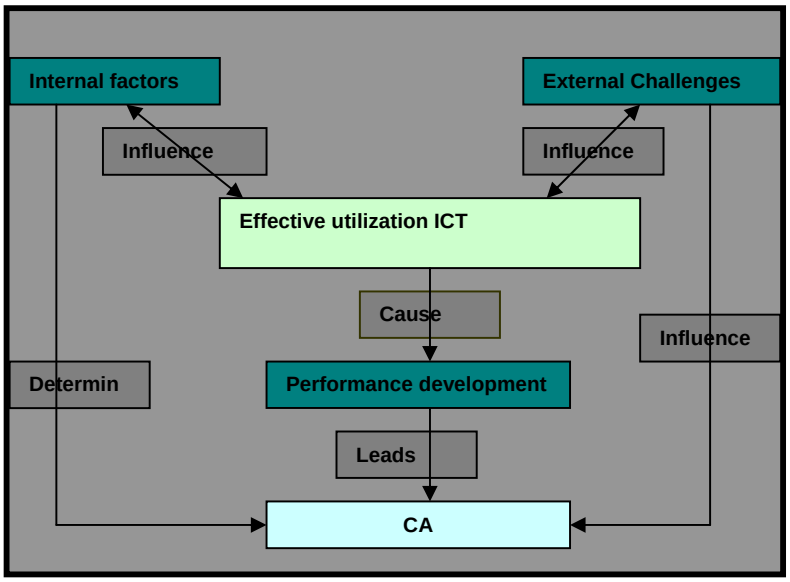

Figure 3: Theory Framework

5. Summary of the Findings

Based on the analysis of the qualitative data the following summary of the most important findings and conclusion were explored.

1. The current application of ICT in the context

A. The current application of ICT in Jordan in general

According to the data which were collected and analyzed, ICT diffusion and application is still in the early stage and ICT diffusion is still slow. The researcher found that this is for many reasons: Jordan is considered as a poor country with limited resources; it depends heavily on outside aids especially from USA and UK and from oil countries like UAE. The financial situation affects ICT investment; especially it needs a huge amount of money for infrastructure purchasing, maintenance, training programs and so on.
The strong points of ICT in Jordan are the availability of a highly educated work force and an increase in the specialists in ICT field.

B. The current application of ICT in manufacturing companies

Based on data analysis, the researcher found that all the participants' companies have a computer, which is considered as a main component of ICT tools. However, there is a difference among the companies in terms of the quantity of PCs. That depends on many factors; for example, company size in term of employees' number, the number of PC is determined by the company's need and work nature. According to the interview analysis, in general, the amount of money that is spent on training programs, motivation and wages is still low.

Also, the result indicated that the use of networks is still low in most companies because it is still expensive for them to connect all the people with networks which require them to combine it with a landline which has to be pay for. Most of them use ICT for the micro office, such as word processing and presentation. Some big companies use advanced ICT tools for design, quality control, manufacturing, and so on.

2. The factors that influence ICT application in Jordanian manufacturing companies.

According to the data we can divided the factories into groups

A. Internal factors; involve financial ability, human , and organizational factors. Also, according to the result, the financial ability plays a role for ICT application in the companies.

B. External factors; it is important, but it plays a lower role than the internal factors in ICT application. These factors include two main elements; business environment and development of external technology.

3. The challenges of ICT applications in Jordanian manufacturing companies.

firstly, an increasing cost investment of ICT tools at the same time increasing maintenance cost of tools; secondly, an increasing demand for expertise and skilled ICT people; finally employees' and managers' resistance to apply new ideas.

4. The extent of application of the CA issue in Jordanian manufacturing companies and factors that affect it.

The results show that CA is a matter of concern for companies which use ICT. Most companies follow four strategies to achieve CA: cost, speed, quality and flexibility strategies. Also, the results indicated the most important factors that affect CA emergence: change customer demand, technological change, customer satisfaction**.**

5. The relationship between ICT and CA in the context

The result indicated that there is a positive relationship between ICT applications and CA. Also, effective utilization of ICT is considered as a source of CA in manufacturing companies. In more detail, the availability of information decreases the uncertainty in the business environment and ICT tools, like the internet, help the company to be on line with business environment including customers, suppliers and competitors. The availability of such information helps the company to build its strategy on this information.

The result of qualitative data indicated that there are modifying factors related to ICT and CA that are performance factors. The company has to achieve performance improvement by using ICT tools to achieve CA in its product.

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