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Digitalisation and Software Sector: Challenges and Concerns

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Abstract

Recent growth of the Indian software industry has set the pace for an electronic revolution that in turn, has led to the search for talented employees with adequate knowledge of soft skills. Based on a survey of software-related companies in the metropolitan city of Mumbai, this paper provides an analytical framework for examining the future outlook of the digitalised economy. Digitalisation and its value creation has to be understood from the perspective of the user. As the importance of e-services in our economy increases, so does the importance of developing the software services industry that will promote and enhance the use of digital technology. The need for capital requirement to ensure positive growth of the variables identified, namely digital technology, software services and e-services industry is the need of the hour. The purpose of this article is to derive a set of key attributes that draws attention to the initiatives for strengthening the position of the software-driven information technology sector. The opportunities, concerns and challenges outlined identifies a directional move for the growth of the digitalised world that has revolutionised the business of conducting value chains.

Keywords: Digitalisation**,** software and services, e-services, information technology, value creation.

About the Author:

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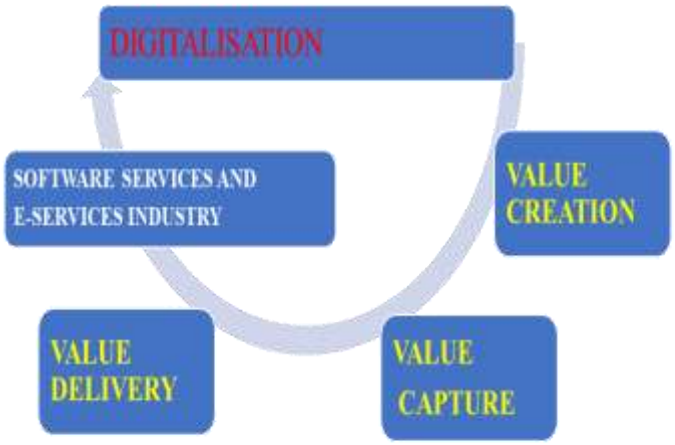
1. Information Technology and the Digitalised Economy

Information technology (IT) is a powerful tool that acts as a catalyst for accelerating economic development. Progressive steps in recent years have been undertaken towards the web and information and communication technology (ICT) use, adding value to all local activities on the internet, widening local access and skills, opening up interactive services for local debates, and increasing the participation of citizens on promotion and management of the territory (Graham and Aurigi, 1997). Organisational structure and size are the key factors determining the strength of the IT software and services industry. Software are the programs, procedures and other operating information associated with the operation of a computer system designed by the software industry. Good transport, stable electricity and communication infrastructure are considered to be vital for the continued growth of the digitalised economy.

E-services *(*electronic services*)* constitute the online services that is dependent on the use of ICT and can be used to deliver the products and services effectively. The three main components of e-services are: the service provider, the service receiver and the channels of service delivery (i.e., technology). Internet is the main channel of e-service delivery whereby a valid transaction of buying and selling (procurement) is possible, as opposed to classic channels for example, telephone, call centres, public kiosk, mobile phone, television that relate to descriptive information being available and no online transaction is made possible.

FIGURE 1: Identification of Variables in a Digitalised World



Source: Authors' compilation

Digitalisation is the conversion of text, pictures, or sound into a digital format that can be processed by a computer, that is, computer-readable format, in which the information is organised into a byte. The byte is a unit of digital information that most commonly consists of eight bits. Historically, the byte was the number of bits used to encode a single character of text in a computer and for this reason it is the smallest addressable unit of memory in many computer architectures. Digitalisation is of crucial importance to data processing, storage and transmission. Integration and adoption of digital technology into everyday life creates value from the use of ICT that is the operation of a virtual world through the use of E-services as identified in Figure 1.

2 . Methodology

2. Review of Literature

Undertaking a review of studies provides the best evidence for identifying the need for digital transformation of the economy. The related literature is reviewed with specific focus on research related to digitalisation under the following heads:

- Gupta and Arora (2015) studied the positive impact that digitisation of Indian economy will have on the growth and development of rural Indian sector. The study discussed nine pillars of digital India.
- Kaul and Mathur (2017) analysed the importance of financial literacy. The finding of the study identified the obstacles in the implementation of various programs to make India financial literate and strategies to implement these policies effectively and efficiently. Impact of digitalisation on a country can be accessed on the basis of its impact on the government, on the economy and the society. The digitalisation has created new job opportunities, have led to innovation in every sector and also led to the growth of the economy. According to the study, digitalisation brings transparency, better control and better job opportunities.
- Khan et. al. (2015) studied the concept of digitisation along with the social economic and ecological benefits of digitisation of knowledge and information. Digitisation is the social transformation started by the massive adoption of digital technologies to share and manage digital information.
- Maiti and Kayal (2017) studied the impact of digitisation on India's services as well as Micro, Small and Medium Enterprises (MSME) sectors' development and growth. The performance of the services sector improved extensively since 2000 onwards. The study concluded that India's service sector and MSME segment have the high potential for future growth with digitialistion. The inclusive growth of both India's services sector and MSME segment give a boost to the volume of trade and India's share with the help of digitalisation.
- Midha (2016) focused on barriers and remedies to prevent the challenges faced by the Indian people. Vision, scope and pillars were included. The study also discussed how the government services can be available to every citizen electronically and improve the quality of life of every citizen.
- Priyadarsini and Vijayaratnam (2016) discussed about components of digital India and its nine pillars, adaption of 'Look at Villages' policy and the smart villages driving towards smart India and the prerequisites of smart villages cluster. Indian villages need to be more focused on basic things such as health care, sanity and education.
- Sheokand and Gupta (2017) introduced the digital India campaign in the Indian economy. The study also discussed pillars and various challenges faced in the implementation of the program. Findings suggested that a digitally knowledgeable and empowered population can transform the economy. Digitalisation will lead to cost savings, increased output, better employment, enhanced productivity and literacy.

The above literature analysis identifies that each study can contribute to several different headings in relation to the three business model elements of a digitalised world, namely value creation, value capture and value delivery and reiterates the fact that a digitalised India has many positive externalities to offer.

3. Data and Research Methodology

The research is based on primary and secondary data collection from various recognised sources. The primary data has been conducted with reference to a study on software firms in the metropolitan city of Mumbai. Through this study of 114 software firms identified from the areas of Central and South Mumbai, Western Suburbs and Navi Mumbai, various analysis and interpretations have been drawn. In this study, firms had to identify the various drivers that will enhance the productivity of the software firms. One such driver was innovation and it can be noted that the findings in the study indicate that organisations in order to compete and survive in the competitive market place must constantly innovate in their development of software products and services. This analysis is important to understand the need for research and development (R&D) in the software industry that in turn will lead to the correlational existence between innovation and entrepreneurship in the world of ICT and a digitalised economy.

3.1. Innovation: An assessment of the driver for innovation in the surveyed firms is based on Table 1 and Figure 2.

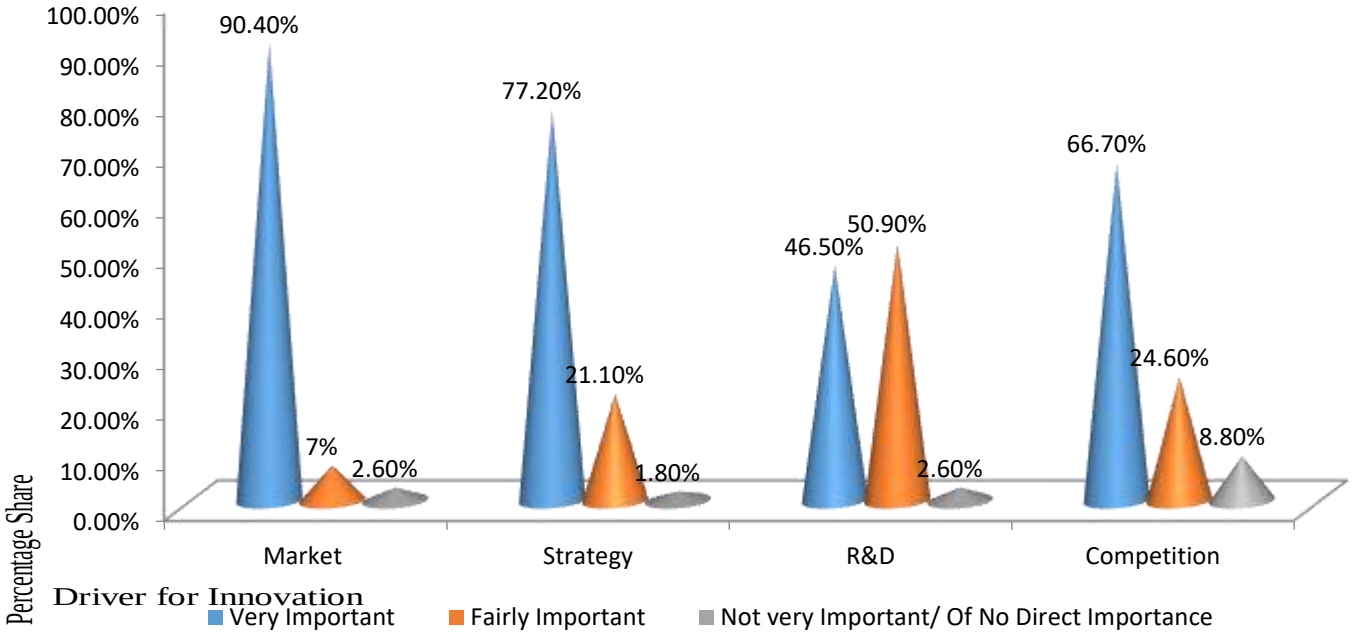
TABLE 1: Driver for Innovation in Surveyed Software Firms

Classification	Very Important (In Percent)	Fairly Important (In Percent)	Not very Important/ Of No Direct Importance (In Percent)	Number of Firms
Market	**90.4**	**7.0**	**2.6**	**114**
Strategy	**77.2**	**21.1**	**1.8**	**114**
Research and Development	**46.5**	**50.9**	**2.6**	**114**
Competition	**66.7**	**24.6**	**8.8**	**114**

Source: Authors' compilation of survey result

It can be noted that lack of investment in R&D activity by the firms has resulted in lack of innovational software by most firms. Most of the firms in the study have rated market and strategy as the very important drivers that are essential. Findings from the study have identified that significant constraints have dominated the domestic software sector market namely, the problems of building credibility, product quality and security, difficulty and cost of marketing, lack of available skills, capital and technology, small size and poor quality of demand. This could be one reason for the lack of adequate R&D facilities.

FIGURE 2: Driver for Innovation in Surveyed Firms



Source: Derived from Table 1.

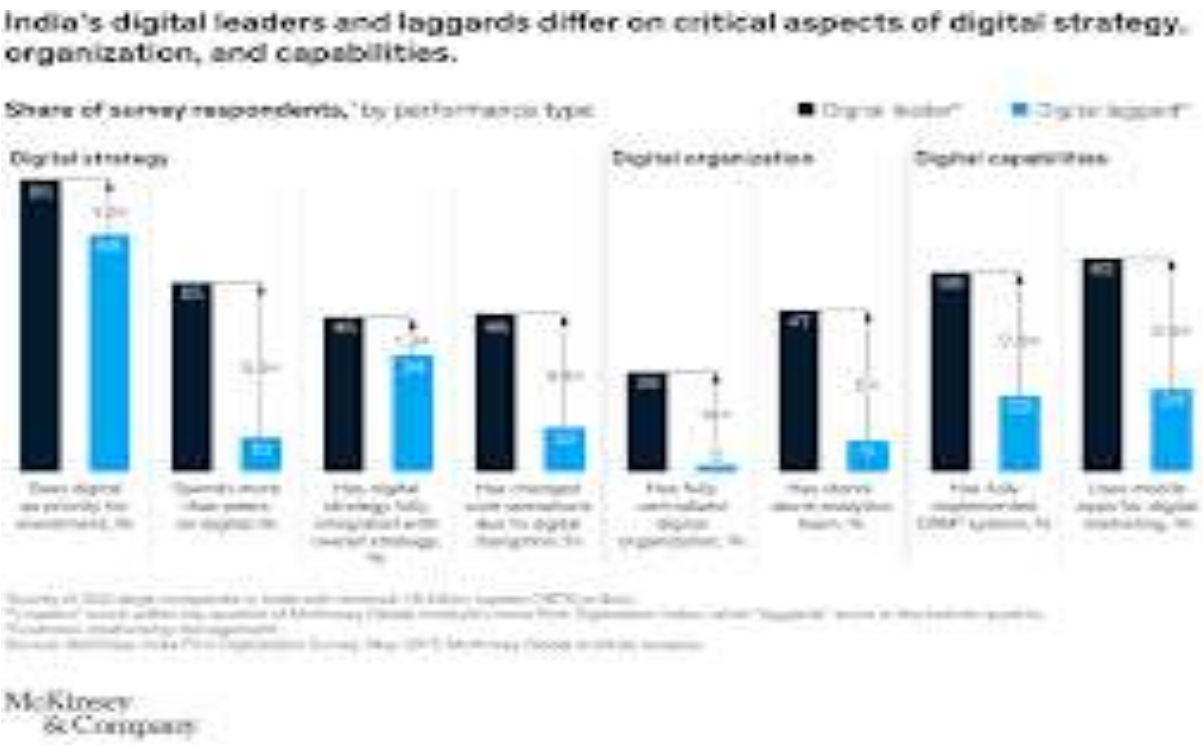
FIGURE 3: On Demand Home Services Startups in India

Source: Web Page

FIGURE 4: Digital Trends Around the World (2019)

Source: Web Page

FIGURE 5: Digital Leaders and Laggards



Source: Web Page

Figures 3, 4 and 5 based on secondary source of data collection identifies the status of digital India in comparison to world economies. It can be concluded that there is a backward and forward linkage between the key variables, namely, innovation in the form of R& D. Software services and e-services are the main drivers for a digitalised world that in turn will enhance the chains of value creation, value capture and value delivery.

4. Challenges and Concerns Encountered

In reviewing the rapidly changing world of digitalisation and the use of e-services, one has to identify that customer experience is an important indicator**.** Continually improving customer experience is an important factor for digital transformation. Another area of concern for a successful digital transformation is the existence of operational processes that should be well defined, streamlined and transparent. A clear integration between data and process wherein, data is used to change the way the company operates and further use the resulting data to make course corrections or further strategic decisions is a critical aspect too.

Digital transformation and the use of e-services is a completely new way of operation on how an organisation delivers value through an ecosystem of activities. However, if one evaluates the case of digital transformation and the use of e-services in the Indian context, one can state that the main challenges to the use of e-services in our digitalised world are:

- Low penetration of ICT and expense of setting up applications
- Fraud on the internet space
- Lack of digital privacy protection norms and security concerns of information
- Cost structure of rapid development of new services and maintenance of old services
- High degree of outsourcing

However, the use of digitalisation and e-services have the following benefits, namely:

- Ability to collaborate in real-time among application engineers to co-design and co-create solutions
- Ability to have engineers engage directly with customers
- Strong knowledge capital and knowledge work flow
- Software, media, or sales through internet channels have gone up by orders of magnitude
- Low marginal cost of service delivery

If one identifies the pros and cons of a digitalised world in the context of the Indian economy, one can state that the potential for e-government remains largely unexploited, even though. ICT is believed to offer considerable potential for the sustainable development of e-government. ICT, in general, is referred to as an ‘enabler’, but on the other hand, it should also be regarded as a challenge and a peril in itself since they call for organisational structures and skills, new forms of leadership, transformation of public-private partnerships (Allen et al., 2001).

Identifying the impediments faced by software firms in Mumbai, it can be seen from Tables 2 and 3 that the advantages and impediments have a correlational and an interdependence aspect with the use of digitalisation in an economy.

TABLE 2: Assessment of Impediments Revealed by Software Firms

Characteristics	Very Important (In Per cent)	Important (In Per cent)	Neutral/ Unimportant/Very Unimportant (In Per cent)	Not Applicable (In Per cent)	Number of Firms
Problems in Export Market	22.8	33.3	6.1	37.7	114
Problems in Domestic Market	27.2	55.3	14.0	3.5	114
Manpower Shortage/Skills	21.1	57.0	18.4	3.5	114
Employee Attrition	14.9	46.5	33.3	5.3	114
Labor Cost	24.6	44.7	28.1	2.6	114
Labor Productivity	20.2	58.8	16.7	4.4	114
Physical Infrastructure*	15.8	53.5	27.2	3.5	114
Commercial Infrastructure**	22.8	53.5	21.1	2.6	114
Quality Certification	21.9	48.2	25.4	4.4	114
Visas	11.4	24.6	29.8	34.2	114
Finance /Capital	12.3	53.5	29.8	4.4	114
Capital Investment	15.8	54.4	25.4	4.4	114
Marketing Access	17.5	42.1	35.1	5.3	114
Communication	19.3	47.4	29.8	3.5	114
Lack of Domestic Computerisation	8.8	50.0	38.6	2.6	114
Lack of Government Support	11.4	50.0	35.1	3.5	114
Tariffs and other Barriers	14.0	54.4	27.2	4.4	114

Note: *Electric Supply, Water, Land, Transportation; **Telephone Lines, Internet Connectivity, Data Networks.
Source: Authors' compilation of survey result

TABLE 3: Assessment of Impediments from Administrative Perspective by Software Firms

Characteristics	Region			
	Central and South Mumbai	Navi Mumbai	Western Mumbai	Total
Availability of Human Resource:				
Yes	63.8	77.8	56.9	61.4 (70)
No	36.2	22.2	43.1	38.6 (44)
Productivity versus Number of Employees:				
Yes	21.3	11.1	20.7	20.2 (23)
No	78.7	88.9	79.3	79.8 (91)
Difficulty and Cost on Marketing:				
Yes	21.3	22.2	25.9	23.7 (27)
No	78.7	77.8	74.1	76.3 (87)

Problems of Building Credibility:				
Yes	**2.1**	**11.1**	**13.8**	**8.8 (10)**
No	**97.9**	**88.9**	**86.2**	**91.2 (104)**
Product Quality and Trust:				
Yes	**31.9**	**-**	**17.2**	**21.9 (25)**
No	**68.1**	**100.0**	**82.8**	**78.1 (89)**
Use of Capital and Technology:				
Yes	**19.1**	**-**	**13.8**	**14.9 (17)**
No	**80.9**	**100.0**	**86.2**	**85.1 (97)**
Competition from Foreign Firms:				
Yes	**21.3**	**44.4**	**32.8**	**28.9 (33)**
No	**78.7**	**55.6**	**67.2**	**71.1 (81)**
Small size and Poor Quality of Demand from Domestic Market:				
Yes	**6.4**	**-**	**5.2**	**5.3 (6)**
No	**93.6**	**100.0**	**94.8**	**94.7 (108)**
Total	**100.0 (27)**	**100.0 (9)**	**100.0 (78)**	**100 (114)**

Note: Figures in parentheses indicate number of firms.

Source: Authors' compilation of survey result

With reference to the impediments faced by the firms from the administrative and labour perspective represented in Tables 2 and 3, the availability of human resources, lack of available skills and labour productivity have been perceived by most firms in the city of Mumbai as the greatest impediment. Labour productivity followed by problems in the domestic market are also been rated as important. It can be stated that workforce challenges are most acute for the ICT industry given its growth trajectory and leadership on the digital technology frontier. According to the World Economic Forum, "By 2022, no fewer than 54 percent of all employees will require significant reskilling and up skilling." The McKinsey Global Institute notes the economies of scale that mobile users and the proliferation of e-commerce have brought to ICT sectors. These emerging developments have benefited from ICT investment and doubled labour productivity between 2005 and 2017.

Capital Requirement that is, obtaining finance is another major concern for the Indian IT software and services firms developing IT software products and services. It is to be noted that substantial investment is required to develop and market the IT software product. It is to be further noted that there is an available infrastructure of lenders that includes banks and other financial institutions, mostly controlled by the Central and the State Governments. However, these institutions are known to have a bias in favour of the established business in their lending decisions. Conventional sources like bank loans are difficult to access given the lack of collateral and the high recurring annual cost of such loans that would be a financial burden for a start-up IT software and services enterprise. A point to be noted is that venture capital funds, too, have largely gone into funding of IT services firms undertaking more routine work with assured markets and have been limited for start-ups focusing on IT software packaged products. Besides banks, the Indian stock exchange, too, have mostly failed to serve as a source of capital for the new IT software and services entrepreneurs. It is felt that the Indian stock exchange should serve as a mechanism for the Indian subsidiaries of multinational corporations to share some of their profits with the Indian elite who have invested in their stocks.

5. Directional Move for A Digitalised World

According to the Software Sector Analysis Report (2019), India's IT industry can be divided into six main components, namely software products, IT services, engineering and R&D services, IT-enabled services/Business Process Outsourcing (ITeS/BPO), hardware, and e-commerce. India is the leading sourcing destination across the world, accounting for approximately 55 percent market share of the US$ 185-190 billion global services sourcing business. The Indian IT sector will benefit significantly from the government's schemes like Digital India, Make in India, and Start-Up India.

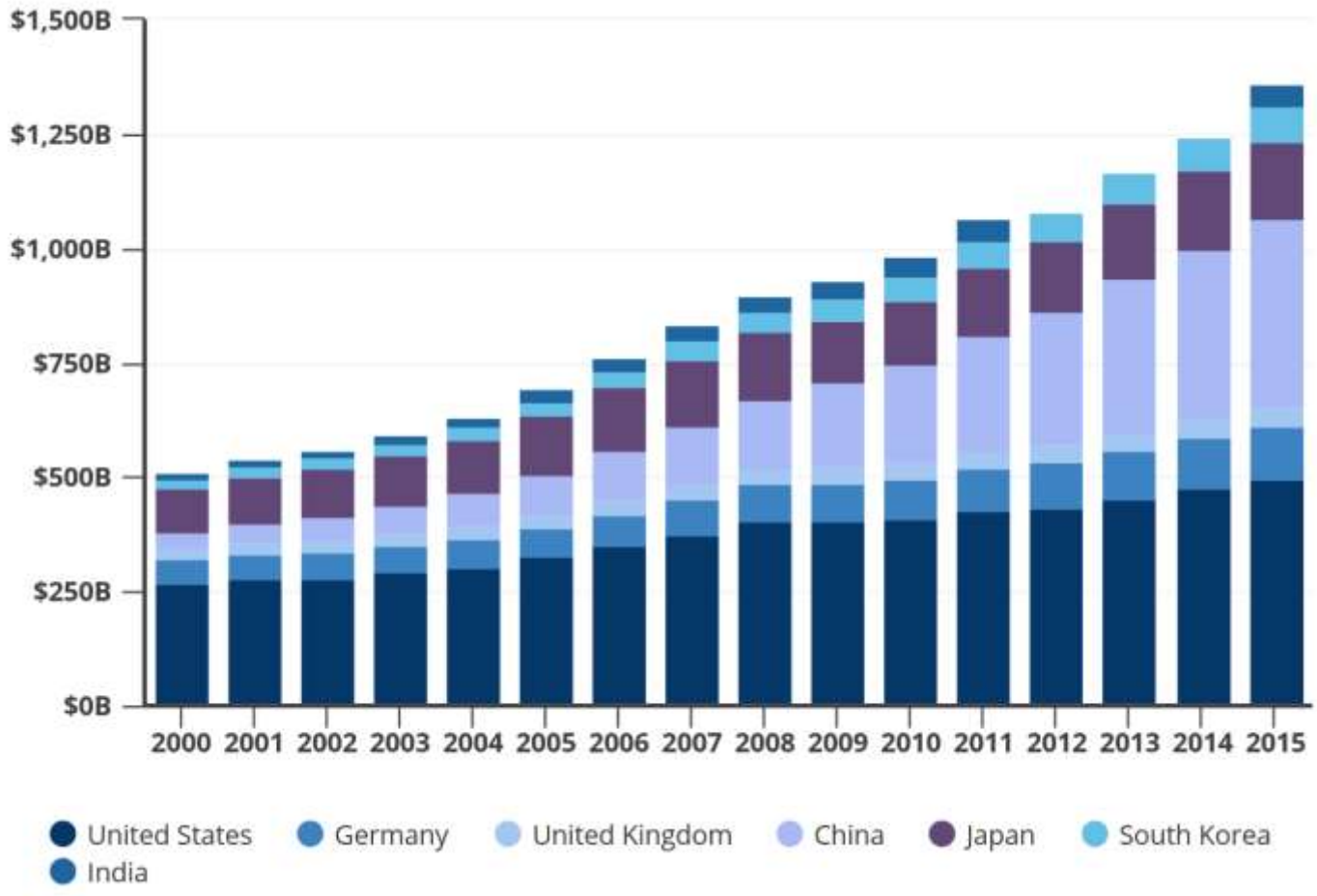
An important growth driver, the information technology/business process management (IT-BPM) sector contributed 9.3 percent to India's Gross Domestic Product (GDP) in 2015-16 and around 8 percent to the GDP of the country in 2017 and is expected to contribute 10 percent of India's GDP by 2025. IT spend as a proportion of GDP continues to be low when compared to the global markets, having increased to an estimated 6.1 percent in 2010-11 from 2.87 percent in 2003-04 while, software as a proportion of GDP is less than 3 per cent since 2003. The Government of India has extended tax holidays to the IT sector for software technology parks of India (STPI) and Special Economic Zones (SEZs). As of May 2019, there were 273 approved SEZs across the country out of which 136 are exporting SEZs. The computer software and hardware sector in India attracted cumulative Foreign Direct Investment (FDI) inflows worth US$ 37.2 billion between April 2000 and March 2019 and ranks second in inflow of FDI, as per data released by the Department for Promotion of Industry and Internal Trade (DPIIT).

5a. Demographic and Service-oriented Linkages

The directional move for the Indian software market can be seen through the linkage effect of relating the software market with the population as well as the software products and services that are feasible for the economy. India has been a software consuming market with a population of more than 1.3 billion and more than 15,000 middle size and small size domestic firms. India exports nearly $2 billion worth of software and Indian organisations collectively spend $5 billion buying IT products and services; produces the maximum number of knowledge professionals as well as those who attend the short courses in IT offered by private training institutions that range from three weeks to one year or even more. The industry’s direct employment has grown at a compound annual growth rate (CAGR) of 26 percent in the last decade, making it the largest employer in the organised private sector of the country. This translates to the creation of about 10 million job opportunities attributed to the growth of this sector.

Spending on R&D innovation has spurred labour productivity and the integration of ICT with the broader economy. The U.S. is a clear front-runner in this category: Total spending on R&D grew from $268.6 billion in 2000 to $496.6 billion by 2015 as indicated in Figure 6. While OECD peer countries increased their spending during this period only incrementally, India and China have made substantial R&D investments in terms of total dollar amount, eclipsing the investment totals of all other nations. India’s spending on R&D tripled, whereas China’s spending increased more than tenfold as viewed in Figure 6.

FIGURE 6: Domestic expenditures on R&D Innovation (2005-2015)



Source: National Science Board, Science and Engineering Indicators. (2018). Retrieved from https://www.nsf.gov/statistics/2018/nsb20181/digest/sections/global-r-d-one-measure-of-commitment-to-innovation)

The challenges as stated in NASSCOM Report (2010) have been on catalysing growth beyond the core markets, establishing India as a trusted global hub for professional services, harnessing ICT for inclusive growth and balanced regional development, undertaking incremental training costs to ensure quality talent availability and to tackle expected costs rise due to wage inflation and increased attrition. The domestic economy needs an indigenous software industry as a key component for development and the indigenous software industry needs domestic business in order to flourish in line with the social and economic development agenda. An efficient financial market with a diverse mix of private and public equity to fuel growth so as to raise money for new ventures is another area that requires attention.

6. Future Outlook: Transformation of the Digitalised World

The directional move of the Indian software market can be attained if the potential of the domestic software market is released to its realised capability, if and only if, the availability of infrastructural facilities are undertaken seriously by the Indian government wherein, facilities must be provided to constantly enlarge its network infrastructure construction and expand the service of telecommunications to penetrate the rural as well as urban areas. Provision of financial and other inducements to firms to take advantage of the internet is another area to be worked upon. A participatory approach and linkages in the Indian software market should be the key solution to avoid the segmentation of the domestic and export markets.

In a nutshell, it can be stated that the Indian software industry has continued to be an export-led sector with the domestic market having witnessed maturity and growth. When both backward and forward linkages materialise, economies of scope can be realised. The economy can end up producing complex final goods, a large variety of specialised inputs and have high wages as well as sustainable economic growth. Regional planning, identification of the export market involving the use and tapping of human resource in terms of both the urban and the rural sector is another directional move for the Indian software market.

The Digitalisation, Business Models and Value Creation, Interim Report (2018) states that digitalisation has greatly reduced communication costs, allowing businesses to quickly reach a global base of suppliers, users or customers and to establish user networks across different jurisdictions through websites, online platforms and mobile applications. Digitalisation brings innovation, ease of working, new job opportunities and growth in the economy. Big data analytics will serve as the foundation for digital transformation. Artificial Intelligence (AI) will drive new digital transformation revenue streams. Although, digital India programme is facing some barriers, yet it has a great impact to make the best future for every citizen. Digital transformation will require new skills and a shift in IT investments.

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