A Literature Survey on Information Communication Technology (ICT) and Management in Organizations

Mahmoud Moussa

Abstract

Despite the fact that the factors driving information and technology dispersal for developing countries are different from those in developed ones, the author in this paper did not focus on a particular nation. The author reviewed materials with no regard to the place of publication or where the investigations took place. An exhaustive review of literature indicated a number of considerable challenges and implications for practitioners. These were: an information system must be set with all tools necessary to provide meaningful information with regard to time issues and completeness; become aware of what an IT system can bring and its impact on the organization’s efficiency, structure, transparency and interpersonal relationships; recognize deficiencies and limitations in the organization’s computer-based information systems; promote change, knowledge sharing, creativity, innovation and democratization; catch up with recent technological developments, which may enhance the efficiency of the organization’s system; and become competent in maximizing the organization’s outcome from the application of such an information system. Above all, policies should be scrupulously communicated to each individual in the organization to ensure the appropriate use of technology and reduce any resistance to change. Lastly, and as a caveat, the quantitative advantages of IT aspects cannot be measured easily because the system is not directly visible when it supports the different processes of an organization.

Keywords: information, IT, management, organization, technology
Author: Mahmoud Moussa is a faculty member at the International Business Management Programme at Rajamangala University of Technology Lanna, Chiang Mai, Thailand.

1. Definitions of Technology

Since technology is one of those words often used in a nonchalant way, Swanson and Holton (2001) defined technology in distinct ways. They defined technology (in general) as the application of the sciences to serve industries, unions, government systems and humanity in general. They defined technology (the process) as a ‘sociotechnical’ means of identifying and solving problems. Nelson and Quick (2006) referred to the term technology as the tools, techniques and practices performed by organizations to convert inputs into outputs. Technology is comprised of the alteration processes employed to recreate resource inputs as organizational outputs (Griffin, 2008; Williams, 2010; Schermerhorn, 2011).

Bartol and Martin (1991) and Jones and George (2011) argued that technology is the mixture of equipment, machines, computers, competencies, information and knowledge that management teams use in the design, production and allocation of goods and services. Technology was also portrayed as the product of human actions or what they attempt to accomplish, while it also presumes structural properties (Prasad, 2009). Technology contains any type of equipment or process that individuals in organizations use in their work routine and “this definition includes tools as old as a black smith’s anvil and tools as new and innovative as virtual reality” (Certo & Certo, 2009:506). Technology is a major part of change for many organizations. According to Kinicki and Williams (2011), technology is not only computer technology but, also, any process or device that allows an organization to achieve a competitive advantage in changing materials required to produce an outcome. Thus, technology is the development of any software or hardware that defines and develops human capabilities that may offer a better environment for an
organization, community and, ultimately, for all of humanity. However, we should not rely solely on technology to perform every task in our lives but it should be perceived as an aid to accomplish the required tasks.

2. Use of Technology in Different Perspectives

Numerous organizations have increased their awareness of the methods and techniques used to incorporate technology into the workplace. This has the ability to stimulate or hinder all processes and activities within an organization. Generally speaking, technologies of different kinds establish an infrastructure for communicating and sharing information necessary to build a high performance organization (Bohlander & Snell, 2004). Investments in technology may not have an immediate impact on productivity as their influence is indirect and subject to changes in many aspects (Ashrafi, 2011). In a similar vein, due to the realization of the significance of technology, organizations expect the expansion of particular processes that are more efficient and profitable, although, they do not anticipate changes in the short term (Prasad, 2008). Technology has consistently infiltrated business processes and is directly controlling them (Prasad, 2009). Prominently, advances in technology repeatedly bring changes to an organization’s structure and, in turn, managers and technology professionals must support and link every area of the organization (Madura, 2001). Such linkage requires effective communication among all employees and employers in organizations.

An organization’s technology is a significant variable in shaping its structure; however, elucidating the rapport between technology and structure is convoluted, because different organizations may use different technologies (Nelson & Quick, 2006). In a similar vein, Bartol and Martin (1991) observed that one reason behind the use of different structures in different organizations can be derived from technology, the knowledge, tools, equipment and work methods employed by an organization in offering its products or services. It is
generally considered best to have a movable structure, encourage flexibility and promote employee freedom for creating and innovating ideas (Daft & Marcic, 2007). However, this can be applied through integrating relevant structures and processes for innovation, creation and implementation.

Arguably, in some organizations, technology influences the number of employees needed to perform operations effectively. Correspondingly, technological changes frequently impinge on the number of employees needed and the types of competencies required (Bartol & Martin, 1991). According to Hodgetts, Luthans and Doh (2006:46), “Some experts predict that in the future technology has the potential to largely displace employees in all industries, from those doing low-skilled jobs to those holding positions traditionally reserved for human thinking. For example, voice recognition is helping to replace telephone operators.” As a general rule, the more complex the technology that an organization applies, the harder it is to manage it because more unanticipated actions may occur. Thus, Jones and George (2011) stated that the more complex the technology, the more a flexible structure and culture is required to enhance the organization’s ability to respond to unforeseen situations. Conversely, the more routine the technology, the more a formal structure would be relevant, because actions and duties needed to produce an output have been tested in advance.

Further, it is fundamental to develop and preserve what Schermerhorn (2011) called a high ‘Tech IQ,’ or an individual’s capability to apply technology at work and a commitment to stay up to date on the modern technological developments. Schermerhorn (2011) also added that ‘Tech IQ’ is needed in basic operations, such as checking inventory, sales transactions, ordering supplies or analyzing customer favourites. It is also needed in the fast growing number of ‘virtual teams’ in which colleagues hold meetings, access common databases, share information and files, make plans and solve problems without having to meet face to face. ‘Tech IQ’ is also required as more people
are ‘telecommuting’ or working from home, which frees them from a normal 8:00-5:00 schedule. It has also been said that organizations are linked through computer-mediated relationships and they are increasingly developing new generations of ‘virtual workers’ who telecommute or work from home, hotels or wherever possible (Bohlander & Snell, 2004). Being ‘virtual’ refers to a primary transformation in the temporal aspects of management and organizations (Lee & Whitley, 2002). Lee and Whitley (2002) further stated that ‘virtuality’ implies an understanding of social changes that ensue not only in a material sense, but also in a conceptual one.

Recently, key technological changes often involve the introduction of new tools, methods, techniques, automation and equipment. Of particular importance to production is the issue of automation. Automation is defined as a technological change that substitutes humans with machines. It started in the Industrial Revolution and continues today as a management opportunity (Robbins & Coulter, 1999). Additionally, innovations in computer and IT have made available new positions within departments and, in fact, give rise to completely new roles in an organization wherein advanced IT skills are required (Mosley, Mosley & Pietri, 2011). It is thus obligatory for management to keep abreast of emerging technologies that are likely to improve effectiveness, enhance employees’ training and prevent employees’ resistance to change. However, technology requires both hardware (equipment) and software (management, training, education) which facilitate the latest technologies to be applied for a long period of time in a satisfactory condition for both stakeholders and stockholders (Forsyth, 2005).

Evans and Lindsay (2011) noted that technology can boost an organization’s capability to leverage customer-related information and offer better customer service. For instance, today’s technology enables written communication to be exchanged at a much faster pace (Dlabay, Burrow & Eggland, 2006). CRM (software) technology is a key enabler of ‘customer relationship management.’ This software can
be tailored to assist organizations by increasing customer loyalty, marking their desired customers and organizing customer communication processes (Evans & Lindsay, 2008).

Furthermore, organizations vary in the technologies used to produce its outputs because:

- Some organizations are very labour-intensive, necessitating lots of labour to produce goods and services;
- Other organizations are very capital-intensive, demanding large investments in machines and equipment to enhance their production processes;
- Some organizations have access to identical technologies and as such have similar cost structures; and
- Other organizations can access a technology that is not available to others (Baye, 2009).

Accordingly, organizations with advanced technology will have a competitive advantage over other organizations and eventually become market pioneers. Unsurprisingly, the rate of technological development is increasing rapidly; therefore, organizations operate in different ways today than they operated in the past. Until recently, the lack of computer-literacy competencies was said to separate ‘the haves and have-nots;’ now, the ‘digital divide’ is the expression used to portray the difference between households with Internet access and those without (Mondy et al., 2002). Some may argue that those without Internet access are deprived from obtaining contemporary information. Leshin (1997) claimed that numerous organizations are turning to the Internet, believing that the individuals who catch up with the latest up-to-date information and technological advances are the best candidates for positions. Cummings and Worley (2009:700) explicitly observed that “the Internet is the backbone of a global economy, and although the technology sector has suffered financial setbacks, few people doubt its future importance.”
Despite all of the above, Heeks (1998) noted that the efficiency of the technology is a regular frustration and yet we persist in believing that success and productivity are easily obtainable if only (a) we purchase the latest software; (b) we possess better computers; (c) we connect to a new communication network or (d) we implement a new management philosophy in order to develop and implement our information systems.

3. IT and Management in Organizations

The operations of any organization are part of a process called the ‘information processing cycle.’ According to Norton (2006), the information processing cycle has four parts and each part occupies one or more specific constituents of the computer:

- **Input:** the computer accepts data from particular sources for processing;
- **Processing:** the computer’s processing parts execute actions on the data, based on some commands from the user or a programme;
- **Output:** the computer may be required to reveal the results of its processing and the computer may also send or transfer the output to another computer through a network or the Internet; and
- **Storage:** the computer enduringly accumulates the results of its processing on some kind of storage medium, disks or tapes.

At this juncture, it is important to consider the characteristics of what constitutes useful information that may assist in developing strategic plans and in recognizing problems in organizations. Daft and Marcic (2007) indicate that high-quality information characteristics involve three broad aspects and these are (a) time: information should be accessible and provided whenever required; (b) content: meaningful information is error-free, complete, concise, accurate and matches the
user’s needs; (c) form: the information should be easy for the user to comprehend and should be offered in a meaningful way. Moreover, information would not be valuable if it does not meet the following criteria:

- **Timeliness:** the information is obtainable for making critical decisions and taking action whenever necessary, otherwise known as time sensitivity; timely information is current and up-to-date; and timely information is provided frequently;
- **High quality:** the reliability and the accuracy of information is of great concern, clarity, orderliness, format; as well as the medium through which the information is conveyed;
- **Completeness:** adequate and up-to-date information to perform tasks is essential; and conciseness and details are additional characteristics of completeness;
- **Relevant:** scan the information for any ambiguity; and
- **Understandable:** comprehensible information is required to understand the essence of what is being said or presented to users in organizations (Schermerhorn, 2011; Goodman *et al.*, 2007).

Similarly, Certo and Certo (2009) categorized the four prime factors that authenticate the value of information as (a) information appropriateness; (b) information quality; (c) information timeliness and (d) information quantity. In other words, organizations should promote the distribution and the use of organizational information that is appropriate, of high quality, timely and of adequate quantity. This would then lead to a discussion of what type of information is needed across managerial levels. For instance, (a) the upper level of management may require information that is summarized and relevant for future development of the organization’s systems; (b) the middle level of management may require more detailed and up-to-date information than that required by the upper-level of management, in order to deal with tactical issues such as tactical planning and tactical control and to have greater understanding of the external environment,
which may affect internal tactical plans; and (c) first-line management or supervisory management may require information that comes primarily from internal sources and that information should be more comprehensive and more recent than that needed by managers at higher levels (Bartol & Martin, 1991). Additionally, Schermerhorn (2011) outlined the following:

- Planning advantages of IT: better and more timely access to useful information, involving more people in the planning process;
- Organizing advantages of IT: more ongoing and informed communication among all parts, improving coordination and integration;
- Leading advantages of IT: more frequent and better communication with staff and diverse stakeholders, keeping objectives clear;
- Controlling advantages of IT: more immediate measures of performance results, allowing real-time solutions to problems (Schermerhorn, 2011:163).

“The most obvious areas in which technological advances in information processing facilitate the use of a particular style are the quantitative and systems perspectives. The geometric increase in microchip processing capability makes it easier to develop ultrasophisticated quantitative models of complex management systems. Rapid processing and feedback of information in these systems models allow the organization to be managed as a coordinated entity. Perhaps less obvious is the impact that information-processing technology has on the subfields of the classical perspective on management (Goodman et al., 2007:42).”

Prasad (2011) observed that organizations should reflect on two important elements of IT-related resources to obtain the benefits associated with investment in IT in developing nations and these are: (a) the ability to control their IT assets and (b) the identification of the
path of IT-related organization value creation. According to Prasad (2011), this level of awareness is likely to develop an understanding of the need to invest in IT-related resources in the developing countries, which may improve their capability to perceive the value from constant investment in IT. Nevertheless, IT specialists are increasingly aware of the difficulty of simultaneously meeting the information requirements and the needs of a particular organization, specifically a large one, such as Total Access Communication Public Company Limited, commonly known as DTAC, or ‘Advanced Info Service,’ known as AIS, which are telecommunications companies in Thailand. Thus, organizations must adapt themselves to changes in technologies and help others adapt. As a caveat, Heeks (1998) asserted that several stakeholders have a great propensity for advocating a fallaciously positive picture of IT; for instance:

- All hardware and software and training firms should be consistently involved through the investment in IT;
- All IT experts’ occupations depend on IT;
- All scholars work in computer science or information systems departments;
- All journalists and other employees create IT magazines;
- All the occupations within organizational IT departments depend on IT; and
- All managers desire rapid solutions for their problems or wish for their organizations to be competitive and skilled by the use of recent technologies.

Indeed, IT is more important in some organizations and industries than others (Thompson & Cats-Baril, 2003). It depends on the positioning of the IT role within the organization; for instance, to whom, at what level, where and what functional area it reports, are among the key questions. It has been estimated that there will be more technological evolution in the next fifty years than in the last thousand years (Mondy et al., 2002). Following this line of thought, organizations should then attain, systematize and utilize enormous
amounts of information to make decisions and practice control over them. One consequence of the ‘information revolution’ is the redeployment of power in today’s more advanced organizations (Mosley et al., 2011). Consequently, organizations should address and concentrate on how much the use of technology can have an impact on controlling every business area. DuBrin (2006) remarked that the development and spread of new technologies boost the significance of innovating to remain competitive in a particular market. A more contemporary view is that information and communication technology is at the heart of the technological revolution, because it makes globalization more realistic as it facilitates access to employees around the world at a practical cost (DuBrin, 2009). Jones and George (2011) also explored the issue of information richness and communication media in descending order of information through four categories: face-to-face communication (e.g. videoconferences); spoken communication electronically (e.g. voice-mail); written communication electronically (e.g. e-mail) and impersonal written communication (e.g. newsletters). It is, therefore, crucial to address the typical responsibilities for an information services department so as to conclude specifically what functions and activities should be performed:

- Formulating an inclusive IT strategy;
- Perpetuating and scripting the current inventory of corporate hardware, software and information systems;
- Developing criteria for telecommunications and setting up local and extensive networks;
- Preserving and defending databases and important applications;
- Assessing, attaining and combining new software and hardware products;
- Training and developing internal and external stakeholders;
- Developing partnerships with information systems experts and vendors in the procurement and expansion of new IT and systems;
• Encouraging technology transfer across organizational divisions; and
• Managing and taking a lead in outsourcing vendor and service provider relationships (Thompson & Cats-Baril, 2003).

Above all, “Technology is not the solution for all organizational problems, and technology will not in and of itself provide relief from poor organizational practices. The benefits that can be gained from technology are many, but the ultimate benefits from technology are the vast amounts of information that can be processed and distributed more easily (Goodman et al., 2007:429).” Concisely, the definitive success or failure of IT is seldom unambiguous. Thompson and Cats-Baril (2003) also found that it is imperative to acknowledge that the functions and responsibilities of information services departments will constantly change as technology and organizations’ strategies change and will impose new organizational structures as well. Notably, technological progression has modified the techniques with which information is obtained and shared; consequently, information is considered a strategic weapon in today’s global economy if well managed and controlled (Ashrafi, 2011). Thompson and Cats-Baril (2003) demonstrated that the responsibilities of organizational management regarding ethical issues can be classified into two general categories: (a) ‘information access’ or who owns data developed by or about individuals; and (b) ‘information stewardship’ or the responsibilities of an organization to store, transfer or manipulate information pertaining to other individuals.

Interestingly, Gitman and McDaniel (2006) have the view that today most of us are ‘knowledge workers,’ who develop or use knowledge to contribute to and benefit from information while involved in the planning, acquiring, retrieving, organizing, analyzing, storing, programming, producing, disseminating, marketing, or selling functions. Perhaps most significantly, we must possess the skills that enable us to use and garner information from the different resources available to us. Above and beyond that, organizations should not avert
the generally accepted system security principles (GASSPs) for maintaining information security and these include:

- **Accountability principle:** organizations must clearly delineate and communicate information security accountability and responsibility;
- **Ethics principle:** organizations should consider standards of ethical conduct when using information and implementing information security systems;
- **Timeliness principle:** organizations should act in a timely manner to circumvent violations of and threats to information systems;
- **Assessment principle:** organizations should frequently evaluate the risks to information and information systems; and
- **Equity principle:** management should be concerned about employees’ rights when developing policies related to security measures (Certo & Certo, 2009).

Thompson and Cats-Baril (2003) indicated that organizations that rely on IT for their operations must develop adequate security mechanisms, as part of their strategic planning process, to protect their systems and plans to recover from a crash of the system. Moreover, Miner and Crane (1995) reported that information security, in terms of human resource information systems (HRIS), comes in three forms: first, ‘physical security’ refers to the security against employee theft and deletion of data; second, ‘access security’ implies managing entry into the system and is typically implemented by the use of passwords; and finally, ‘procedural security’ indicates a set of policies and operating practices that ensure compliance with privacy laws. Comprehensively, DuBrin (2006, 2009) synthesized the positive and negative consequences of IT. The positive ones are as follows: (a) enhances productivity and teamwork; (b) develops a competitive advantage; (c) supports management philosophies; (d) enhances customer service and suppliers’ connections; (e) develops
communication and coordination; (f) facilitates rapid access to large amounts of information; (g) enhances scrutiny of information and decision making; (h) allows better empowerment and organization structure; (i) saves time through employee self-service; and (j) takes advantage of employee monitoring and surveillance. On the other hand, the negative ones include (a) wasted time at the computer; (b) recurring actions; (c) a decline in customer service; (d) perplexed consumers; (e) wired managerial workers; and (f) reliance on the Internet. In short, the richest communication happens face-to-face; thus, IT need not always be so ‘high-tech’ because the critical issue is that high-performance work systems cannot thrive without timely and accurate communications (Bohlander & Snell, 2004).

O’Brien and Marakas (2006) stated that in many organizations ‘technology management’ is the major role of a Chief Technology Officer (CTO), who is responsible for all planning and deployment of IT. Chief Executive Officers (CEOs) ought to support their functional and organizational managers to acquire and implement the plethora of methods, tools and techniques of IT to build a genuine IT culture and not only seek to adapt and adopt the recent technologies (Seyal, Rahim & Rahman, 2000). Today, Chief Information Officers (CIOs), or Chief Knowledge Officers (CKOs) are important upper-level members of any management team, helping organizations use technology to communicate effectively with others while providing better service and lower costs (Nickels, McHugh & McHugh, 2008; Schermerhorn, 2011). As declared by Schermerhorn (2011:161-162), “The new IT-intensive organizations are flatter and operate with fewer levels than their more traditional organizational counterparts; computers replace people whose jobs were devoted primarily to moving information. This creates opportunities for faster decision making, better use of timely information, and better coordination of decisions and actions.” In brief, organizations nowadays are not only using IT but also they are being affected by its changes, either positively or negatively. It is, then, rational to believe that IT
breakthroughs that influence all areas of human actions seem to be occurring daily (Thomas, 2008).

The IT specialist roles in industrialized nations are widespread and have a crucial part in connecting organizational IT requirements with knowledge and skills (Winley & Wongwuttiwat, 2012). However, that is not the scenario in developing countries in spite of the efforts made to emphasize the importance of the IT sphere. Most senior managers need more IT information and are not as acquainted with electronic information systems (EIS) as their western counterparts. Managers should receive ongoing training courses in IT services that can educate them on how to plan, design, select, implement and use emerging information and communication technologies. These courses would enable them to acquire the technical knowledge and skills required to build cohesive teams effectively, information and communication technologies and business activities, with regard to the organization’s strategic goals. Such courses would allow managers to comprehend how to manage data and IT operations in the organization, recognize a systematic and professional approach to the management of IT service provision in the organization, develop precise communication tools and enhance their analytic methods when developing solutions in complex situations.

The most problematic issue for EIS development in developing nations is the potential for the project to be conducted by the IS department, with little user involvement in design and development (Jirachiefpattana, Arnott & O’Donnell, 2005). They also added that if the local culture of the organization is such that engagement in system development is under the control of a manager, then EIS may not be an effective IT system for that organization. Consequently, users should be indisputably engaged in system development; however, development should be performed by local information systems professionals who are familiar with the local management culture and customs. It is also important to note that terms such as IT departments and IS departments may be wrongly used interchangeably. However,
IT departments incorporate all aspects of IT, software, hardware and networks in organizations; on the other hand, IS departments are specifically information systems that support management, operations, decision-making and help individuals interact with technologies in support of business activities. In other words, IS departments determine the way in which an organization interacts with the technology used and the way in which the technology is applied to the organization’s processes. An organization’s IT is comprised of the hardware (personal computers, mainframe computers), software (operating systems, programmed applications), telecommunications hardware (routers, multiplexors), networking hardware and software (local area network cards and operating systems), database management and other technologies it implements to store and retrieve information and present them for organizational decision making (Daft, 2010; Daft & Marcic, 2007; Thompson & Cats-Baril, 2003). Dessler (1998) defined IT as any processes, practices or systems that smooth the progress of processing and conveying information. Prasad (2008) observed that there are greater benefits that IT ventures offer than the widely perceived concrete outcomes. These outcomes are more at the personal level, which is very encouraging, particularly for the developing nations, where domestic and international businesses target their IT ventures at the operational level. This necessitates understanding the relationship and the interaction between the technology and its users. As Prasad (2009) noted, understanding the interaction between technology and users could be through an ‘ethnographic approach.’ Equally, recognizing how technology is applied and to what extent this technology enhances the organization’s performance depends on the ability to understand how employees and management perceive the term technology. Madura (2001:219) claimed that “Technology and the knowledge-based economy are not constrained by the physical objects and materials of a firm. Information is flexible and can be structured and organized in a number of different ways. For example, videoconferencing and telecommuting allow project teams and departments to work together regardless of where they are located and
what department they work for. Thus, technology enables departments within a firm to communicate more easily.”

Recently, management of technology, particularly in developing nations, has become a key consideration within organizations. Undeniably, progress in IT has offered organizations huge benefits from the explosion in information. At the organizational level, there is a consensus that IT, when implemented effectively, speeds up business activities at a high rate and thereby saves organizations a significant amount of time (Lee & Whitley, 2002). Though there is an agreement that IT adds to business value, practitioners are still uncertain as to how that occurs, especially in developing nations (Prasad, 2008). Hence, it is necessary to understand how IT investments, which may support the efficient use of technology resources, add value to an organization. Contemporary critiques postulate that it is not IT itself that creates value but, instead, how IT is used to support organizational performance. Prasad (2009) assumed that preliminary meetings would be useful with organizations that have the propensity to invest in IT, to guarantee that they stand to learn something from the new trend. Management success entails ‘computer competency’ or the aptitude to use computers to their greatest advantage and ‘information competency’ or the ability to organize, assemble, evaluate and analyze information for making decisions and solving problems (Schermerhorn, 2011). In essence, the management of hastily shifting technology is paramount to any organization. Hence, advances in information systems technology will continue to have influence over the operations, costs, management work environment and competitive situation of numerous organizations (O’Brien & Marakas, 2006).

4. Core Technology and Its Management

Technology can include electronic or digital products and systems considered as a cluster. It includes the use of any software, hardware or electronic devices in organizations. Core technologies are the basic
building blocks from which all technology systems are created and we use them to help us solve problems and extend human capabilities (Smith & Gray, 2010). Core technologies are responsible for managing integrated IT systems resources and for maintaining a secure and stable computing environment for the organization. As noted by Griffin (2008), a large number of organizations apply numerous technologies but an organization’s most significant one is called its ‘core technology,’ which is a term that can be perceived in and applied to service organizations. Haag and Cummings (2010) categorized technology as both ‘hardware’ (the physical tools which compose a computer) and ‘software’ (the instructions that the hardware follows to accomplish a particular task). Moreover, Haag and Cummings (2010) assembled the six categories that all technology hardware falls into, as follows:

- An ‘input device’ is a device to type some orders or information, including such tools as a keyboard, a mouse and a monitor;
- An ‘output device’ is a device to identify the consequences of your information-processing commands, including such tools as printers, monitors and speakers;
- A ‘storage device’ is a tool to accumulate some information and use it later, including such tools as thumb drives, flash memory cards and digital versatile disks (DVDs);
- The ‘central processing unit’ (CPU) is the hardware, which formulates and implements the software instructions and coordinates all the hardware operations;
- A ‘telecommunications device’ is a device to transfer information to and receive it from another individual or computer in a network. For instance, if one accesses the Internet by utilizing a modem, then the modem is a ‘telecommunications device’; and
- ‘Connecting devices,’ which involve a universal serial bus (USB) port into which one would connect a printer for example and internal connecting devices on the motherboard.
Computers and other forms of IT could be supportive but not fundamental. In other words, they are likely to be necessary when a colossal amount of information is a prerequisite for making critical decisions in an organization. Most importantly, to amalgamate computers within the organization entails not only setting up hardware and software but, also, many physical and human conditions are required. Time, for instance, has recently become an essential issue in social sciences and management studies. Lee and Whitley (2002) found that the clock and the computer influence chronological aspects of individuals, organizations and, eventually, society, as well as the way people perceive time.

Despite the fact that technological revolutions can intimidate an organization, they may have weighty implications for a management team; for instance, they can accommodate new prospects for designing or distributing new goods and services (Jones & George, 2011). Jones and George (2011) also added that telecommuting along the information superhighway, videoconferencing and text messaging offered many organizations the opportunities to diversify commitments geographically. Similarly, technological changes can assist organizations in offering better services and operating more effectively and efficiently (Williams, 2010). Although changing technology clearly contributed to much of the environmental changes facing organizations, these same technological advances have allowed leaders to manage the organization’s work in new ways to be more effective and efficient (Robbins & Coulter, 1999).

Thus, a potentially pertinent question is, ‘how can management urge technological change’? As generally noted by Daft and Marcic (2007), technology change is bottom up, which means that ideas are generated and championed at lower organizational levels and channelled upwards for endorsement and execution. Evidently, the ease of use of suitable technology is a keystone of productivity and the ontology of the core technologies in use is an imperative ingredient for a competitive advantage over others (Schmermerhorn, 2011). However,
new technologies, or technological changes, as indicated by Nelson and Quick (2006) are a mixed blessing that can act for the improvement of a job performance or else create ‘technostress,’ which results from the negative impacts of some new technologies in organizations. With the purpose of deciding which technologies to apply, Haag and Cummings (2010) explicated the following: (a) evaluate rivalry in the marketplace and pressures on the organization; (b) recognize vital business strategies to identify environmental and competitive pressures effectively; address tactics and procedures that advocate the selected organization’s strategies and, eventually, integrate technological devices with those critical processes. Otherwise, organizations are highly likely to apply the wrong technologies, followed by an adverse fate and undesirable outcome. Nevertheless, it is difficult to envisage how new technologies can have a negative impact on organization’s processes and productivity (Jackson & Schuler, 2000). As such, organizations should anticipate new challenges, regardless of the direction from which the changes arise.

Technology has abridged product life cycles, such as in periods of product development, market orientation, growth, maturity and decline (Allen, 2010). Additionally, Allen declared that with e-mail and the omnipresent Internet throughout organizations, customers currently anticipate rapid answers to their concerns and document preparation. Consequently, organizations must catch up with changing consumer demand, new technologies, as well as the technological innovations of their competitors.

5. Adopting and Managing Exploding Technology

A technology explosion is an increase in the development of high technology products and the innovation of new things. There are numerous ways that technology has affected our lives: it is hard even to count them all. The following points are just a few ways in which the technological explosion has influenced us and made our lives
easier: (a) computers allows us to analyze enormous amounts of data, reduce the need for paper documents and to be able to communicate quickly with people around the globe; (b) automated processes increase the efficiency of operations; (c) an organization’s accounts and customer profiles can be easily stored and accessed, which increases the market penetration of a business; and (d) technology has helped us meet the security demands of business. As observed by O’Brien and Marakas (2006), numerous organizations in the 21st century around the world are converting themselves into global business powerhouses through major investments in IT. Consequently, O’Brien and Marakas (2006) recommended one well-established approach to managing IT, which consists of three important elements:

- Managing the joint development and implementation of business/IT strategies: conducted by the CEO and CIO, plans are created by business and IT professionals to enhance the strategic goals of the organization; the process also involves assessing the business situation for investing in the development and implementation of each IT project;
- Managing the development and implementation of new business/IT applications and technologies: this is the major responsibility of the CIO and CTO; this area of IT management includes organizing processes for information systems development and implementation, as well as the responsibility for research into the strategic applications of new information technologies; and
- Managing the IT organization and the IT infrastructure: the CIO and IT professionals are responsible for managing the IT infrastructure of hardware, software, databases, telecommunications networks and other IT resources, which must be maintained, acquired and monitored.

Nickels et al. (2008:596) wrote that, “Until the late 1980s, business technology was just an addition to the existing way of doing business. Keeping up-to-date was a matter of using new technology on old
methods. But things started to change as the 1990s approached. Businesses shifted to using new technology on new methods. Business technology then became known as information technology (IT), and its role became to change business.” It is well known that a common threat mediated by IT is the peril of emerging technologies or the likelihood of a new technology adopted by a competitor in the marketplace. IT continues to grow and new methods and applications are evolving every day. For instance, Daft and Marcic (2007) explained that some of the recent trends in IT that have supreme influence are wireless applications, peer-to-peer technology, new communication tools such as blogs and wikis and international expansion. Consequently, Thompson and Cats-Baril (2003) urged professionals in emerging technologies to shed light on the following: (a) scan and monitor the environment to identify potential threats that may result from the use of some technologies in the organization; (b) assess the practicality of the accepted new technologies to specify how they can be utilized effectively; and (c) support the embracing and incorporation of emerging technologies into the organization.

Robbins and Coulter (1999) assembled some implications derived from the vast increase of IT research and these include: required job competencies will increase; employees will need to learn how to read and comprehend software and hardware manuals, technical journals and comprehensive reports; and provide organizations with the ability to innovate, offer goods and services rapidly and be able to react quickly to customer concerns. Furthermore, just having access to new technologies may not be enough to ensure the effectiveness and efficiency of an organization. Hence, Thompson and Cats-Baril (2003:229) revealed that, “Although an emerging technology group can help, what is required for organizations to keep pace with new IT and its uses is an organization composed of individuals who are all willing and able to continually learn.” In other words, the management of emerging technologies is fundamentally the management of change within an organization. Robbins and Coulter (1999) noted that management can modify the technology used to
transform inputs into outputs, good and services and they claimed that perhaps the most obvious technological changes in modern times have come through managers’ endeavours to widen computerization.

According to McGuigan, Moyer and Harris (2008) ‘computerization’ has made output per worker higher and, as a result, minimized unit labour costs when processing insurance claims. They also argued that computerization and IT increased productivity and minimized costs across different industries, because of research and development (R&D) capabilities offered by computers and IT systems. Lazear and Gibbs (2009) observed that the last few decades have experienced most remarkable developments in the speed and capabilities of IT, as well as rapid price reductions. Additionally, new forms of IT have transformed control systems because they support the flow of accurate and timely information across the organization’s hierarchy and within functions and divisions (Jones & George, 2011).

The responsibility of coping with new technologies will be on workers and management who desire to use new technologies in the workplace. Prasad (2009) observed that interviews, discussions and observations should be taken into consideration with all parties involved and meeting minutes, budgets, and policy statements may offer important insights into a management vision on IT use and investment. On a similar note, the perceptions and experiences of different managerial levels and the workers of the IT department should be taken into account. Prasad (2011) affirmed that the existence of human IT capital in the developing nations will also represent an important connection between the emerging technology and organizational processes. Many believe that intellectual capital will soon be the prime way in which organizations assess their value. Consequently, leaders view information as a critical resource to manage, just as they manage raw materials, cash flow and other resources (Daft & Marcic, 2007). Further, Gitman and McDaniel (2006) showed the following procedures necessary to protect IT assets:
• Guard all equipment on premises with effective physical security;
• Secure information using the latest encryption technology to encode confidential information so only the recipient can decode it;
• Stop unwanted access from unauthorized individuals by using special authorization systems, such as passwords, fingerprints or voice recognition;
• Set up firewalls - hardware or software intended to prevent illegal access to or from a private network;
• Monitor activities with a detection system that is alerted when unauthorized access occurs or other suspicious activities arise;
• Train employees how to react to problems and anticipate them in advance rather than waiting until they happen;
• Maintain regular staff-training activities to offer counsel about necessary security measures, such as logging out of networks when leaving the office and changing passwords frequently;
• Ensure that all employees have strong passwords that include numbers, letters and other symbols and ensure that they avoid revealing their personal identities;
• Launch a database of relevant information and frequently asked questions (FAQ) for employees so they can tackle problems themselves; and
• Develop a healthy communication environment, set up a friendly atmosphere and a non-judgmental form of listening to others.

6. Recommendations for Further Studies

Further studies may explore the ethical dilemmas involved in assessing information, technology and management within organizations and its consequences. In addition to that, more research on the criteria that are essential to developing a system which enhances and promotes the use of technology in the developing
nations, would be helpful. Perhaps it is more important to determine the pertinent technologies and how they can be utilized effectively for small, medium and large enterprises in the new global economy. We also need to recognize how individual traits affect the use of these technologies and the influence of culture and politics in making critical decisions regarding the investment in technology as a strategic element. Lastly, further investigations could determine why and when decision makers should decide to search for the latest technologies in the marketplace.

7. Implications and Challenges for Leaders and Practitioners

Evidently, there are various types of computerized information systems and technologies that help a lot of decision-makers at different managerial levels. However, although there is a plethora of technologies, it is agreed that all these information systems serve leaders within organizations. Consequently, leaders must be capable of comprehending their own information systems and how they function effectively and efficiently, in order to make proper decisions. The author sees a number of significant implications for prospective leaders and practitioners, as follows: (a) provide information systems equipped with all mechanisms necessary to offer valuable information with regard to time issues and completeness; (b) become sensitive and alert to all consequences derived from the use of a particular IT system and its impact on the organization’s efficiency, formation, transparency and relationships among all individuals; (c) be aware of any drawbacks, restraints and deficiencies in computer-based information systems; (d) value the magnitude of change, knowledge creation, creativity, innovation and democratization; (e) become knowledgeable and erudite about any recent technological invention that may contribute to the development of the system in storing, processing, retrieving or gathering information; and (f) become skilled at maximizing the organization’s benefits from the use of such an information system.
Moreover, in order to make an organizational culture compatible with the technology used, efforts should be directed towards both systems and humans. Policies should be developed and effectively communicated to enhance the correct use of technology and discourage any resistance to change. As illustrated earlier in this paper, the alignment of IT and organization strategies is crucial. One reason behind this proposition is that organizations can accomplish their goal from their IT investments only if management functions and activities are coordinated effectively, rather than being isolated. Ultimately, practitioners should realize measuring the quantitative benefits of IT is problematic because these benefits are not directly observable and/or indirectly enhance the different activities of an organization. To this end, Goodman et al. (2007) thoroughly concluded the 21st century issues in the use of IT and illustrated them as follows:

1. Information architecture: developing a sophisticated plan of the information requirements of the organization;
2. Data resources: data are now considered the vital part of production;
3. Strategic planning: the most critical issue and it includes careful alignment of technology with organizational plans;
4. Human resources: identification of the breadth of professional expertise regarding information systems, to expand and maintain progressively technical and multifarious organizational computing environments;
5. Organizational learning: learning how to make effective use of information technology;
6. Technology infrastructure: includes launching an infrastructure that may enhance present operations while being flexible enough to cope with changing technology and organizational needs;
7. Information system organization alignment: support organizational activities and operations effectively without hampering either the technology or the organization;
8. Competitive advantage: technology is not the only source of achieving a competitive advantage but it is becoming an important condition. Competitive advantage results from the effective position of IT in reforming internal organizational processes, maintaining electronic connections with suppliers and customers and determining the organization’s design;

9. Software development: creating new methods and techniques that are likely to ease the process of developing needed software systems; and

10. Telecommunications system planning: this can be implemented to condense structural, temporal and spatial limits on organizational relationships.

8. Remarks

Given the potential impact of culture on the understanding and processing of information, technology and management within organizations, cultural norms, values and beliefs should be of paramount importance. In particular, although most evolving technologies arise in the industrialized nations, we can still learn from one another. This paper could be helpful for either scholars or practitioners by creating and describing lessons on what leads to the effective use of IT resources. The author hopes that the tactics, procedures and explanations offered in this study will enable IT-related professionals in the developing nations to realize that the ability to cope with perpetual change and the interaction of organizational resources is vitally important and, in fact, essential to attain the greatest value from IT assets and investments.

Acknowledgements: Many thanks for my colleagues Peter Oswald and Curtis Fry for editing and proofreading my paper. I am also grateful to the editor and the peer-reviewers for commenting, reading, and advising on areas of concern.
9. References


