

Dependency Analysis of Other Service Sectors On ICT

¹Narinder Singh Rana, ²Dr. S N Panda

¹Research Scholar, Punjab Technical University, Jalandhar, Punjab, India

²Professor, RIMT-Regional Institute Of Mgt & Tech., Mandi Gobindgarh, Punjab, India

Abstract

The use of the computational and communication devices has been increasing at an exponential rate for the last couple of decades. Today, along with the Information Technology (IT) and IT enabled Services (ITeS), all other sectors such as financial institutions, manufacturing and retail, transportation and logistic services, tourism, pharmaceuticals, education, public governance etc are highly dependent on ICT (Information and Communication Technology) infrastructure and resultantly the economic growth and stability of a country are highly dependent on the secure and continuous availability of the ICT resources. A miscreant or an adversary today just needs to target this subtle and neophyte backbone of the neo economy and bring more disaster to the country than any weapon can. It has been observed in past that the breakdown in the ICT infrastructure has caused a ripple effect in the economy and created an environment of instability. In this paper, the authors have studied the impact of the ICT sector on other sectors of the economy and the society as a whole.

1. Introduction

The last three decades can very well be termed as the computer age, as in this tenure we have seen the sapling called ‘Personal Computer’ growing into a tree called the Internet. It is paradoxical to understand whether the growth of ICT sector has influenced other sectors to expand and depend on it or, the growth in other sectors and their need for communication propelled the ICT sector. But eventually the effect has been that today all the sectors of economy are heavily dependent on ICT sector. In this paper, the authors have used the data from the sectoral e-Business watch study conducted on different sectors of the European economy by various organizations in contract with the European Commission, Enterprise & Industry Directorate General to study and assess the impact of ICT on European enterprise and industries in general and the economy as a whole. The analysis is primarily based on the e-business watch surveys and Eurostat data. According to the latest data available from the Eurostat, Fig 1.1 shows, in percentage, the value added in the GDP and personnel employed by the ICT sector in various European countries. The graph exhibits that the ICT sector had a significant contribution of average 4.2 % in the GDP of the European countries in 2008 and employed average of 2.4% of the total personnel employed in the member countries. This impact of the ICT sector is only a fraction of contribution that the ICT is making to the growth of the industries and overall economic development of the countries.

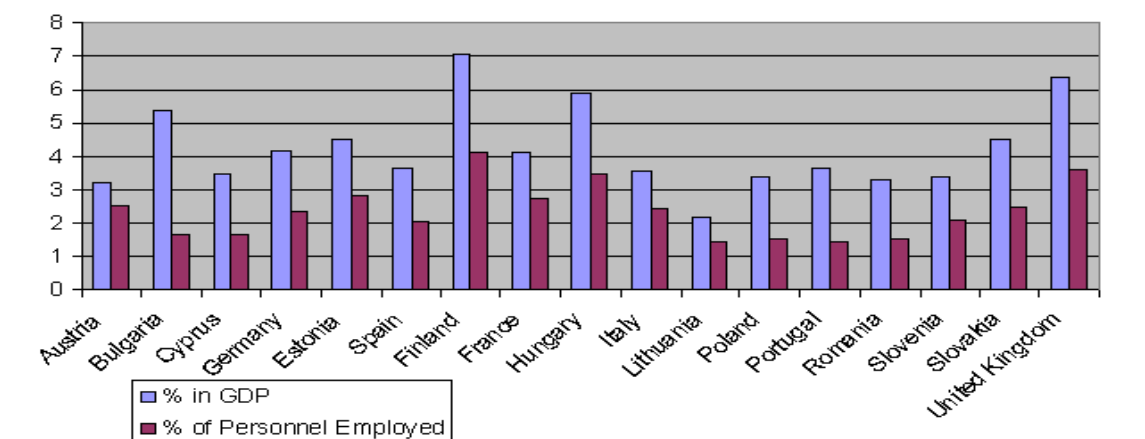


Fig 1.1 Percentage of Value added by ICT sector on GDP

In the following sections, the assessment of the impact and use of ICT technologies in other prominent sectors will be studied. A common framework and methodology is used to assess the preparedness, implementation, efficiency and value addition done by the ICT in conducting e-business in other sectors. Following parameters have been used to assess the preparedness of the businesses to embrace and successfully implement e-business. Firstly, penetration level of the internet in the sector (as it is primary pre-requisite to implementation of ICT), secondly the use of network technologies like intranet, extranet, remote access to data etc, and lastly the security and authentication in place to protect the business from the perpetrators. Further the contribution of ICT as the driver of process and product efficiency and/or innovation is used to establish the impact ICT has on that particular sector. Also, some of the business application and innovation brought about by use of ICT in various sector are briefly discussed with the help of a business case study.

2. Financial Institutions

If we have to select one sector that has been revolutionized by use of ICT, it would certainly be Banking, Insurance and other financial institutions sector. The last couple of decades have seen fundamental changes in the quality and content of these sectors worldwide. Automatic Teller Machines, Real Time Gross Settlement, Electronic Fund Transfer, Electronic Data Interchange, Mobile Banking, Online Bills Payments etc have become common terms and represent the novel instrument to carry out financial transactions. According to the latest data from Eurostat, the financial services sector generates more than 20% in value added revenues and employs more than three million people in EU-25. The Financial Institutions(FI) are quite advanced when it comes to the general ICT uptake indicators like Internet access, intranet, extranet and remote access of data. Almost all (99%) of the Financial Institutions in EU-25 had internet access and almost 80% of these (weighted by employment) had broadband connection. The survey also shows that 9 out of 10 companies either had Local Area Network(LAN) or Wireless Local Area Network (WLAN) based intranet, almost half of the financial institution, 5 out of 10, were also found to have extranet connection with some customers. The uptake for the remote data access in the FI has been slow at 37%, primarily because of the security concerns and nature of data. In term of the security measures and authentication procedures the financial institution are forthright as antivirus software and firewall were implemented by 9 out of 10 organizations. As many as 87% of banks have reported that they take periodic backups to recover data in case of catastrophic failure or security breach. One technology that still has scope of further inclusion in financial institution is the secure server technology as currently only 8 out of 10 banks are using it, especially the small and medium banks have further scope of improvement in implementation of secure servers as they are considered vital for secure transactions. Also in authentication techniques PIN codes and encryption are used by 68% and 61% organization respectively but digital signature are being used only by about 38% FIs. Almost 90% of Large (250+ employees) and Medium (50-249 employees) banks and 77% of Small (10-49 employees) banks have reported to have website which is used for e-Marketing and e-Banking interaction with the customers. Due to the cost effective nature of e-Marketing it is being used as the most commonly used tool for marketing and advertisement. It has been observed that the small banks which have effectively used websites for marketing purposes have shown a significant improvement in turnover and profit as compared to the banks that do not have a website.

Another important factor which shows the ICT uptake in the banking industry is that 8 in 10 banks have reported that they regularly interact with public authorities through Internet. The interaction activities include gathering information, e-tendering and e-filling which are rather common in most industries. During the further analysis of the impact of ICT investment on increased labor productivity, innovation, market structure and sector value chain, it has been observed that ICT investment has a positive effect of the total productivity of the financial institutions but ICT capital has to be appropriately supported with the complementary organizational changes and highly skilled human capital. To analyze the Impact of ICT on innovation is proxied by the number of Initial Public Offerings (IPO) because the new entrepreneurial venture can be facilitated to ICT as it does not require old capital as is evident from the Internet only banks such as Egg Bank and SkandiaBanken.

3. Retailing

Another significant sector of the European economy is the retail sector which, according to the Eurostat data, generates more than 20% in value added revenues and employs about 16.74 million people in around 3.73 million firms out of which 3.5 million firms are micro firms employing 1-9 people. The retail sector comprise of three processes of trade, between wholesaler and retailer, internal operations and, interaction between retailer and the end user of the product. The retail sector has a high ICT uptake as indicated by factors such as Internet access, intranet, extranet and remote access of data. A 95% of the firms weighted by employment are connected to the Internet, the percentage is slightly lower as compared to other sectors as a large number of family run retail stores operate even without a computer. Although the penetration rate of Internet is 100% and 99% in large and medium sized organizations respectively. Almost half of these organizations (53%) had a broadband internet access. The survey also shows that 66% companies weighted by employment are connected using either a Local Area Network(LAN) or Wireless Local Area Network (WLAN) based intranet. The uptake for the remote data access in the retailing is about 45% In the survey, about 60% of the firms said that they were budgeting the same amount for ICT in the next financial year, 35% said that they are actually planning to increase the ICT budget for next year and only 3% planned to decrease it. The most important aspect of the retail management that is effected by ICT is the Supply Chain Management (SCM) which is divided into the upstream supply chain from the manufacturer or the wholesaler to the retailer i.e. e-procurement, the internal supply chain from the ware house to the stores and movement of the products within the store i.e. e-operations and lastly the e-marketing and e-sales which constitute the downstream supply chain from the retail firm to the customer. In 2007, almost 60% of large retailers said that they either process or exchange data electronically, as an industry average, retailer accounting for 55% of total employment said that they order at least some goods online and 50% said that they received at least some invoices electronically, soon all B2B exchanges of invoices is going to be electronic, especially for the organizations which do business regularly. In EU-7 about 31% of firms have been conducting most or good amount of internal processes electronically. Bar-coding is another advanced electronic mechanism that is being used by firms representing 59% of employment, in their in-house operations. Latest technology such as RFID is also being increasingly used by the retailer in Europe. The use of ICT in the downstream SCM, i.e., from the retailer to the customer has also been increasing continuously as in 2007 retail firms representing 69% of employment had website which is used to sell products,

facilitate access to product catalogue or provide after sale service. As in case of financial institutions, ICT has a positive effect on the productivity in the retail sectors, but it has to be appropriately, complemented with the organizational changes and skilled human capital. ICT implementation has also been found to positively effect the product and process innovation in the retail sector as 21% of retails firms, representing 32% of total employment, made some kind of product innovation in 2006/07 out of which 70 % of these innovations were enabled by ICT. It has also enabled large number of process innovations as 45% of firms had introduced such innovation enabled by ICT. According to almost half of firms weighted by employment also believe that ICT usage also has a considerable effect on the competition and market structure in Europe.

4. Transportation And Logistics Industry

The Transport and Logistics Industry (TLI), which covers the rail and road transport (both freight and passenger), warehousing and storage, cargo handling and other support activities, has a contribution of 7% in the GDP of the European Union and employs about 5% of the total people employed in EU-27. The TLI sector has been growing consistently at rate of 2.5% since last one decade, mainly due to the economic decisions and agile manufacturing which requires just in time delivery of raw material, and on demand supply of products, but it has also led to more congestion, accidents, noise and air pollution and dependence on fossil fuels, so the efficiency gained by ICT implementation in this sector would also mean environmentally sustainable, economic growth. The road transport, because of its capacity to move goods any where in the continent with low cost, has the highest share of 44% in movement of goods followed by short sea shipping which accounts for movement of another 41% goods and railways and inland shipping accounts for 10% and 4% respectively. Whereas in case of transportation of people, road transport accounts for 85% followed by railways and airways at 6% and 5% respectively. The transportation sector alone is responsible for 28% of CO₂ emission out of which road transport alone account for 85% of total emission by transport sector. This has a huge effect on the air quality, noise pollution and other environmental hazards. Other important consideration, especially in road transport is road safety. According to an estimate, around 40,000 people die and other 1.2 million are injured in road accidents in Europe every year, so a better use of ICT can be undertaken to bring these figures down. ICT also plays an important role in the logistics industries in form of efficient identification technologies such as bar codes and RFID, communication technologies such as E-mail, Value added services and electronic data interchange and data acquisitions methodologies such as scanning and warehouse management systems. The TLI has a high ICT uptake which is evident as 97% of the firms with 10 or more employees are connected to Internet. All (100%) medium and large industries are connected to the internet and 50% of them have a broadband connection which is considered a prerequisite to the successful implementation of e-business. The internal network such as LAN or WLAN has been implemented by 50% and 22% companies respectively. In the SeBW survey the firms have agreed that ICT implementation has a positive effect on the productivity, turnover and profitability of the organization, so almost all firms (97%) said that they will increase or keep the same budget for ICT investment as that of the previous year.

The security technologies such as Public Key Cryptography (PKI), digital signatures and RFID are also heavily being used in the transportation sector as around 31% of the firms that were interviewed said that they have been occasionally or frequently using the digital signatures. The RFID, although in its inception stage, has a tremendous potential to contribute to efficiency and security, and add a new dimension to the quality of service provided for transportation of people and goods. The RFID technology is being used by firms accounting for 13% of employment in the TLI sector but in future, as the technology would mature and become more affordable, its use would grow tremendously. In the internal management of TLI sector e-Procurement, Customer Relationship Management(CRM), Enterprise Resource Planning(ERP) are also being used by 21%, 17% and 44% respectively by firms weighted by employment. In the logistic sector 92% firms said that they had implemented some ICT applications to comply with request from the customers who wanted to use these applications to better manage and track their consignments. As with other sectors studied above, ICT has been found to have a positive affect on the productivity of the firms but only if it is complemented with appropriate changes in the organizational processes and human skills, it implies that the investment in ICT has to be complemented with the investment in human resource training and skill development. In case of innovations also ICT has a huge impact on the development and implementation of innovative business products and processes, as about 57% of all companies that had introduced new product in last one year said that it was directly related to ICT and around 66% of innovative process introduced in last one year were enabled and implemented by ICT. This figure is even more important for large (250+ employees) firms as 90% of the product and process innovation in these firms have been observed to be driven or/and enabled by ICT.

5. Tourism Industry

Tourism industry is another important and fast growing sector in the European economy which employs around 8.1 million people in 1.4 million tourism related firms. The analysis of the tourism sector has been done on basis of 2006 survey of e-business watch with data primarily from EU-10 countries which represent almost 80% of European population and thus the representation of the EU. The tourism sector includes the subsectors of accommodation, gastronomy, travel and tour operators and aviation sector. The globalization and new tourist destinations have enabled better contribution of ICT in this sector in form of readily available information, comparison and purchase of tourism

products online. The tourism sector is inline with the average internet connectivity index of all the sectors in the EU with 90% of the firms representing 93% of employment were connected to the internet, out of which almost 80% firms are connected through a broadband connection. A total of 53% employees in tourism industry have been found to be using the internet regularly which is significantly higher than the all sector average of 43%, but the adoption of remote access to data is only around 13% primarily because most of the firms are micro firms, but the remote access is available to employees of 71% large firms. The adoption of LANs is also quite high in tourism industry as 63% small firms, 73% medium firms and 92% of large firms use them. The tourism sector is also a heavy user of contemporary technologies such as Voice-over-IP and Virtual Private Network as 16% of the firms have reported to be using them. The preceding analysis ensures that the necessary infrastructure of uptake of ICT is available in the tourism sector. According to the e-business watch survey, ICT expenditure corresponds to around 7% of the total cost of the company. Out of all firms that were surveyed 66% said that they would keep the ICT budget for the next year at the level of current year whereas 24% firms said that they would increase the ICT budget while only 8% would decrease it. The use of open source technologies such as Linux operating system, Mozilla browser etc and security technologies such as secure server technology and firewalls are also being adopted in the tourism sector in EU as around 34% of the firms have reported use of open source technologies and 17% firms have reported the use of secure server technologies such as Secure Socket Layer(SSL) and Transport Layer Security(TLS) in their firms in case of large firm the uptake of these technologies is much higher as 77% of them have reported to be using them. The firewalls are being used by 64% of firms which represent 81% of employment of the sector. The ERP software, accounting software and document management software is also being used by 15% , 67% and 13% of the firms weighted by employment. E-invoicing is also being used by a considerable number of firms representing 20% of employment as 24 % firms send or receive e-invoice. The ICT infrastructure is also being recognized as a major driver for the e-marketing and e-sales and it is true even for tourism sector as 49% of firms weighted by employment take orders online out of which 32% firms have reported to receive more than 25% of their total orders online, whereas 28% firms weighted by employment uses e-marketing and e-selling. As with other sectors, tourism sector also has been found to enable product and process innovation by using ICT infrastructure and technologies as in the survey 32% firms weighted by employment said that they have introduced an innovative product in last one year, out of which 53% firms said that the innovations were related to or enabled by ICT. Similarly 35% firms weighted by employment said that they had made some process innovation in last one year out of which 76% firms said that their innovation was directly related or enabled by ICT.

6. Hospital Sector

The last sector analyzed by the authors is the acute care hospital sector which serves the in-patients who stay at least over night for medical treatment and not the out-patients who are treated ambulatory. The term used in this study is e-health instead of e-business as the patients in the hospital are not treated as customers and commercialization of health care activities is considered against the medical ethos. According to the survey of e-business watch in 2005 there were 13,000 hospitals in EU and employed around 2.5 million people. The total health expenditure in percentage of GDP is between 6% (Slovak Republic) to 12 % (Switzerland) and the acute care hospitals have as average share of 35% in the total health care expenditure. The hospital sectors has been found to have very good ICT infrastructure in term of internet penetration and technologies used as 98% of hospitals representing almost 100% of employment have internet connectivity and a majority of them, 85% weighted by employment, have broadband connection. Also 34% of hospitals have said that they provide remote access of data to its employees or other authorized medical practitioners who require such data. Hospitals also has the requisite LAN and WLAN in place as 96% and 32% firms weighted by employment have reported to have them, VPN is also being used by around 63% of the firms which represent 71% of the employment. Also 57% of hospitals have said that they employee ICT practitioners and 39% said that they provide regular training to their employees. The hospitals reported that they had sent 8% of their total budget on ICT infrastructure during last year and 58% firms said that they are going to keep their ICT spending at the same level for next 12 months, while 34% said that they would increase ICT spending whereas only 8% plan to decrease it. Hospitals are also heavy user of open source technologies as 58% of the hospitals surveyed have reported to be using them. The security technologies are also being used by most of the hospitals in EU. The hospitals store, process and distribute a huge amount of very personal data related to its patients and have to face a dilemma, as on one hand they need to make this data easily available, to ensure proper treatment to the patients and on the other hand they need to protect this data from unauthorized access. In the survey 47% of the hospitals which represent 63% of employment have reported to be using secure server technology, 40% of hospitals weighted by employment are using digital signatures and more than 90% of hospitals are using firewalls to protect their networks and data from unauthorized access or manipulation of data. The hospitals are also using the ICT in internal and external process integration as hospitals representing 75% of employment have Intranet in the hospitals, more then 90% hospitals using computerized accounting system and contemporary technologies such as ERP, and electronic medical record management software are being used by 33% and 69% of firms weighted by employment respectively. E-invoices are also used by 58% of hospitals for sending document to public and private insurance firms. 67% of firms also said that they purchase online from their suppliers. As with all other sectors in the study ICT has been found to have a huge impact on innovation in hospitals as well as out of 30% of hospitals who made a product or service innovation in last 12 months, 55% said that their innovation was directly related or enabled by ICT, similarly out of 44%

of hospitals that said that they made some process innovation in last 12 months, 77% said that the innovation was enabled or related to ICT.

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