

# The Influence of Technological Development on Organisational Productivity

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**Abstract:** *When top management of organisations invest hard earned resources in technology, their objective in most cases is to increase productivity while ensuring that internal processes become more efficient and effective. The reality after implementing the said technology tends to be sometimes disappointing as a lot of factors are not thoroughly considered prior to the implementation phase. Technological development has pervasively interfered with all aspects of business activities in ways that a business entity cannot afford to be indifferent when issues of technological development are being considered. Areas like manpower levels, organisational staff size, information management, quality of products, services and processes. In addition to these areas which are affected by technological development, institutionalising the technological process comes with additional effects. It is therefore recommended that future research looks at empirical studies to ascertain how the digital divide mediates the influence of technology on a business organisation considering the contexts of both developing and developed countries.*

**Keywords:** technology, development, productivity, institution, manpower levels

## 1. Introduction

Several organisations have invested fortunes in modern technology hoping to cut down on operational costs while improving productivity. Researchers have not been able to agree on whether such results are truly achieved. Discussions related to whether a 'production complex' exists, particularly in the area of how much production is influenced by information and communication technology (ICT) is yet to be concluded (Bans-Akutey, 2022). This uncertainty aids the illustration that despite how much investment is made in technology; the amount of reasonable improvement in production has not increased, and will most probably decline. Lehr and Lichtenberg (1999) explain that "since production is defined as the ratio of output to each input unit, and ICT tools are input, there is the need to ask under what circumstances business owners would require application of technology to increase productivity".

It has been proven that it is quite expensive to incorporate swiftly and efficiently fresh software programs (Alamiri et al., 2020). Berger, in 1999, exposed that "Microsoft spends sixteen thousand dollars a year on every one of its operations in technology and development" (Bans-Akutey, 2022). "In 1990, the debate continued on exposure to technology all around us except production facts and figures. Apart from this, there is enough proof that suggests the truth of the controversial debate that new ICT tools, including computer hardware and software, increase productivity" (Bans-Akutey, 2022). Studies indicate that "many well-funded IT businesses lose about \$ 5000 per year per workplace due to the need for integration" (Mills & Bourne, 2002). Futzing denotes "the time users spend confused while clearing unspecified events and overcoming uncertainty and anxiety when ICT tools put together complex information that cease working" (Bans-Akutey, 2022). In contemporary times, an increase in the level of ICT related research confirms the struggle to determine if there is really 'production crisis'. "One of the objections to the confusing production debate is that there may be a failure to quantify production profits

from ICT tools as a result of a significant slowdown preceding when the benefits can be realized". It is largely debated that the use of computers requires significant changes to the related physical and institutional arrangements like employees and ICT infrastructure preceding the recognition of benefits (Bans-Akutey, 2019; Alamiri et al., 2020; Bans-Akutey 2022).

## 2. Technological Development

Information and Communication Technology (ICT) usage, in contemporary times has been considered "as a strategic development area in all areas of an economy, precisely, in a highly vigorous and extremely challenging organisational setting which needs the use of advanced ICT tools to increase productivity, cost efficiency, and supply goods and services with high quality to clients" (Allen & Morton, 2004; Bans-Akutey, 2022). ICT serves as a powerful tool that facilitates "advertising, communicating with clients and searching for possible clients, in addition to offering ICT facilities as notable probable services for clients" (UNDP, 2001; Werthner & Klein, 2005, Bans-Akutey, 2019; Bans-Akutey, 2022).

ICT has significantly transformed how individuals live, study, labor and interrelate (Eke & Kenebara, 2020; Bans-Akutey, 2020). Tambe and Hitt (2014) identified that ICT is a tool used by most businesses to explore innovative ways of carrying out their operations and disseminating information in order to make profit or achieve set objectives. With reference to Abou-Moghli et al (2012), "ICT represents a combination of technologies made up of the internet, software, hardware, computer, television, telephone, email, satellite, blogs, and internet-working projects". Kushwaha (2011) discusses ICT as "skills and tools that individuals use to segment, mete out, and gather data to interconnect with each other, individually, or in teams, by using computers and connected networks". Listyarini et al. (2016) refer to ICT as "any use of technology to access, gather, manipulate and present meaningful information at the end". Kioko et al.

(2015) denoted that “ICT is a technology used to sustain data collection, analysis, organisation and demonstration in an expressive form”. “ICT is used in diverse fields and in all of them, the underlying feature is its approval as a system that facilitates moving data through the use of several communications aided by electronic means for easy access and assessment” (Koltay, 2016; Okeke et al., 2021; Bans-Akutey, 2022).

Top managers oversee resource allocation and circulation; this can be sometimes perplexing when managing profit-making tasks that arise as a result of numerous projects. Hobday (2000) explains that “ICT serves as one of the significant inventions that are mostly executed to aid in the procedure”. According to Peansupap & Walker (2005), “ICT is mostly executed as it is believed to aid interaction, advance incorporation, increase production and provision of service”.

The reliance of business organisations on modern technological development and modification is in line with their growth (Ankumah & Bans-Akutey, 2021). Companies employ the use of digital technologies to determine remedies for particular challenges, to facilitate efficient decision making, to increase efficiency and productivity, and to compete on the international market and corporate world for emerging businesses (Martin-Rojas et al., 2019). Additionally, “ICT is viewed as an influential power that unlocks stimulating prospects that allow organisations to attain set objectives, missions and aims in an efficient way” (Bans-Akutey, 2022). Consequently, “managers in companies need to gain a general appreciation of the prospective nature of ICT and connect the attainment and operation of ICT to the structural assignment of the organisation” (Hacker & Saxton, 2007).

ICT is at the focal point of quite a number of organisational tasks, procedures and operations. Presently, businesses worldwide use more than half of their new investment resources on ICT and its related infrastructures. How business organisations use these enormous assets is very essential to the company’s productivity. ICT also happens to be the link between the “organisation’s business model and the crucial indicators of excellence”. “Several companies have not been successful at working with funds intended for their ICT-based projects because of poor orientation between ICT use and operations of the business” (Dodds et al., 2003; Haro-Domínguez et al., 2010; Kramer et al., 2011; Srivastava et al., 2015; Bans-Akutey, 2019; Bans-Akutey, 2022). For instance Toyota, a Japanese vehicle manufacturer, has performed excellently in spite of the increased competition and challenging business environment. This is as a result of the installation of properly planned organisational structures and ICT systems which work synchronously to improve the business’ agility, effectiveness, efficiency, and quality. “It helps to be able to quickly respond to clients’ needs and requests; as well as variations on the market as incidents happen when working directly with several suppliers and retailers or wholesalers” (Bans-Akutey, 2022).

Basic ICT tools have served the purpose of safely keeping, restoring, ordering, disseminating and algorithmically

changing almost all forms of data that possess the ability to be digitized into numbers, text, video, music, speech and programs (Brynjolfsson & Hitt, 2000). Frenzel et al. (2009) observed that the ICT era has brought about several probabilities coupled with some problems; owing to this, business owners and managers need to educate and get familiar with this knowledge in order to maximize the advantages made available by using ICT in this contemporary information-based era while limiting the effects of the several challenges that come with its use.

Using ICT for business has made even the playing field for all businesses around the world but for a few differences (Naab & Bans-Akutey, 2021; Bans-Akutey, 2019). It is difficult to imagine a world without mobile phones and the internet (Schubert & Leimstoll, 2007). “This is because the use of ICT has reduced the gap between buyers and sellers, thus making closeness a possibility unlike what were existent in earlier eras. ICT has been found to enhance efficiency and improve productivity in several forms that lead to reduced costs of operation, improved allocation of resources and technical enhancements” (Olusola & Oluwaseun, 2013). “In order for a business organisation to do well in such an evolving and competitive setting, top managers need to be proactive in the use of innovative technological practices and improved techniques”. ICT thus enables the prudent use of finances, time and other resources used on repetitive tasks in several organisations (Chinomona, 2013).

The use of ICT in business operations has completely altered the practices of management together with how work is performed in nations around the world (Bans-Akutey, 2019). Being able to properly disseminate information by using technology helps to empower government, stabilize institutions and provide exposure to individuals who are able to integrate it well into their operations and organization. Presently, the flow of information throughout the world is unrestricted, because of the availability of the internet; people are able to access very large data banks which ICT makes available. Woherem (2000) approves that “by virtue of the use of internet connectivity, organisational transactions can be carried out throughout the world eliminating all middlemen or physical connections with the client”. The use of ICT for business operations has developed through four distinct segments (Eke & Kenebara, 2020): “Large central mainframes, personal computers and distributed data processing, the networking of microcomputers and the networking of networks”.

At times when businesses successfully introduce a new technology in their operations, they face varying levels of difficulties in effectively incorporating the new technology into their operations to facilitate preservation or increase in market share and retention of their competitive advantages. “Managers therefore need to be made aware or trained by experts regarding potential challenges as well as possible outcomes that can affect the organisations strategic goals and tactical goals” (Ahsan & Malik, 2015). “Once top management acquires the requisite training, there is the need to put together a viable framework that will be shared with the entire workforce and funded by the leadership of the

organisation” (Ahsan & Malik, 2015; Kamal et al., 2015; Srivastava et al., 2015; Yin, 1992; Bans-Akutey, 2022).

Top management are tasked with the responsibility of making strategic decisions related to the acquisition of new technology, incorporating the acquired technology into operations which encompasses change and then improvement of the requisite infrastructure. Technology acquisition involves getting an external tool or knowledge that is vital for efficient running of its operations (Zahra & George, 2002). Technology integration focuses on how the acquired technology is explored, evaluated and modified to facilitate the development of new products or service improvement (Iansiti, 1995). Technological infrastructure is the framework on which the organisation depends. It serves as the foundation for the company’s applications (Byrd & Turner, 2001). New technology acquisition and integration affects an organisation in several ways. Some affected areas have been examined in the subsequent sections.

### 3. Manpower Levels and Organisational Size

The motive for investing heavily in technology is to possibly increase organisational productivity. “Traditionally, this has been achieved through the use of machines to improve labour productivity and decrease costs related to human resources. In modern times the focus is currently on the effect of ICT on the magnitude of the organisation” (Bans-Akutey, 2022). There is enough evidence indicating a relationship between the increased rate of ICT use and fairly small businesses. This implies that the use of ICT tools decreases the required staffing capacity (Bans-Akutey, 2019). Brynjolfsson et al. (2011) found that relationships are all strong in a range of requirements and more than four dimensions of specialisations. Notwithstanding, researchers have stressed that these research conclusions need not be generalised due to variations in business operations and time frames. “The reduction in corporate size is particularly severe with the shortfall of just a couple years after investment in ICT” (Bans-Akutey, 2022). This implies that the impact, positive or negative, of innovative technologies is not wholly experienced in the short term.

Alternatively, “ICT may result in small organisation sizes because it makes room for organisations to ‘outsource’ some of parts of their operations”. This means that, employing the use of ICT is likely to cause business organisations to ‘buy’ instead of having to ‘make’ the parts and services required for producing their core products. “The evident outcome is that in most instances technical support services are sometimes provided by consultants from other organisations” (Bans-Akutey, 2019). It is possible that such consultants may come in variable sizes “from small operations to fairly large international companies”. However, there are presently no known studies on the relationship between ICT and work, thereby proving that ICT affects employment positively. Osterman (1987) concluded from his study that an investment in ICT leads to an rise in the number of employees in that organisation after a few years of reduction in employee size. Similarly, Berndt and Morrison (1995) concluded that rather than relieving workers of stress, the rise of IT often causes employees more stress. It has been observed that several research

studies indicate job losses. A general study, similar to that conducted by the United States Congress Office of Technology Assessment, concludes that “ICT seemingly creates increased employment than it destroys” (Handel, 2003, Bans-Akutey, 2019).

It appears predicting the influence of ICT on is quite precise. Woodward (1965) introduced a measuring scale where businesses were known by the rate of technical complexity in the process of production. It explains that “when the technological level is high, it has shown that a large part of the processes are done mechanically with the use of technology, while the low-tech complexity means that workers play a major role in this process – thus work is done manually”. Woodward (1965) indicated that “the aggregate of management levels and the ratio of manager to staff keep increasing as the complexity of technology grows”. For businesses which are into manufacturing, and produce a tangible deliverable, which are not so sensitive, the correlation between labor levels and ICT is very easy to predict.

### 4. Impact of Technology on Human Resources

ICT has brought forth enormous changes to organisations and how they work by the use of effective and efficient human resource management techniques leading to a much needed and complex process (Ball, 2005). The function of the personnel department is generally managerial with presence in almost all organisations but in order to decrease the heavy burden of managerial duties, several institutions began using automated systems to perform their routine processes, by installing and launching ICT powered software applications, resulting in the development of Specialized Human Resource Management Systems (HRMS). As a result of this progress, the usage of ICT in HRM has shot up exponentially in recent times resulting in several uses for a diversity of human resource applications.

Ruel et al. (2008) opined that the term ‘electronic human resource management’, eHRM, was introduced by the end of 1990 when e-commerce took over most business settings. E-HRM is a term used for an internal use of e-business applications to enhance value creation through excellent information flow. With ICT advancement, companies are able to handle the increasing volumes of personnel-related activities more efficiently, resulting in the acquisition more insight from accumulated data.

The integration of ICT into personnel management results in the introduction of human resource management system (HRMS), a term that defines systems and procedures which combine both human resource management (HRM) and information and communication technology (ICT). “It integrates all personnel management functions and procedures with ICT, thus processing and transforming raw data into standard processes and software packages for organising business resources” (Bans-Akutey, 2022) that support recruitment and selection, flexible benefits, development, e-learning and more. HRMS represent systems that assist companies to acquire, maintain, manage, examine, store and share insights about the organisation's labour force. Inasmuch as ‘E-HRM is sometimes used to

signify the use of ICT within the HRM profession, Martin et al. (2006) gives significant areas where HRM practitioners conventionally introduce ICT skills.

In addition, HRM is likely to be included in organisational growth as well as in managing change. Workers form part of the most sensitive sectors in organisation's, where the excellent performance or under performance of the business lies in its HRM capacity. It is without a doubt that the actuation and execution of ICT within personnel departments is quite complex and diverse depending on the organisation's HRM strategies and practices.

Martin et al., (2008) explains that the use of ICT could determine increased visible customer relations for a company and hence cause it to render value to the strategy. Social Media has also facilitated an increase in the impact on the company. Wachira (2010), "states that HRM in Africa needs to be focused on the use of the worldwide." "Notwithstanding, the application of ICT to facilitate HRM functions is mostly driven by prospective benefits such as process efficiency and effectiveness, saving of costs, increased client satisfaction, improved data precision, increased visibility and compliance procedures, improved data availability, informing and facilitating change in the role of HRM" (Bans-Akutey, 2022).

Designing HRMS mostly involves making a choice between the use of a customized solution suitable for the HRM and entire organisational needs. "Discussions with managers on how to design and develop the system is critical to design procedures and ensures that the system will work" (Bans-Akutey, 2019). There is a high possibility that personnel managers may assume advisory or strategic role because of the rise in the information availability and data reliability. The progress of several organisations have seen major developments and introduced HRM systems which facilitate selection, recruitment, employment placements, performance appraisal, employee compensation and benefit evaluation, health, safety and security. Nowadays, the areas for the implementation of the HRM system include: Salaries, Work, Time, Benefit Management, HR Knowledge Management, Hiring, Training, Learning Management System and Performance Tracking (Bans-Akutey, 2020).

"Remuneration changes as a result of automatic payment procedure achieved by collecting information during work and punctuality, estimating several deductions and taxes, while also performing regular salary checks and staff taxation statements" (Bans-Akutey, 2022). The covers every staff-related activity and integrates existing financial management systems. The activities include deadlines as well as all job-related efforts. Other more developed systems give a vast range of information retrieval methods, staff sharing abilities and data analysis features. The examination of cost and efficiency measures are key tasks (Khan et al., 2018). A profit management module helps organisations to closely monitor staff involvement in compensation plans like insurance, salary packages, profit sharing and retirement plans. The HRM module is an integral part of several other personnel categories spanning from when an employee joins the company till retirement. The system takes note of simple arithmetical data and

address information, selection procedures and milestones, training and capacity development, skills and competencies, and salary planning records. Advanced systems help employers to read applications and enter relevant information, inform employers and disclose the organisational state to employees.

Online recruitment has proven to be one of the effective ways of hiring prospective employees to occupy organisational roles. Those Talent Management Systems (TMS) mostly include: assessing staff engagement; selection and recruitment; virtual rental or published rental platforms focused on both employers and potential employees. Huge costs used to maintain a planned recruitment effort, have resulted in the introduction and use of a dedicated Applicant Tracking System (ATS). The capacity building module provides a framework for businesses to manage and monitor workers' training. The system, mostly called the Learning Management System (LMS) allows managers to track employees' development programmes, skills and qualifications, and to specify which capacity building programmes are used to improve the skills of employees.

## **5. Impact of Technology on Organisations - Institutionalisation of Technological Progress**

"As the technological set-up in a segment develops, it delivers an established structure in which technological transformation can occur as a routine, supportive procedure amid several companies" (Bans-Akutey 2022). The infrastructure defines the restrictions of technological complications, offers an established technological tactic, and launches the mode of assessment of projects and results (Bolton & Foxon, 2015). As the organisations participating in the network make commitments to use particular technological approaches, their inventive effort will be compatible with that of the other organisations who are the potential users of their technological approaches. At the same time, the users make commitments to these approaches in their operations and product lines, as do their customers and suppliers.

In effect, the situation becomes more standardised, which allows for greater exchange (March & Simon 1958). As the technology becomes more standardised, its role in competitive strategy must change. Technology becomes an effective barrier to new entrants, and strategy relates to attempts to improve the market position and returns on investment of individual firms within the sector. This view of the invention process suggests that the institutionalization of the infrastructure is a critical factor in the effective formulation and implementation of technological strategies. Some implications of this view are discussed below.

### **5.1 Institutionalisation and Radical Technological Change**

As the technological infrastructure becomes increasingly institutionalised, it affects the nature of radical technological change within the product market. The commitments of

organisations during the invention process makes radical change more risky and expensive since such change involve moving beyond the technical areas in which the firm is experienced (Bans-Akutey, 2022). The technological commitments of the organisations and their customers make radical changes more costly to adopt. Such changes will not be consistent with their operations, and investments in new equipment, new product designs, and new styles of doing business may be required to integrate a radically different technology into their operations. At best, radical changes will disrupt the product markets and create levels of uncertainty.

The institutionalisation of the infrastructure is a barrier to the entry of radical technological changes, as it bars the entry of new competitors. On the other hand, radical changes may create opportunities such as new markets and lines of business (Martin-Rojas et al., 2019). The effect of radical innovation is more likely to move the organisation into a new business and create new line. Radical process changes can revolutionise product markets, create new markets for hitherto costly products, and can result in making new products possible (Bans-Akutey, 2022). Such radical changes are often critical in the history of a company or industry. However, from a strategic point of view, such radical changes are very difficult to predict. If such radical changes cannot be predicted or planned, they can be built into a systematic technological strategy (within a business strategy) only under certain, specific conditions.

Firms seeking to break out of technological constraints, either to revitalize a stagnant industry, confront foreign competition, or to create new lines of business, may find radical changes useful (Martin-Rojas et al., 2019). Indeed, as the level of institutionalization increases, radical change will become increasingly necessary in the effective pursuit of strategies. "Under such conditions, however, a firm would need to break out of the existing infrastructure, either to work on its own or to seek access to alternative invention processes" (Bans-Akutey, 2022). As institutionalisation increases, radical changes will come from outside of the infrastructure that grows up around the product market. If successful, the firm's technology strategy could then be built around both the emergence of a new infrastructure and the technological progress that occur as the radical change is domesticated (Martin-Rojas et al., 2019). Organizations should not, however, count on radical new technologies to help them out of current problems. There are good institutional reasons why technological "quick fixes" are unlikely to appear and less likely to be effective. Radical process and product changes provide a sound basis for technological strategy only under very special conditions.

## 5.2 Institutionalisation and the Timing of Technological Change

As institutionalisation increases, the timing of technological change tends to be very critical. Any advantage accruing from a technological change will be hard to protect. Patents and trade secrets will be easily penetrated because of the standard and public character of technology. Firms can use the pattern of technological development to their advantage by carefully timing the adoption of a product or process

change. A first-mover advantage can be achieved and protected if subsequent developments are small enough or infrequent enough to provide a long lead time before a second mover can obtain a worthwhile technological advantage (Zahra et al., 2009). In other words, a firm can wait until technological development has gone far enough to produce a set of changes that provide a competitive advantage and then use the incremental nature of institutionalised change to protect its first-mover advantages (Bans-Akutey, 2022). A timing strategy is possible when the infrastructure and the process of technological change are institutionalised. Institutionalisation provides a stable process in which good judgement can be made of the rate and magnitude of future technological change.

## 5.3 Institutionalisation and Product Technology Leadership

Institutionalisation has important implications for firms attempting to establish a competitive advantage based on product technology leadership. Sustaining an effective strategy based on leadership in product technology requires that the firm continues to introduce new products. As institutionalisation increases, the rate of new product introduction increases (Martin-Rojas et al., 2019). Thus, maintaining a competitive advantage based on new product technology requires being positioned to gain the new technology as soon as possible. The firm must maintain access to the technological infrastructure in order to carry out such a strategy. Without access, technological leadership becomes impossible as the infrastructure develops. Such a strategy also requires that the firm influences the kinds of product technologies that are being developed (Omerzel & Antoncic, 2008). Since institutionalisation requires that other organisations can have access to the technology, a firm can successfully pursue this strategy only if the invention process produces changes in product technologies that fit into the firm's overall strategy (Bans-Akutey, 2022). This requires being involved in establishing the direction of technological development in ways which serve its own technological needs. Institutionalisation also increases the rate of technological change. Only those firms that are well integrated into the system will be able to sustain a strategy of product technology leadership and enjoy the benefits of rapid improvements in product technologies.

## 5.4 Institutionalisation and Process Technology Leadership

Firms building a strategy in which leadership in process technology is important will face similar effects of institutionalisation. Increased institutionalisation will be associated with an increased rate of process innovation and shifts to more systematic, routine, and efficient production (Bans-Akutey, 2022). This will lead to falling production costs as the technological infrastructure develops. Only firms who have committed to the technological program of the invention process and linked their technological strategy to it will be able to systematically and smoothly adopt successive changes. So, a process technology strategy, tied to a cost leadership strategy within the firm, will require linkage with the system (Martin-Rojas et al., 2019). Here too, the problem of aligning the organization's strategy with

the direction taken, and attempting to influence the direction taken in the development of the infrastructure, is a key strategic issue.

### 5.5 Institutionalization and Mobility Barriers

Institutionalisation improves barriers to entry by creating a specialized and integrated technology particular to an individual product market (Martin-Rojas et al., 2019). This implies that firms operating businesses are expected to accelerate the pace of development and limit access to the technology in order to protect the sector from new entrants (Bans-Akutey, 2022). Given the weakness in the protection that patents and trade secrets provide, entry barriers need to be maintained by limiting network access, and focusing the direction of the technological change towards enhancements for existing technologies.

Institutionalisation has a similar effect on exit barriers (Harrigan, 1980). As firms participate in, and commit to, the technology produced in the network, they limit their ability to engage in other lines of business. "As the technology becomes increasingly specialised, it becomes more limited in its application" (Bans-Akutey, 2022). As a result, organizations may find themselves confined to a situation where they cannot escape without incurring high costs.

### 6. Conclusion

With the huge investments business organisations make in the use of technology, it is expected that organisations effectively manage technological developments in order to achieve the anticipated productivity. Technology affects the organisation's mode of communication, issues related to human resources, processes, products as well as the quality of manufactured products. Further research is required to specifically measure the effect of technology on each of the identified aspects of the business organisation. Considering the digital divide in developing and developed countries, further studies is required to ascertain how the digital divide mediates the influence of technology on a business organisation.

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