

Assessment of the Economic Impacts of ICT in The Hashemite Kingdom of Jordan Project

Final Report

For: Ministry of Information and Communications Technology



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Executive Summary

The Hashemite Kingdom of Jordan was among the pioneers in the region to realize the economical potentials coming along with rapid developments in ICT that were happening in the last decade of the past century, therefore Jordan launched several initiatives during the past 10 years to leverage the economical benefits of ICT developments. Hence, strategic plans were developed and implemented, investments were made in various areas related to ICT, especially in the ICT infrastructure, people adaptation to ICT tools, liberalization and regulation ICT market and many others. In the same time few initiatives were more focused on leveraging ICT tools to move into Knowledge economy such as the initiatives that took place in the Education sector.

The need to define efficient measures to assess the impact of ICT on the economy has been rising since the early stages of the journey, but due to the need to stay among the regional pioneers and the general realization of the need to frog leap, higher priority was always given to further development rather than assessment of achievements.

In the recent couple of years the need to assess the impact in order to design future initiatives and develop policies and strategies, helped in raising the priority for ICT Impact assessment.

The study at hand aimed to set the first building block in defining and applying a more integrated performance model that will demonstrate the impacts of the ICT developments across the various Jordanian economical sectors, in addition to the overall Jordanian economy level.

In spite of all the challenges while identifying reliable sources for statistical data needed to measure the ICT impact, the project team managed to develop a valuable tool that is robust yet flexible enough to accommodate the rapid developments in ICT technologies. The Impact Assessment Model was used to draw the baseline for ICT Impact on the Jordanian economy.

According to the study outcomes, ICT contribution to the GDP reached to 14.1% in total of Jordan's economy, this figures comprises of 9.5% as a direct contribution by the ICT sector and 4.62% by enabling the other economical sectors considered as indirect contribution to GDP.

Additionally, ICT contributed an average of 13.9% to the country's overall productivity and 22.1% to Jordan's labor productivity. Meanwhile and in terms of impact on employment ICT created 84,154 new jobs divided between direct employment in ICT sector, indirect employment in other sectors for new jobs resulting from the introduction of ICT in these sectors and induced employment in other sectors resulting from economic activities of ICT sectors employees. As for revenue coming from taxation and despite of the lack of numbers regarding IT taxations, the telecommunication and indirect ICT generated taxes reached JD 336,145,610.

In addition to that, ICT increased the potentials for the Jordanian economy to benefit from a large female workforce since tasks using ICT tools does not require physical effort, minimize location restrictions, and increase the flexibility of working environment. This is demonstrated in an overall coefficient strength factor of 0.902 between ICT diffusion and the ability of females to have better



working opportunities; where 0 means almost no chance for women and 1 means equal opportunities between genders to work for the same job.

A quick view on the above key results clearly shows the benefits that Jordan would have from applying periodic comprehensive ICT impact assessments, as the outcomes will help policy makers better design, develop, implement and monitor their policies and strategies. In addition, these results demonstrate the need to integrate ICT related initiatives with sectors' plans to promote and develop these sectors.

It is urgently needed to promote the results of this study and build on the achievements made in this project to come up with a complete comprehensive framework to periodically assess ICT impact, which means that many stakeholders need to work hand in hand to ensure the availability of the required data upon running the Impact Assessment Model to ensure more accurate results which in turn leads to ability to make better decisions towards ICT diffusion; hence maximizing positive impacts of ICT to the country's economy.



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1 Introduction

This document serves as a corner stone to help ICT policy makers define their methods to maximize the benefits and the positive impacts from ICT, and to help them better reach the other economical sectors in maximizing the benefits from their investments in the information and communication technologies.

The report summarizes the various detailed documents that were developed during the course of the "Assessment of the Economic Impacts of ICT in The Hashemite Kingdom of Jordan" Project. Hence, mainly key results were addressed in this report in order to ensure delivering a direct and clear message to interested stakeholders. In the meantime, further analysis details are to be found in the external annexes -Project deliverables - which are the Analysis Report, and the ICT Impact Model along with its manual, to help ICT policy makers perform thorough future assessments and better define targets.

Section 2 of this report provides a brief about the method and the approach followed by the project team to conduct the project and reach to required results. Section 3 provides an overview of the "Impact Assessment Model" that was developed and applied during the project to become the tool used now and in future to assess and identify the ICT impact on the Jordanian economy. The key results of the study are summarized and illustrated in Section 4, followed by section 5 with an overview the survey conducted.

The key recommendations are stated at section 6, driven from the findings resulting from the methodology of conducting the project, and analyzing the results of the project and the survey.

Although the project team faced many obstacles and challenges to identify and assess the economical impact of ICT in Jordan, the results will still serve as a good baseline for future assessments.



2 Study Approach

The scope of the study is concerned with the impact of ICT on economy, the project team followed a well established approach to assess the ICT impact on Economy starting with the selection of representative sectors to be studied through assessing ICT use as well as the impact of ICT on those sectors, mainly in terms of productivity, labor productivity, employment, and research and development. The criteria used for selection are divided into quantitative and qualitative, and weighted according to importance and relevance to the objective of the study; quantitative criterion is based on economic indicators such as Gross output, contribution to GDP, Employment, total exports, whereas the qualitative criterion is based Sector Competitiveness, Strategic Policy Focus, most Studies Internationally, and Data Availability. The selected sectors based on this approach were Healthcare, Education, Financial Intermediaries, Wholesale and Trade, and Manufacturing.

Several local and international studies, reports, related policies and strategies were reviewed and analyzed including but not limited to; the National E-Commerce Strategy, National ICT Strategy of Jordan, Jordan National Agenda, Measuring the impact of ICT use in business (UNCTAD), The Economic Impact of ICT measurement, evidence and implications, (OECD), World Telecommunication/ICT Indicators (ITU), and others.

The scope of this project included conducting interviews with key stakeholders from the ICT sector and representative sectors. In these interviews perceptions and information related to; the development of ICT sector, services, usage and utilization of ICT were collected. On the other hand focus groups conducted in Amman and Irbid with sectors' representatives contributed less to the study inputs due to low attendance from invited stakeholders.

Based on the information gathered, ICT background was developed through summarizing the status of the sector in the last 10 years highlighting; the changes in laws and regulations, infrastructure development, and ICT use in businesses and households. More focus was given to the representative sectors where key ICT related initiatives were stated, and trends over the study period (1999-2008) for sector performance in terms of economic and ICT aspects were stated as well.

Furthermore, ICT indicators required to assess the impact on economy were identified depending on international standards and adapted to fit the Jordanian economy and ICT environment.

An "Analysis Model" was also developed to serve as the tool to assess the impact on the overall economy and on sectoral level. The model was built and rolled out on available data. Some of the data for certain sectors were unavailable so a multi-pronged approach to augment the model and close the data gaps was used through identifying a series of proxy indicators, and applying a series of linear growth rates to fill in the gaps.

In order to assess the main ICT aspects of the business environment, the Impact assessment model identified and measured the following aspects:



- Gross Domestic Product
- Taxation
- Female Gender aspects
- Organizational Structure and Firm size
- Quality of Information
- Outsourcing
- Urban/Rural Divide
- E-Government
- Environment
- Quality of Labor
- Flexibility of Employment
- Supply and Demand
- Cost

Accordingly the model was completed, the ICT impact on the overall economy was measured, and the impact on each of the sectors was evaluated and measured against the overall impact on the economy.

According to the lack of data, some studied aspects for certain sectors have no quantitative results and are ranked qualitatively. The scale of qualitative economic impact is measured on a five-point scale: Very High; High; Medium; Low; Very Low. Each sector is benchmarked against the others in relation to its estimated impact and ranked as such. In general, impacts less than 5% are considered to be very low; up to 10% is considered low; up to 25% of medium impact; up to 50% of high impact; and above 50% of very high impact.

The following diagram provides an illustration of the study approach described in this section.

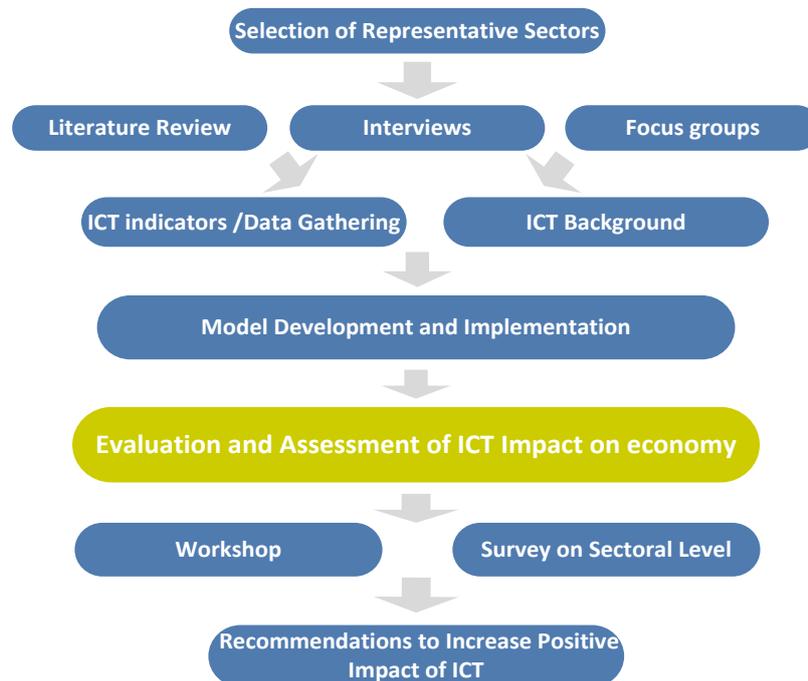


Figure 1: Study Approach

Based on the findings of the study and the workshop and survey results, recommendations were developed to increase positive impacts of ICT. Furthermore the project conducted an Enterprise level questionnaire to develop key recommendations on the firm level.



3 ICT Impact Model Overview

The ICT Impact Assessment Model is a flexible tool, developed based on all study aspects, related factors and formulas. The Model may be utilized in the future through adding more economical sectors, updating the data, and filling in the data gaps.

The ICT sector was defined to include the telecommunication sector and IT related activities, detailed in the below table.

Telecommunication (ISIC 6420)	
-	Satellite telecommunication activities
-	Wired telecommunication activities
-	Wireless telecommunication activities
-	Other telecommunication activities
IT Related Activities	
7220	- Software consultancy and supply
7221	- Software publishing
7229	- Other software consultancy and supply
7250	- Maintenance and repair office, accounting and computer machinery
7290	- Other computer related activities includes:
	- Computer consultancy and facilities management activities
	- Other information technology and computer service activities
	- Web Portals
	- Data processing, hosting and related activities
	- Software publishing
5151	- Wholesale of computer, computer peripherals equipment and software
5152	- Wholesale of electronic and telecommunications parts and equipment

Table 1: ICT related Activities

To detail the assessment of the impact of the ICT on the Jordanian economy, several aspects of the business and economic environment were identified. The analysis was completed on both the national economy macro level, as well as on the micro level of five representative sectors. Within each of these levels; productivity, labor productivity, employment, research and development, and other aspects of the business environment were measured. However and due to significant and fundamental data gaps, only contribution to GDP, productivity, labor productivity, employment, , female gender aspect, and taxation had generated significant results.



Each of these aspects was assessed as follows:

- The ICT impact on **Gross Domestic Product Contribution** was assessed by measuring the direct impact on GDP from ICT sector itself and the effect that ICT diffusion has on expanding output in the rest of the economy.

ICT impact on GDP= ICT Direct Contribution to GDP + ICT Indirect Contribution to GDP

The Direct Impact from ICT Sector is calculated using the GDP production approach which concentrates on value-added, whereby for the ICT sector itself using this formula: **$GDP = gross\ output - intermediate\ consumption$** .

The approach for calculating the indirect Impact due to ICT value-added gains adopts the same concept of calculating GDP using the Production Method, concentrating on value-added, however the formula is adapted to be **$GDP_{ICT} = Gross\ Output_{ICT} - Intermediate\ Consumption_{ICT}$** ; Where Gross Output_{ICT} is the additional output generated in the sector due to the additional ICT inputs, and Intermediate Consumption_{ICT} is the related intermediate consumption used for ICT inputs. Compared to overall Intermediate Consumption, this value is extremely limited; as it generally includes ICT hardware such as computers.

It is important to note that this additional value-added is assumed to be gross output due to reduction in cost per unit resulting from increased production, realized through operational efficiencies. This is assumed to mean that ICT did not increase unrelated intermediate consumption.

- The ICT impact on **Productivity** was assessed by measuring the extent to which the diffusion of ICT in a sector will change the levels of return a firm receives from an input during production.

Therefore and as illustrated in the below diagram, among all factors impacting productivity ICT impact on productivity is measured by adding up ICT related factors i.e. Capital ICT and ICT index.

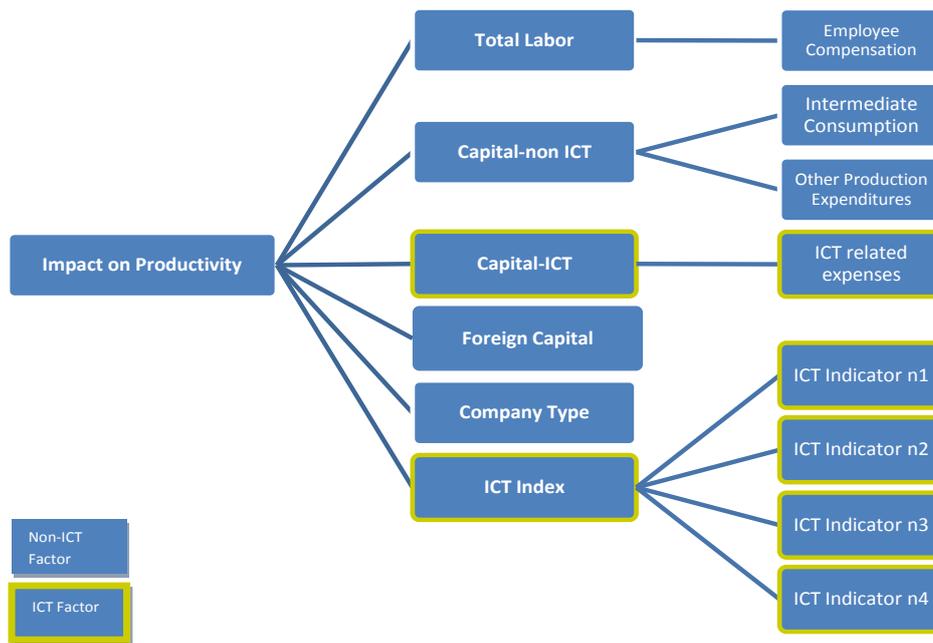


Figure 2: Impact on Productivity Factors

- The ICT impact on **Labor Productivity** was assessed by measuring the extent to which diffusion of ICT in a sector will change the level of output a firm receives from labor input.

Therefore and as illustrated in the below diagram; among all factors impacting labor productivity, ICT impact on labor productivity is measured by adding up ICT related factors i.e. Capital ICT per labor and ICT index.

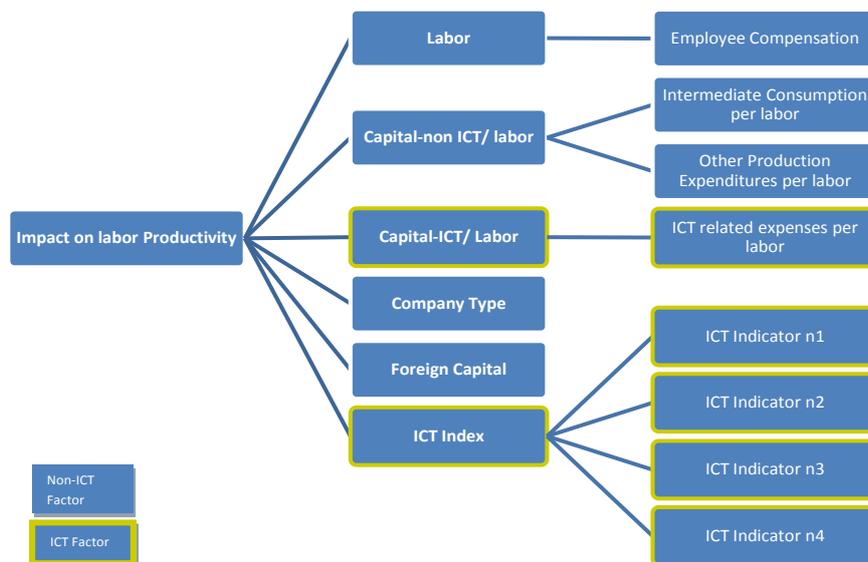


Figure 3: Impact on Labor Productivity Factors



- The ICT impact on **Employment** was assessed by measuring the number of people performing a service for monetary compensation (direct, indirect and induced).

ICT Impact on Employment= Direct employment + indirect employment + induced employment

- * Direct employment: Jobs belong to the ICT sector and its companies.
 - * Indirect employment: jobs created in other sectors through the ICT sector's consumption
 - * Induced employment: jobs generated by the increased economic activities from the sector's employees
- The ICT impact on **Female Gender Aspect** was assessed by calculating the strength of the relationship between diffusion of ICT in the economy and the percentage of female employees.
 - The ICT impact on **Taxation** by measuring the Direct Taxation from ICT (corporate, income and sales), Indirect Taxation from additional profit, output and employment generated due to ICT influences on the rest of the economy, and the Induced Taxation due to induced employment.

ICT Impact on Taxation= Direct Taxation + indirect Taxation + induced Taxation



4 ICT Impact Assessment Results

4.1 ICT Impact on Overall Economy

This section provides an overview on the results of the ICT impact assessment on the overall economy (macro-level) by summarizing the findings on the main aspects. More details can be found in the detailed analysis model document- Annex IV: Analysis Report.

All results specified in this section are based on the study calculations formulating the baseline for 2008 unless otherwise mentioned.

4.1.1 Contribution to GDP

Gross Domestic Product is the total value of final goods and services produced. The ICT sector's contribution to GDP is divided into the direct impact of ICT output on GDP through the production of the ICT sector itself, and the impact that the ICT sector has on increasing production in the rest of the economy.

**ICT Contribution to
GDP is 14.1%**

From productivity calculations regression, the ICT input influenced the total output in the overall economy and within certain sectors. For 2008, the total impact on GDP was **14.1%**, where the ICT sector itself contributed 9.5% directly to GDP; the remaining 4.6% came from the remainder of the economy. Out of this, the five sectors, in focus, contributed 2%; with the financial services sector and the manufacturing sector benefited most from increased output due to ICT diffusion.

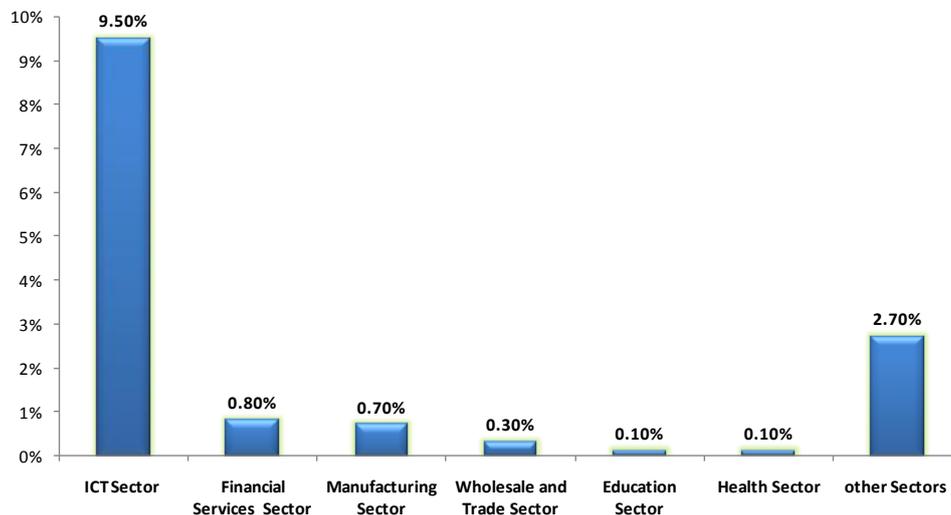


Figure 4: Distribution of the ICT Impact on GDP 2008

Results presented in the following table clearly show that the highest contributing sector to GDP (regarding ICT's contribution to GDP) is financial services. Possible reasons for this include the fact that financial services are highly dependent on the ICT as; it does not only substantially improve the speed of transactions, but also minimizes informational asymmetries, lowering the price of many



financial goods, leading to an increase in sales, whereas informational asymmetries and speed of transaction are less important for sectors such as education and health.

Due to the large scale output of the manufacturing sector in the overall contribution to the economy (at 18.5%), the mild impact from the ICT sector will generate huge results for GDP.

ICT Impact on GDP	GDP ('000 JD)	Percentage %
ICT Impact on overall Economy GDP	2,126,754	14.1%
ICT Sector Direct Contribution to GDP	1,427,738	9.5%
ICT Impact on Financial Services Sector's Contribution to GDP	122,861	0.8%
ICT Impact on Manufacturing Sector's Contribution to GDP	102,610	0.7%
ICT Impact on Wholesale and Trade Sector's Contribution to GDP	44,507	0.3%
ICT Impact on Education Sector's Contribution to GDP	20,071	0.1%
ICT Impact on Health Sector's Contribution to GDP	9,151	0.1%
ICT Impact on remaining sectors' Contribution to GDP	399,816	2.7%

4.1.2 ICT Impact on Productivity

To pinpoint the effect of the ICT sector on economic productivity, time-series data were used to run a regression with a variety of factors. With output as the dependent variable, the independent variables were divided between variables not related to ICT and those that are related to ICT), in order to distinguish the effect as follows:

ICT Impact on Productivity of the overall economy is 13.9%

- | | |
|--------------------------------|-----------------------|
| • Variables not related to ICT | - Labor |
| | - Company type |
| | - Non-ICT capital |
| | - Foreign capital |
| • Variables related to ICT | - ICT related capital |
| | - ICT diffusion index |

On productivity within the overall economy, ICT contributed an average of **13.9%** to productivity, mainly affected by the ICT impact on financial sector and the education sector.

Within the overall economy the percentage of ICT impact is broken down among ICT related factors/ indicators as follows:



Indicator	Weight	ICT Impact on Productivity %
ICT Related Capital **	100%	0.5%
ICT Diffusion Index	100%	13.9%
Percentage of Employees in Economic Enterprises Using PC Regularly	24%	3.34%
Percentage of Economic Enterprises which Use E-trade Service in Sale and Purchase Transactions	23%	3.20%
Percentage of Economic Enterprises which Train their Employees Continuously on PC Programs and Application	11%	1.53%
Percentage of Economic Enterprises which have Internet Service	10%	1.39%
Percentage of PC Sets Linked to Internet Service	7%	0.97%
Percentage of Economic Enterprises which have Intranet Services	6%	0.83%
Percentage of Economic Enterprises which Offer Services Through their Website	6%	0.83%
Proportional Distribution of Economic Enterprises, which Grant Privileges for the Employees who have Computer Skills	5%	0.70%
Proportional Distribution of Employees, who have Email Address in the Economic Enterprises	5%	0.70%
Percentage of Economic Enterprises which Deal with E-Government Portal	3%	0.42%

** ICT related capital figure is considered statistically insignificant - not included in the overall ICT impact on productivity for the overall economy.

The two factors that produced the highest impact were the percentage of employees in economic enterprises using PCs regularly, and the percentage of enterprises involved in e-trade for sale and purchases.

4.1.3 Labor Productivity

Labor productivity is defined as the level of output received from labor input. To pinpoint the effect of the ICT sector on economic productivity, time-series data were used to run a regression with a variety of factors; with output as the dependent variable, the independent variables were divided between those that are not related to ICT and those that are related to ICT in order to distinguish the effect.

ICT Impact on Labor Productivity is 22.1%

- | | |
|--|---|
| <ul style="list-style-type: none"> • Variables not related to ICT | <ul style="list-style-type: none"> - Labor - Company type - Non-ICT capital - Foreign capital |
| <ul style="list-style-type: none"> • Variables related to ICT | <ul style="list-style-type: none"> - ICT related capital - ICT diffusion index |



On labor productivity within the overall economy, ICT contributed an average of **22.1%** to labor productivity, mainly affected by the ICT impact on the financial sector and the education sector.

Within the overall economy the percentage of ICT impact is broken down among ICT related factors/ indicators as follows:

Indicator	Weight	ICT Impact on labor Productivity %
ICT Related Capital **	100%	1.2%
ICT Diffusion Index	100%	22.1%
Percentage of Employees in Economic Enterprises Using PC Regularly	24%	5.3%
Percentage of Economic Enterprises which Use E-trade Service in Sale and Purchase Transactions	23%	5.1%
Percentage of Economic Enterprises which Train their Employees Continuously on PC Programs and Application	11%	2.4%
Percentage of Economic Enterprises which have Internet Service	10%	2.2%
Percentage of PC Sets Linked to Internet Service	7%	1.6%
Percentage of Economic Enterprises which have Intranet Services	6%	1.3%
Percentage of Economic Enterprises which Offer Services Through their Website	6%	1.3%
Proportional Distribution of Economic Enterprises, which Grant Privileges for the Employees who have Computer Skills	5%	1.1 %
Proportional Distribution of Employees, who have Email Address in the Economic Enterprises	5%	1.1 %
Percentage of Economic Enterprises which Deal with E-Government Portal	3%	0.7%

** ICT related capital figure is considered statistically insignificant - not included in the overall ICT impact on labor productivity for the overall economy.

4.1.4 ICT Impact on Employment

ICT impact on employment is measured through calculating the direct, indirect, and induced employment as follows:

**ICT Impact on Employment
is 84,154 Jobs**

- **Direct employment** is the number of workers in the ICT sector and the number of workers in an enterprise in a specifically ICT-related field.
- **Indirect employment** is the number of new jobs the ICT sector creates in other sectors due to increased output effects of ICT, jobs due to ICT consumption, changes due to ICT generated labor productivity fluctuations, and innovation changes due to ICT.
- **Induced employment** is the employment generated by increased economic activity from the sector's employees in the economy at large.



The overall impact on employment was 84,154 Jobs; 16,650 were direct jobs meaning that they belong to the ICT sector and its companies. 51,600 Jobs were created in other sectors by the ICT sector's consumption, and increased output due to the ICT sector. An additional 15,904 jobs were created by induced employment. However, these jobs were underestimated due to the lack of information on ICT employees within each of the sectors, as well as the fact that there is a lack of information regarding innovations related to ICT that might generate significant additional employment opportunities.

The below diagram illustrates the distribution of the ICT impact on employment.

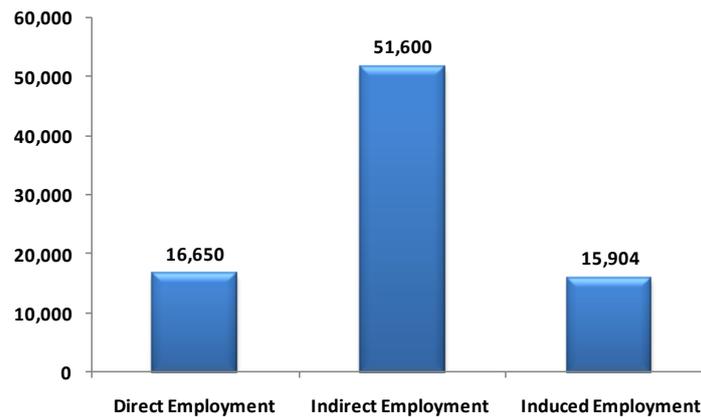


Figure 5: ICT Impact on Employment

4.1.5 ICT Impact on Taxation

ICT impact on taxation is measured through studying taxes on goods/services, corporate tax and individual income tax and categorized as Direct, Indirect and Induced Taxation.

- **Direct Taxation** that is levied directly from the ICT sector, which are corporate taxes from firms, income taxes from ICT employees, and sales tax from ICT firms.
- **Indirect Taxation** emerged from:
 - a. Corporate taxes emerging from additional profits/loss created by ICT
 - b. Income taxes saved/lost due to the addition/reduction in employees due to the ICT sector
 - c. Addition/reduction in sales tax due to the change in revenue prompted by ICT
- **Induced Taxation** emerged from induced employment created by the ICT sector.

ICT Impact on Taxation
is JD 45,891,076

The impact on taxation was **JD 45,891,076** mostly generated by the ICT sector (86%) of total impact on taxation. This result is also underestimated as only taxation from the telecommunications sector is considered, and no taxation related data is available from the IT sector.



4.1.6 ICT Impact on Female Gender Aspect

Within the workforce itself, the ICT sector has a large impact on gender balance. ICT reduces the need for physical labor and creates more white-collar jobs. Women, therefore, would find better employment prospects due to diffusion of ICT.

**ICT Impact on Female
Gender Aspect
correlation factor is 0.902**

The impact on the other sectors is found by trying to capture if the diffusion of ICT into the workplace has affected the gender balance and if so, how it has done so. To capture this, a simple correlation is conducted through comparing the percentage of female employees to the diffusion of ICT (through the percentage of ICT expenditure and the daily use of computers). In 2008, on average in the Jordanian economy, the correlation stood at a correlation factor of **0.902** indicating an extremely strong relationship between ICT diffusion and female employment.



4.2 ICT Impact on Sectoral Level

This section provides an overview on the result of the ICT impact assessment on sectoral level through summarizing findings on the main aspects. More details can be found in the detailed analysis model.

4.2.1 Manufacturing Sector

4.2.1.1 ICT Impact on Sector's Productivity

ICT impact on manufacturing sector's productivity was **7.7%** and is explained by ICT diffusion. A deeper look at the manufacturing sector productivity shows that non-ICT capital is the highest contributing factor to productivity, over 70%.

The impact of ICT capital is considered low due to the low magnitude of ICT expenditure compared to total other expenditure within the sector; in effect reflecting the labor intensive industrial base of Jordan, with small workshops, and factor-based production.

The 7.7% impact of ICT on productivity supports the fact that the Jordanian manufacturing sector, in general, did not invest much in automating core functions of the manufacturing value chain such as; use of Programmable Logic Controllers, Robots, On-line Procurement and Sales and Marketing applications. The ICT use was mostly taking place at the support functions levels such as; Accounting and HR in addition to the secretarial work. Therefore the ICT use in the Jordanian manufacturing sector did not create a marginal increase in the sector's productivity as it did not increase sales revenues and/ or reduce manufacturing direct costs.

4.2.1.2 ICT Impact on Sector's Labor Productivity

As with productivity, the low technological advancement of the manufacturing sector in Jordan means that it is relatively still more labor-intensive and was not semi or fully automated. Thus, increased ICT in this sector did not yield to a large impact.

The ICT Impact on manufacturing sector's labor productivity caused by ICT diffusion was **8.9%**. This result may reflect the fact that the Jordanian manufacturing sector is still dependent on its labor force, as opposed to other societies which have mechanized their manufacturing industries to a higher degree whom having the ICT tools coming stronger in the heart of the manufacturing process, which have led to larger impact on increasing the sector's Gross output, hence increased the number of units produced by the same number of labors. Nevertheless the use of ICT in the supporting functions has created, to a certain degree, a positive impact on increasing the capacity and productivity of the overall labors within the sector.

ICT Impact on Manufacturing Sector's:

- a. **Productivity is 7.7%**
- b. **Labor Productivity 8.9%**
- c. **Employment : 2,912 Jobs**
- d. **Taxation: JD 384,830**
- e. **Female gender aspect correlation factor: 0.91**



4.2.1.3 ICT Impact on Sector's Employment

The Jordanian manufacturing sector is labor-intensive and composed of small workshops (77.9% have less than 5 employees, as of 2007- DoS). This means that ICT spending through processes like automation, MIS, and other such aspects are relatively low. The Impact on employment is considered low as a result and is equal to **2,912 Jobs** where approximately 74% is considered indirect employment and 26% is induced employment. However the increase of ICT use in manufacturing especially in automating the manufacturing process is expected to change the labor map within the sector, as more skilled labors will be required in order to operate the automated machinery. This in turn will lead to better paying employment opportunities.

4.2.1.4 ICT Impact on Sector's Taxation

In 2008 the total taxation generated by the ICT impact on manufacturing was **JD384,830** composed mainly of income taxation from the additional employment opportunities generated by ICT sector's within the manufacturing sector (43%), sales tax due to increased revenue (41%) and corporate taxation from the increased output (15%), hence profitability generated by the ICT sector. The numbers show that the ICT impact on taxation is relatively low for the manufacturing sector that has a high contribution to GDP, but this is expected because the use of ICT within the sector is still, mostly, within the supporting functions of the manufacturing process. Hence no real increase in Gross output was created as a result. Therefore the number will get much higher when ICT use becomes part of the core functions of the manufacturing process as it will increase the Gross output and production hence corporate and sales taxation, and at the same time it will affect the employment skills and payments hence leading to increased employees income tax.

4.2.1.5 ICT Impact on Sector's Female Gender Aspect

The percentage of employees that are female in Jordanian manufacturing sector between 1999 and 2006 almost doubled, from 11.9% of female employees in 1999 to 22.1% of female employees in 2006 - DoS. Reflecting a strong correlation with a factor equals to **0.91**, between the ICT Index usage and the female employment in the manufacturing sector. The gender coefficient clearly supports the strong relation between ICT use and equal opportunities for genders, as the ICT will create a better and more flexible working environment that is less dependent on physical strength and location restrictions.



4.2.2 Education Sector

4.2.2.1 ICT Impact on Sector's Productivity

The educational sector's productivity reflects that labor aspect is the highest contributing factor to productivity, at 52.2%; as the purpose of a school is to impart knowledge and skills on young people, the primary method to achieve this is face to face interaction, thus a large number of personnel are needed. ICT capital is the next most important component, at **22.2%**. This is because education is a knowledge based industry, ICT can help disseminate and spread knowledge at fast speeds.

ICT Impact on Education Sector's:

- a. Productivity is **22.2%**
- b. Labor Productivity is **48.3%**
- c. Employment : **11,700 Jobs**
- d. Taxation: **JD 2,139,216**
- e. Female gender aspect correlation factor: **0.91**

The impact of ICT diffusion was considered statistically insignificant due to information gaps, so the ICT impact on education Sector's Productivity is considered 22.2% caused by the ICT related expenditures. So it is very clear that if information needed to calculate the impact of ICT diffusion is available as well, then the overall Impact of ICT on the Education Sector productivity would have been higher, which is expected due to the fact that Jordan has given a focused attention to enhance the capabilities of the Education sector through various initiatives such as Education Reform for Knowledge Economy and Jordan Education Initiative (JEI). Also the fact the Education output is only calculated through students fees hence use of ICT is not expected to increase sector revenue, but the use of ICT in the Education sector is expected to reduce operational costs, in addition to increasing the quality of the graduated students.

4.2.2.2 ICT Impact on Sector's Labor Productivity

The most important factor affecting labor productivity in Jordan is ICT; as ICT is a vital tool in education, allowing the same number of educational staff to impart knowledge to a far greater audience of students than that allowed by traditional 'face to face' interactions. The impact of ICT labor productivity, in education sector is **48.3%**. JEI, and EFRKE (I &II) had focused a lot on increasing the ICT skills of the teachers which in turn led to good increase of the Labor productivity as they became empowered and enabled with ICT tools that would help them perform their daily tasks in a more advanced methods and faster ways.

4.2.2.3 ICT Impact on Sector's Employment

The number of people employed in the Jordanian education sector increased from 121,787 employees in 1999 to over 162,000 employees in 2008- DoS.

ICT impact on education sector employment is **11,700 jobs** where approximately 88% is considered indirect employment and 12% is induced employment. The relatively high percentage of indirect employment is affected by the need of high number of IT skilled staff to work at the education entities to ensure all technical services and support is provided to the teachers, in addition to the need of IT teachers as all education entities are providing IT tutoring to their students.



4.2.2.4 ICT Impact on Sector's Taxation

In 2008 the total taxation generated by the ICT sector's impact on the education sector was **JD 2,139,216** composed mainly of sales tax from additional revenue generated by the ICT sector's impact (49%), income taxation from the additional employment opportunities generated by ICT within the sector (31%), and corporate taxation from the increased output, and hence profitability generated by the ICT sector (19%).

ICT Impact on Sector's Female Gender Aspect

The percentage of employees that are female in Jordanian education sector between 1999 and 2008 almost tripled, from 7% of total employees in 1999 to 24% of total employees in 2008, which reflects a strong correlation with a factor equals to **0.91** between the ICT Index usage and the female employment in the education sector. This is related to the flexibility of working environment and decrease in location restrictions at educational related entities which helped in increasing the correlation factor of female gender aspect which leads to increasing the number of female employees to work at entities other than schools.

4.2.3 Health Sector

4.2.3.1 ICT Impact on Sector's Productivity

ICT impact on the health sector's productivity is considered **medium** when compared to the ICT impact on the overall economy, due to the fact that spreading of information is vital, and regular/ updated information is necessary to the well being of the patient.

Results are statistically insignificant due to information gaps, and cannot be analyzed. However and due to the fact that ICT is not yet well active in the core functions of the health sector and yet still more at the supporting functions level, as no real initiatives took place in automating core functions; the impact is expected to be low to medium, however as the Jordanian health sector is becoming more to realize the importance of ICT use in its operations, and in trying to increase number of patients coming from out-borders therefore it is expected to see larger impact of ICT on the sector's productivity as ICT may really help in increasing revenue and decreasing the sector's costs.

4.2.3.2 ICT Impact on Sector's Labor Productivity

The ICT impact on health sector's labor productivity is considered **medium** when compared to the ICT impact on the overall economy, due to the fact ICT reduces the need for staff, while maintaining output in health facilities.

Results are statistically insignificant due to information gaps, and cannot be analyzed. However, the use of ICT in the Health sector is expected to have a high impact on the sector's labor productivity as sector's workers will become capable to handle more cases and records. Nevertheless in Jordan the Health sector did not really have focused initiatives yet to properly introduce the use of ICT.



4.2.3.3 ICT Impact on Sector's Employment

The number of people employed in Jordanian health gradually increased from almost 39,000 employees in 1999 to over 52,200 employees in 2008- DoS.

ICT was responsible for creating, in 2008, **2,041 jobs** in the Jordanian health sector (98% of which came from indirect employment, and the remainder from induced employment). The number of indirect jobs created in the health sector is considered relatively low due to the need only for IT supporting staff to manage the IT operations and ICT related tools which are still considered at its early stages.

ICT Impact on health sector's Employment is 2,041 Jobs

4.2.3.4 ICT Impact on Sector's Taxation

In 2008 the total taxation generated by the ICT sector's impact on the health sector was **JD799,610** composed mainly of sales tax from additional revenue generated by the ICT sector's impact (66%), corporate taxation from the increased output, and hence profitability generated by the ICT sector (22%), and income taxation from the additional employment opportunities generated by ICT within the sector (12%).

ICT Impact on health sector's Taxation is 799,610 JDs

4.2.3.5 ICT Impact on Sector's Female Gender Aspect

Female employees in the Jordanian health sector went from a minority in 1999 rising to a majority in 2008, reaching 74.2% of total employees - DoS, which reflects a strong correlation with a factor equals to **0.92** between the ICT Index usage and the female employment in the health sector.

ICT Impact on Health sector's female Gender aspect correlation factor is 0.92

This correlation factor reflects the importance of ICT to facilitate the employment of female staff in various positions as it provides more flexible environment and reduces the location restrictions.

4.2.4 Financial Intermediation Sector

4.2.4.1 ICT Impact on Sector's Productivity

ICT impact on Financial Intermediation Sector's productivity was **41.6%**, where ICT capital is the most important component and this is in line with the hypothesis that financial services require frequent update, accurate data, and ICT capital is needed to ensure the transmission of such data. ICT index is the next most important component, followed by labor.

ICT Impact on financial Sector's:
a. **Productivity is 41.6%**
b. **Labor Productivity 48.5%**
c. **Employment Jobs: 9,870**
d. **Taxation: JD 1,277,664**
e. **Female gender aspect correlation factor: 0.7**

This impact is due to the fact that financial sector in the last years are using various ICT tools and introduced e-services for their customers such as e-banking solutions, where it significantly helped in increasing its productivity through enabling e-transactions and managing more clients with less time and effort.



4.2.4.2 ICT Impact on Sector's Labor Productivity

ICT impact on the Financial Intermediation Sector's labor productivity was 48.5%, mainly caused by ICT capital. The contribution of ICT diffusion is considered low where results are statistically insignificant due to data gaps and cannot be analyzed.

Therefore, as we cover the information gaps the ICT impact results on labor productivity will increase as the diffusion of ICT significantly helped the labor to produce more using ICT tools through serving more clients and communicate more effectively specially that banks have many branches and insurance companies usually deals with lots of external parties to deliver its services on daily basis.

4.2.4.3 ICT Impact on Sector's Employment

The number of people employed in Jordanian financial services gradually increased from almost 17,100 employees in 1999, to 23,200 employees in 2007- DoS.

ICT was responsible for creating, accumulatively till 2008, **9,870** jobs in the Jordanian financial services (40.5% of which come from indirect employment, and 59.5% from induced employment).

The ICT impact on employment figure can be justified as financial sector needs IT skilled staff to support and manage the ICT systems at its various entities as they have advanced technologies compared to other sectors, and their salaries are high and capable of enhancing their level of living which affects the induced employment.

4.2.4.4 ICT Impact on Sector's Taxation

In 2008 the total taxation generated by the ICT sector's impact on the financial services sector was **JD1,277,664** composed mainly of income taxation from the additional employment opportunities generated by ICT within the sector (44%), sales tax from additional revenue generated by the ICT sector's impact (40%), and corporate taxation from the increased output, and hence profitability generated by the ICT sector (16%).

4.2.4.5 ICT Impact on Sector's Female Gender Aspect

The percentage of female employees in the Jordanian financial services sector from 1999 to 2008 grew from 24.1% to 26.1% of the total number of employees - DoS, which reflects a good correlation with a factor equals to **0.7** between the ICT Index usage and the female employment in the sector; however this figure is underestimated due to accuracy of the available data used.



4.2.5 Wholesale and Trade Sector

4.2.5.1 ICT Impact on Sector's Productivity

ICT impact on the wholesale and trade sector's productivity is considered **medium** when compared to the ICT impact on the overall economy as its main ICT function is limited to transmitting data about available goods/services and storing records/data.

Results are statistically insignificant due to information gaps, and cannot be analyzed. However and due to the fact that ICT is not yet well active in the core functions of the wholesale and retail trade sector and yet still more at the supporting functions level, as no real initiatives took place in automating core functions; the impact is expected to be low to medium, however the wholesale and retail trade is becoming more to realize the importance of ICT use in its operations, and in using e-procurement and e-commerce therefore it is expected to see larger impact of ICT on the sector's productivity as ICT may really help in increasing revenue and decreasing the sector's costs.

4.2.5.2 ICT Impact on Sector's Labor Productivity

ICT impact on the wholesale and trade sector's labor productivity is considered **medium** when compared to the ICT impact on the overall economy, mainly caused by ICT diffusion where it is almost four times of the impact of the ICT capital.

Results are statistically insignificant due to information gaps, and cannot be analyzed. . However, the use of ICT in is expected to have a high impact on the sector's labor productivity as sector's workers will become capable to handle more tasks cases and records. Nevertheless the Health sector did not really have focused initiatives yet to properly introduce the use of ICT.

4.2.5.3 ICT Impact on Sector's Employment

The number of people employed in the Jordanian wholesale and trade sector gradually increased from 110,200 employees in 1999, to 253,500 employees in 2008 - DoS.

**ICT Impact on Trade
sector's Employment is
14,823 Jobs**

ICT was responsible for creating, in 2008, **14,823** jobs in the Jordanian trade sector; most of which come from indirect employment, and the remainder from induced employment.

4.2.5.4 ICT Impact on Sector's Taxation

In 2008 the total taxation generated by the ICT sector's impact on the wholesale and trade sector was JD 33,397,946 composed mainly of sales tax from additional revenue generated by the ICT sector's impact (70%); corporate taxation from the increased output, and hence profitability generated by the ICT sector (27%); and income taxation from the additional employment opportunities generated by ICT within the sector (2.5%).

**ICT Impact on Trade
Sector's Taxation is JD
33,397,946**



4.2.5.5 ICT Impact on Sector's Female Gender Aspect

Female employees in the Jordanian wholesale and trade sector were resembling a minority in 1999 not exceeding 9% of total employees, reaching 17.2% of total employees in 2008 (DoS), which reflects a strong correlation with a factor equals to **0.91** between the ICT diffusion and the female employment in the sector.

**ICT Impact on Trade sector's
female Gender aspect
correlation factor is 0.91**



5 Survey Overview

A field survey was conducted to address the effect of adopting and using ICT by enterprises and organizations representing six sectors (ICT, Manufacturing, Health, Education, Financial Intermediation, Wholesale and Retail Trade). The survey covered a sample of 120 enterprises using a questionnaire form that was designed especially for this purpose. The questionnaire included sections about the general information of the enterprise; past experience with the use of ICT, perception and awareness regarding the effect of ICT on the performance of the enterprise in terms of economic aspects and the main initiatives, plans and recommendations to increase the use of ICT in the enterprise.

The collected questionnaires were checked, verified and then entered using Excel data entry frame. The findings were extracted through descriptive analysis of the data. The results were represented on the overall level and on the sectoral level at the survey report.

Survey results showed strong relation between the degree of investment/use of ICT in the sector and the depth of the impact on the economic performance. ICT and financial sectors were the largest beneficiaries from the ICT revolution in Jordan in terms of use, economic gain and performance.

Firms stated that the ICT diffusion will increase and it will be more utilized through the development and expansion of ICT infrastructure, developing sectoral strategies for ICT diffusion, awareness, usage and support, cost reduction of ICT components available in the market, having application of information and networks security systems, centralized, on-line databases for the different sectors, Directing the attention of public to the importance of ICT development, particularly in remote areas of Jordan, and reduction of tax rates on ICT components.

All results and details can be found in annex IV: Survey Report.



6 Recommendations

When His Majesty King Abdullah II blessed the REACH initiative in 1999, Jordan has declared its long term strategic goal to become part of the Knowledge-Based Economies. At that time, in lighted by the vision of His Majesty along with His continuous support, in addition to a sincere governmental and national will, the leaders of the Jordanian ICT sector envisioned the need to pave the path to achieve the set goal, therefore, in the following decade their main focus was to create the enabling environment for ICT to become an enabler of the Knowledge-Based Economy. Hence, the key initiatives of these years were more targeted towards:

- Developing a robust State-of-Art infrastructure, that would be capable of in fulfilling the provisioned growing needs for connectivity, therefore initiatives like; ICT Market liberalization, Connecting Jordanians, Schools and University Networks, Jordan Broadband and Knowledge Stations, in addition to many others took place in the past decade aiming at increasing access and enhancing connectivity all across the country
- Empowering Jordanian human capital with efficient ICT skills; that would enable the Jordanians utilize the benefits of ICT in their day to day personal, social and working life. Therefore initiatives like ICDL and Cambridge training took place, but more importantly and since the majority of the Jordanian population is still in schools and universities; extra attention was given to reform the educational system to empower today's students with the effective skills and knowledge that will enable them create the better prosperous future of Jordan. Hence initiatives like Education Reform for Knowledge Economy (ERFKE), Jordan Education initiative (JEI), Computer for each Student, along with others were targeting the students segment.
- Developing a strong and productive ICT sector that is capable of enabling the other economical sectors with effective ICT based tools. Therefore many initiatives took place to support the sector and enhance it, among these initiatives were the liberalization of the market, the linkages with industry leaders, opening of new markets to increase its revenues hence increase its capabilities.
- Creating a legislative environment which is capable to facilitate the use of ICT in various domains, hence initiatives like the Electronic Transaction Law took place
- Facilitating financing mechanisms and attracting international strategic investments that will both facilitate financing and in the same time enrich Jordan know-how capabilities

So and In brief, in the past decade Jordan was primarily focused towards developing and enhancing its capabilities as these are the building blocks for future waves of action plans that will leverage these capabilities to achieve Jordan's long term goal of becoming a Knowledge-Based economy. A thorough revision for ICT Impact assessment study outputs supports that conclusion; as the ICT sector grew in a fast pace maintaining a continuous high growth rates in its direct contribution to the Jordanian economy, whereas indirect contributions were growing in much slower rates. This can be clearly seen when drilling down into the indicators used to assess the ICT impact, as indicators like



use of e-trade in enterprises, had very low values. Also the brief firm level survey that was conducted during the course of this project supports the above conclusion as enterprises mostly showed interest in ICT but in the same time are not highly using IT in their core business functions.

6.1 Five Years Recommendations

Based on the outputs of this study, including the Assessment report, the Analysis results and the survey results, the key recommendation relies in the need to shift the focus of the coming strategies and action plans to increase their leveraging of the developed ICT capabilities in the different economical sectors, which in turn will eventually lead to transferring these sectors into becoming more effective and productive. Hence, these sectors should start involving more ICT in their core business functions, in order to efficiently realize the benefits of having ICT as an effective enabler.

The way to implement such a recommendation is through considering it as a strategic goal for the next five years that need to be addressed from several aspects in order to be achieved. These aspects and their relevant high level actions may be grouped and explained as follows:

6.1.1 Raising Awareness

Study outputs, interviews with stakeholders and survey results show clearly that various economical sectors need to know more about how ICT could help them in their performing their daily activities. As many of them indicated and presented their interest in adopting ICT but their actions and the values of the relevant indicators show that the majority need help in better understanding the role of ICT in their domains. To have efficient mechanisms to raise awareness the following ideas may be helpful:

- a) Always work with sectors' formal representatives such as; associations and unions; as these are fully aware of the unique characteristics of their sectors' so they can help delivering the key messages in a better form
- b) Design and implement targeted awareness campaigns for each sector in order to ensure relevance of content and examples
- c) Encourage and conduct missions to countries that have scored successes in using ICT in their sectors core functions
- d) Promote success stories to encourage others to follow proved practices

6.1.2 Alignment between ICT and Business

It was clear throughout the course of the project that in many of the Jordanian sectors and enterprises; ICT is thought of and implemented in disconnected manner from business, which led to inability of measuring ICT benefits on business levels. Therefore reaching an effective alignment requires several types of alignments and changes on how Jordanian businesses and enterprises work, therefore the following need to be considered:



- a) Work with sectors' formal representatives to ensure having ICT related objectives in their Business strategies to develop and enhance their sectors, as these objectives shall become strategic goals for their ICT strategies. Thus achieving ICT goals will show and create direct impact on achieving business objectives. So ICT will be considered a strategic tool for sectors' development
- b) Promote measuring performance monitoring of ICT initiatives by measuring achievement of related business objectives, and start by promoting this concept in the government as a model for the other sectors
- c) Promote transforming ICT from being a cost center in any enterprise into becoming an enabler, through promoting the need to conduct value chain analysis for the various sectors and highlight the role of automated core functions in improving the whole value chain.

6.1.3 Human Capital development

Human Capital is the core element for any development, therefore it is essential to give this aspect a special attention. The common type of providing basic ICT skills only did not lead much into creating demand by work force for more automation of core functions.

- a) Promoting of having specialized relevant to business domain programs is expected to give much better results in creating higher demand for ICT in various business domains
- b) Working with academia to strengthen ICT and Non-ICT students skills in using ICT will lead to have better capable working force
- c) Encourage academia-business cooperation in all sectors, in order to introduce ICT in the different academic specializations.

6.1.4 Laws and Regulations

The legislative environment is essential for adoption of ICT based solutions, as enterprises should be legally comfortable while conducting their electronic transactions; also the laws and regulations play a major role in offering various types of investment forms in ICT enabled enterprises

- a) Encourage sectors' to review and identify their legislative needs that would ease adoption of ICT in their core businesses
- b) Develop regulatory framework to increase the trust of in electronic transactions, protect data, enable e-payment

6.1.5 ICT solutions and tools

It is important to have innovative ICT solutions that would enable business functions effectively, therefore below concepts worth to be considered

- a) Encourage the various sectors to introduce ICT (automation and usage of new applications) into core business functions through comprehensive analysis of sectors



value chains and firms value chains which have higher impact on economy development rather than limiting its use to supporting functions, accordingly encourage ICT sector companies to develop relevant products and services

- b) Encourage the development of shared ICT services to be used by enterprises mainly SMEs.
- c) Encourage and support private sector ICT innovation activities in research and software development...etc
- d) Encourage e-content creation that is relevant to economical sectors' contributors

6.2 Enhancing Measuring ICT Impact Recommendation

- a) Adopt a methodology to ensure proper data management for Impact Assessment defined Indicators
- b) Certify Data sources and define Information map

Periodically revise the Impact Assessment Model to ensure the validity of the used indicators, as these indicators may change by the introduction of new ICT technologies.



7 Appendix I: Annexes

- 7.1 Annex I: Analysis Model**
- 7.2 Annex II: ICT Impact Model**
- 7.3 Annex III: ICT Impact Model Manual**
- 7.4 Annex IV: Survey Report**