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Digital Architects: Providing Solutions For Long Term Development

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Abstract

Technology and innovation have become two concepts that are indispensable in the processes of implementing the development strategies of decision-makers, both at the microeconomic and macroeconomic levels. The growing interest in these topics also arises from the intense global competition in the race to conquer new markets, but also from the need to identify new ways of coping with changes in both society and the environment. From this perspective, business organizations aiming at long-term development, maintaining or improving of their market position have to reconfigure the way they carry out their activities and organizational processes either by incorporating technologies/innovations or by creating/developing new methods/techniques/processes, i.e. by promoting and supporting their own innovative activity. From this perspective, ICT companies are becoming key players in a society where digitalisation has become a necessity, an aspect also highlighted by the global pandemic triggered by COVID-19. Whether we are talking about different hardware equipment/devices or other hardware components, or different software, applications, software platforms or different types of software, we can state with certainty that these are essential, we would say critical, elements in the digital infrastructure of a successful company that aims to be competitive.

Keywords: technology, development, innovation, strategy, digitalization

Introduction

The theme under consideration meets the needs of economic actors to survive and perform in a society affected by a series of climate changes, in a society more interconnected than ever, in a more turbulent and unpredictable business environment, but above all in a society that has to prepare itself to face phenomena/processes that have not occurred, are not known, but that can shake the foundations of the proper course of socio-economic activities. In this context, technology and innovation in various fields can be promoters of long-term progress and well-being, which are included in the development strategies of many institutions and organizations worldwide.

Through this study we aim to examine the extent to which technologies, specifically the ICT sector, can contribute to the long-term progress of today's society. At the same time, we aim to highlight the major role of companies in this sector in the digitalisation of the activities of business and other organizations and, in particular, their contribution to improving performance and enhancing global competitiveness. Last but not least, we aim to " map " the ICT sector at a global level by analyzing the performance of companies operating in this field and determining their influence on the reshaping of the world economy and, therefore, of society.

In conducting the research, we considered on the one hand, the use of qualitative tools/methods and, on the other hand, the use of quantitative tools whose interaction/connection facilitates a more complex approach to the

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analyzed topic. Thus, initially we resorted to the study of some works in the literature in order to create an overview of the issues analyzed and to determine the state of knowledge on this segment. Subsequently, we proceeded for the analysis of some economic indicators (revenue, profit, assets, number of employees, market value and R&D budget) that show the activity of ICT companies (the telecommunications component was not included) ranked in the Global Fortune 500 by means of descriptive statistics (we rendered the mean, median, standard deviation, minimum and maximum value of the indicators analyzed), using the Data Analysis add-in/function in Microsoft Excel.

Literature Review

In the long term, technologies become a strategic component for companies' development plans, as a result of the skills and knowledge accumulated by employees over time and reflected on the performance of the business organization and beyond (Tonchia S., Tramontano A., 2004). Simply put, economic entities aiming to strengthen their position in the market are constantly looking for new tools and methods/techniques that can help achieve the objectives set at top management level.

IT has made a major contribution to the rise of companies globally because the technologies deployed in this area have facilitated the expansion into foreign markets through the development of international networks. Thus, computers have been incorporated into the practice of business organizations, has been created the infrastructure for conducting videoconferences, various software programs have been increasingly used, etc. (Colin-Coulson T., 2002). More recently, companies in different fields are using different sharing systems such as Dropbox, Groupware, etc. which significantly streamline employee access to data and information related to projects, making it easier to work from anywhere. Moreover, such tools allow companies to work with partners and experts in different parts of the world, as well as to have global clients, due to the facilities that the internet offers in terms of access to information. In addition, these technologies enhance the global presence of companies by enabling uniform monitoring of the operations from anywhere in the world, in the sense that R&D, manufacturing or company headquarters can be located wherever there is a computer that allows communication between these work points via email, skype, zoom, google meet and similar applications (Cullen J., Parboteeah K., 2010). Thus, information technologies can be a strategic component of the long-term development policies of companies aiming for a globally competitive position. Moreover, the benefits of these tools have been highlighted by the current pandemic context that has imposed remote working for many organizations and institutions.

The performance of business organizations and other categories of institutions/organizations is permanently linked to their ability to use technologies, to build a digital infrastructure, and thus to take advantage of the opportunities offered by ICT companies, the so-called digital architects, who are responsible for the development of the e-business and e-commerce component of the global economy. With reference to e-business, we recall that this concept implies that companies carry out economic activities using ICT and the Internet, the two tools being interdependent. At the same time, e-commerce (electronic commerce) involves transactions such as the purchase and sale of goods (often involving a support and logistics component) using technology. In practice, it is found in several forms: business-to-business (B2B), business-to-consumer (B2C), business-to-government (B2G), consumer-to-consumer (C2C) and, more recently, mobile commerce (m-commerce - conducting commerce transactions using mobile phones) (Bocij P. et al, 2015). The global situation shows that in recent years the value of e-commerce transactions conducted online has increased significantly, a development largely influenced by the pandemic caused by Covid-19. The digital infrastructure of companies has enabled trade operations to be carried out under almost normal conditions, even though all socio-economic activities have been carried out in compliance with fairly strict rules and regulations.

Digitalization (the use of ICT sector-specific tools for running operations and organizational processes, automation of the production process, use of different platforms, applications, etc.) has therefore become a necessity for business organizations and beyond (Szymczyk K., Emary I., 2021). According to Eurostat, at EU level, in 2020, about 77% of firms (in Eurostat statistics micro enterprises are excluded, so the data covers firms with more than 10 employees) had a website. At the same time, for the same year, 21% of firms had e-commerce sales. In addition, in 2020, 98% of companies in the EU had internet access for their employees, allowing human resources to use the internet at work to carry out their job-specific activities. All this points to a high level of activity for ICT companies providing hardware and software support for the operation of websites, e-commerce and related platforms.

Innovations are often linked to technologies, so the most familiar forms of innovation are technological. In addition, innovations often result from the development of new technologies or new ways of using existing

technologies (Peters B., 2008). The connection between innovation and technology can be approached from two perspectives. On the one hand, technology can be the result of innovative activity carried out systematically in a company or a research centre, and on the other hand, as a way of developing new innovations. Today's progress in society is largely due to technological advances that have been reflected in all areas of activity. Visible results can be seen in medicine, education, research but also in industry and agriculture. For example, telemedicine has made a significant contribution to improving medical care by consulting different experts from different parts of the world. In addition, without current technology, teaching could not have been carried out in optimal conditions (in fact it could not have been done without endangering the lives of others), given the worldwide spread of the coronavirus. Therefore, our analysis will focus on the ICT sector as a promoter of long-term development. Beyond these aspects, the management of companies should take into account the reconfiguration of the implemented strategies, in the sense that it is necessary to implement strategies focused on the development of technological infrastructure, but also strategies related to the innovative activity of business organizations. The most innovative companies in the world are still those in the ICT sector, which have significant annual budgets for research and development and, therefore, for the development of new processes/products/services. From this point of view, their role in strengthening long-term development policies at both micro and macroeconomic level is visibly more important. From this perspective, decision-makers have the task of implementing technology-focused strategies as well as strategies aimed at innovative capacity and activity, which together underpin long-term progress alongside other factors such as human resources, top management vision, and measures taken at state level to support education and R&D respectively.

It is necessary to emphasize that long-term success and performance is not only due to innovation budgets as financial resources become useless without human capital. Thus, innovation becomes more a matter of teamwork, of experience and training in different fields, of the ability of individuals to creatively combine distinct perspectives/knowledge (Tidd J., Bessant J., Pavitt K., 2005). Critical thinking and the ability to solve sometimes seemingly unsolvable problems are therefore key elements in innovative activity. From this point of view, the IT sector has succeeded in attracting well-trained, specialized human resources and, at the same time, as is well known, companies in this sector are constantly investing in their employees, who are the foundation of long-term performance.

When considering the contribution of the ICT sector, and therefore of those firms we call digital architects, to long-term development, it is necessary to remember their contribution to the development of the so-called intelligent enterprise. The literature mentions that this type of company is related to concepts such as intelligent information systems, intelligent ICT solutions for enterprise management or learning organization (Emary I., Brzozowska A., 2018). Inevitably, we connect what represents technology with what represents knowledge management, management information systems or intellectual capital management because the business organization that will have to face future challenges and a constantly changing business environment will emphasize the tacit and explicit knowledge of employees, but also new information technologies in order to remain successful and competitive.

In the digital economy, the competitive advantage of business organizations is based on the intangible component, i.e. everything from research activities, licenses, patents, tacit and explicit knowledge, software, digital code behind applications, to the specific way of organizing socio-economic activities (Haskel J., Westlake S., 2018). We also emphasize that developing this component of a company's infrastructure requires partnerships with IT firms providing digital solutions, as well as the internal constitution of a team of specialists/experts. In addition, the current context has highlighted how important digital skills are and how necessary trained human resources are to maintain an optimal level of socio-economic activities even in less favorable conditions.

O brief overview of the worldwide technology sector

In order to give a brief picture of the ICT sector, we have chosen to highlight the situation for the companies included in the Global Fortune 500. Following the selection, we have included 39 companies in the analysis (the selection criterion was strictly based on sector, including all companies, regardless of position or country of origin, operating in this field), more specifically we have studied indicators reflecting the activity of approximately 8% of the companies in the Fortune ranking. Among the companies included in the analysis are: Apple, Microsoft, Samsung, Oracle, Huawei, Dell, Facebook, Intel, IBM, Toshiba, etc., with the best positions being occupied by companies headquartered in the US. As far as companies in these sectors are concerned, the best position in the ranking is held by Apple, which ranks 6th out of the 500 companies included in the total, followed by Samsung (15th) and Alphabet (21st). Table 1 shows the results of the descriptive statistical analysis of the indicators mentioned in the first part of the paper, concerning the performance of ICT companies in 2020.

Tabel 1 Descriptive analysis of the technology sector including the companies ranked in Global Fortune 500 for 2020

Indicators	Mean	Median	Standard Deviation	Minimum	Maximum
REVENUES	68,024.18	45,477.80	57,379.18	24,124.00	274,515.00
PROFIT	9,020.59	3,250.00	13,566.76	-2,874.80	57,411.00
ASSETS	100,072.72	61,908.40	93,943.90	14,397.40	347,991.80
EMPLOYEES	161,905	114,714	152,978	22,074	878,429
MARKET VALUE	302,823.57	55,324.00	591,415.90	2,922.00	2,449,744.00
R&D	7.34	4.50	7.76	0.044	27.57

Source: Data processed by the author using Global Fortune 500 Ranking for 2020

On the basis of the results obtained, following the descriptive statistical analysis, we formulate below some assessments for the sector as a whole and some examples of companies:

- Regarding the revenues obtained by the companies in the analyzed sector we mention that the average was 68,024.18 mil. USD and the median was 45,477.80 mil. USD; at the same time, we note that the revenues deviate by 57,379.18 million USD from their average value; the minimum value of revenues was 24,124.00 million USD for FLEX (headquartered in Singapore) which produces electronics and electrical equipment, ranking 499th in the Global Fortune 500; the highest revenue value was USD 274,515.00 million for Apple (headquartered in the USA) which produces computers and other types of equipment, ranking 6th in the Global Fortune 500; the second highest revenue value was recorded by Samsung Electronics.
- From the perspective of the profit obtained by the companies included in the analysis we note that the average was 9,020.59 million USD and the median was 3,250.00 million USD; at the same time, we point out that the profit deviates by 13,566.76 million USD. USD 13.566.76 million from the average value recorded for this indicator; with regard to the minimum value, we point out that two of the companies in the sector analyzed recorded a loss in 2020, namely Hewlett Packard Enterprise and Nokia (the value indicated in the table is for the Finnish company which ranks 485th in the ranking); however, strictly from the profit perspective, we note that the lowest value (53.9 million USD) is for the American semiconductor company Jabil, which ranks 446th; at the other end of the scale, the highest value is for Apple, as mentioned above, followed by the American company Microsoft (44.281 million USD), which produces computer software.
- In terms of the value of assets held by companies operating in this sector we note that the average was 100,072.72 million USD and the median was 61,908.40 million USD; at the same time, the value of assets deviates by 93,943.90 million USD from the average value recorded in this area; the minimum value of assets was 14,397.40 million USD for the company Jabil referred to above, and the maximum value was 347,991.80 million USD in the case of Samsung Electronics, which is followed by the company Apple with an asset value of 323,888.00 million USD.
- Regarding the number of employees of the companies analyzed, we note that the average was 161,905 employees and the median was 114,714 employees; at the same time, the number of employees deviates by 152,978 from the average value; the minimum value of the number of employees was 22,074 employees for the company Xiaomi (a company of Chinese origin that has managed to establish itself on the global market) which ranks 338th in the ranking; the maximum value of the analyzed indicator of 878,429 employees can be observed at the level of the company Hon Hai Precision Industry (a company based in Taiwan, known as Foxconn) which is ranked 22nd in the analyzed ranking; it is followed by the company Accenture (a company of Irish origin, which is ranked 258th in the ranking) which had a number of 506,000 employees in 2020.
- In terms of market value, we find that the average value was 302,823.57 million USD and the median was 55,324.00 million USD; at the same time, we note that the market value deviates by 591,415.90 million USD from the average value; the minimum level of market value is 2,922.00 million. USD for Wistron (headquartered in Taiwan and producing computers and office equipment), which ranks 421st in the ranking; the maximum market value is 2,449,744.00 million USD for Apple, followed by Microsoft with a market value of 2,155,085 million USD.
- -From the perspective of R&D expenditure, we point out that the average value is 7.34 billion USD and the median is 4.5 billion USD for the sector analyzed; at the same time, the value of R&D expenditure deviates by 7.76 billion USD from the average value; the minimum value of this indicator is 0.044 billion

USD for the company Jabil, while the maximum value of R&D expenditure is 27.57 billion USD was recorded by Alphabet (Google's parent company operating globally in the Internet Services and Retailing market), followed by Huawei Investment & Holding (44th in the ranking, operating in the Network and Other Communications Equipment market, headquartered in China) with a value of R&D expenditure of 22.04 billion. USD.

The sector's solid position indicates a high global demand for everything from information technology, computers, electronic equipment, office equipment and other devices to facilitate the way a company or other organization does business. The investments that business entities can make in order to carry out specific activities may include not only the hardware components mentioned above (ICT hardware or even specially configured premises for the installation of servers or other equipment), but also software and data assets, as well as the costs of training human resources to use them or hiring people with some expertise in this area (Remenyi D., Bannister F., Money A., 2007).

The data highlighted above indicate the rise of these categories of companies as a result of the fact that many institutions and business organizations worldwide have digitalized their activities, which has led to an increased interest in the tools/solutions offered by the ICT sector. The vast majority of the companies investigated have experienced growth in turnover, even under pandemic conditions. This is because there has been a significant increase in global demand for phones, computers and their components (here we recall the global semiconductor crisis that has reshaped production chains), but also for specialized software, payment integrator websites, etc. Beyond all,we must not forget the wave of uncertainty generated by the current crisis has exposed many of the vulnerabilities of business organizations.

Conclusions

As a result of the above, we can conclude that companies called digital architects will in the future become an essential partner for any business organization, institution, etc. that aims to use information technologies to digitize its operations. This is because a certain amount of expertise, experience and specialist knowledge is required to set up an IT-enabled architecture. However, the rise of digitalisation will require, where appropriate, the inclusion of an IT department in the corporate/institutional organizational structure to ensure the proper functioning of the ICT infrastructure. As we have presented, technology is an essential element of an enterprise's infrastructure in terms of its impact on improving their performance and competitiveness in the market, facilitating new ways of doing business. Based on these considerations, we consider that a new type of company is emerging worldwide, namely the digital company/firm (or intelligent enterprise) with a flexible organizational structure that includes an IT department, a developed ICT infrastructure and a human resource with digital skills.

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