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Information Communication Technology as Catalyst for Pedagogical Changes to Generate a Smart Manpower Requirement in Developing Countries

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ABSTRACT

The human development sector has been influenced largely by the integration of ICT in education and different sectors. This study explored the employees' perceptions on the influence of ICT as catalyst for pedagogical changes in order to create a smart manpower requirement for 21st century. The study was qualitative in its nature. Thirty-six respondents participated in this study. Data were collected through interview conducted to explore different views related to how ICT influences the pedagogical changes to generate a smart human capital for the development of countries. Results revealed ICT as a transformational tool that influences the attainment of new skills required by students, teachers and other different employees in other working sectors. Employees' perceptions towards the role of ICT in changing pedagogical activities in order to create a smart manpower requirement for this century were positive. The study also proposed different recommendations which would be considered in order to solve all identified barriers.

Keywords: ICT as catalysts, smart manpower requirement, pedagogical changes, human development

INTRODUCTION

Countries pay much attention to the development of their education system so that they can contribute to their overall development (Munyengabe et al., 2017a). One of the major contributions of education to the development of countries is to generate the required human resources with adequate skills that can contribute to the needed innovation processes which may contribute to the development of countries. Information Communication Technology (ICT) is among the key elements to be considered in developing manpower required through the improvement and efficiency of education sector (Kayisire, & Wei, 2016; Mukama, 2009; Tully, 2014).

According to UNESCO (2015), the integration of Information and communication Technology (ICT) in education system is considered to be one of the major goals which aims to raise the standards of ineffective centralized education system.

Integrating the ICT in teaching and learning process can have various positive effects like student's achievement and motivation as well as greater differentiation, interactivity and individualization. ICT in education has the positive influence in human capacity development, infrastructure, equipment, content, economic and social development. It also has impact on e-governance, private sector development, rural and community access, legal, regulatory, institutional provisions, standards as well as national security and many other sectors (Jaarsveldt & Wessels, 2015; Tully, 2014).

Information Communication Technology is important in the development of the education sector as it contributes to the human development sector required for the overall development of countries (Kayisire, & Wei, 2016; Mukama, 2009; UNESCO, 2015). As a matter of illustration, researchers can share and gain more knowledge

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Contribution of this paper to the literature

- The use of ICT in changing pedagogical practices is one of the major tools to enhance the quality education required for generating a smart manpower requirement of 21st century.
- Employees in different working sectors use ICT tools to develop their career and attain the new skills and information required in their everyday activities.
- Employees' perceptions on ICT use was found to be very positive to show that all working sectors/organizations should focus on how they could fully use and integrate ICT tools in their working places.

through the use of ICT tools, while business companies and different organizations may facilitate employees to increase their skills by means of ICT tools and related technologies.

In the Education sector, it is believed that it is important that children become familiar with ICT at an early age, because they need those skills for their future education as well as in their adulthood (Burkhardt et al., 2003; Heeks, 2016; Tully, 2014; UNESCO, 2015). The use of ICT is very crucial in promoting the efficiency of education in different levels of Education specifically Pre-Primary education, Primary, secondary and Tertiary education (Heeks, 2006; Hinze & Plautz, 1988; Munyengabe et al., 2017b).

This study bases on the exploration of the use of ICT in defining human development in its general meaning related to the expansion of human capabilities, increasing different choices in the human capital, enhancement of freedom, and a fulfillment of human rights. In other words, this study elicits the mental development, social, working capabilities, extension of knowledge through growing and experiencing things and learning new things by the means of ICT.

Smart manpower requirement in this study refers to smart human resources development or a smart human capital requirement for the economic growth to sustain overall development of any country. According to UNESCO (2015), the human development is defined as "the process of enlarging people's choices", which choices allow them to "lead a long and healthy life, to be educated, to enjoy a decent standard of living", as well as "political freedom, guaranteed human rights and various ingredients of self-respect". Quite related in this paper, the researchers focused largely on the exploration of the enlargement of choice by means of ICT and its integration in education system.

REVIEW OF LITERATURES

ICT as a Catalyst for Required Pedagogical Changes

Today' education system influences largely the development of countries by generating the required skills for 21st century (Munyengabe et al, 2017b). Furthermore, this contribution shapes heavily different reforms and innovations undertaken to render the education system much better for meeting all educational expectations. (Jaarsveldt & Wessels, 2015; Tarus et al, 2015).

One of these reforms was to implement ICT policy in education system. ICT use has contributed a lot by increasing education quality. For example, a recent study of Munyengabe and his co-authors has shown in deep the importance of ICT for teachers, learners, parents and many other stakeholders in education system (Munyengabe et al., 2017b). According to Tarus et al. (2015), the use of ICT in teaching and learning has been shown by its importance expressed by online course materials, where for example, teaching and learning can be accessed 24 hours a day, without limitations. The Role of ICT in enhancing teaching and learning activities can been looked at as a real channel for knowledge transmission between teachers and learners (Altınay- Gazi & Altınay-Aksal, 2017; Burkhardt, et al., 2003).

The use of ICT tools also facilitates the quick access to the required content to be attained. It is also important to note here that some of the types of ICT programs, mainly teleconferencing technologies help in the transfer of the content of a given subject matter to be received simultaneously by different learners or followers located in different geographical areas (Muhametjanova & Cagiltay, 2012). Internet and the World Wide Web play the crucial part in disposing different types of learning materials to unlimited spaces without any restriction of people and without any time barrier (Tarus et al., 2015).

The introduction of ICT in teaching and learning processes has also been very influential to teachers as ICT facilitates them to share teaching resources (Jaarsveldt & Wessels, 2015); expertise and advice (Tarus, 2015; UNESCO, 2015). ICT tools remove the barrier and allow flexibility in what, how, when and where to carry out all teaching and learning activities (Altınay- Gazi & Altınay-Aksal, 2017). Thanks to ICT applications, teachers' skills, confidence and enthusiasm are maximized. ICT in education serves as a teachers' powerful tool for easy planning

and content preparation to be delivered (Burkhardt, et al., 2003). With ICT applications, teachers benefit full access to up-to-date pupils and school data at anytime (Muhametjanova & Cagiltay, 2012; UNESCO, 2015). Evidence from researchers has also shown that ICT is one of the potential and powerful tools necessary to extend all educational opportunities and needed changes (Munyengabe et al., 2017a; UNESCO, 2015).

It has also become evident that the use of ICT tools has important influence in increasing the quality education in developed countries (UNESCO, 2003). Different researches have largely shown that ICT use can be considered as a good example to be applied in developing countries because they require attaching their education systems to the overall development. ICT in education helps schools with limited and outdated library resources. Besides, it was also important to recognize the ICT roles in facilitating communication between resource persons, mentors, experts, researchers, professionals, business leaders, and peers all over the world (Asongu & LeRoux, 2017).

ICT Role in Human Development and Economic Growth

The application and development of ICT have the influential impact on individual development, education reform, social and economic growth (Heeks, 2016). For example in agricultural sector, the intervention of ICT is considered to bring the most vital influence to its current development by the introduction of irrigation system and the verification of growth of crops. This sector plays a vital role in the economic growth because it is the source of most of basic human needs such as food and clothes. Only smart employees adequately skilled in ICT can develop this sector which is believed to contribute largely to poverty reduction (Burkhardt, et al., 2003). Another pertinent example of importance of ICT in agricultural sector is where farmers in the developing countries use ICT to have access to price information at national and international markets as well as connect policy makers to other farmers.

Another important domain in which ICT plays a vital role is the environmental sector where the control of climate change is easily made possible (Tully, 2014). Employees who use technological tools to master the climate changes share information with the public through different forms of communication influenced largerly by ICT tools. ICT tools also help employees to increase skills and information required at their everdays' activities. According OECD (2012), ICT tools were illustrated as tools that can deal with environmental control by the following activities: Making a deep surveillance of environment, analyzing the environment data, planning for environment, protection and management of environment, capacity building and impact and mitigating the influence of ICT utilization.

The positive impact of ICT in every day human life can also be demonstrated by its vital role in health care (Mansell, 1999; Tully, 2014). Information and Communications Technology (ICT) has an influential role in improving health care for individuals and communities. Through the use of ICT tools doctors and other stakeholders in health sectors are largely helped by ICT tools to share and store different information in this sector (Unwin, 2009). The use of ICT tools also supports the development of database and other applications required to enhance health sector. The use of ICT has been proven to be influential in providing the capacity to improve health system efficiencies and prevent medical errors (Mansell, 1999; Tully, 2014).

The role of ICT has also been illustrated by its influential part in E-government and civic engagement that provide spaces and time for individuals who can participate in expressing their civic engagement. Not only does ICT play different vital roles in aforementioned areas but also in many others like tourism, military, finance, gender promotion, international cooperation, social media. ICT is also considered as essential tool for people with disabilities.

Barriers to Adequate Integration of ICT for Pedagogical Changes

Although ICT has been found to be the main tool in the development of human capacity by offering different ways to reach on the required skills in the transformation of employees into a smart manpower requirement, its successful use is still being hindered by different obstacles mainly lack of appropriate infrastructures required for using ICT tools (Bornman, 2016; Kayisire & Wei, 2016).

For instance, it has been evident that the access to required information that employees would use in their everyday activities could not be reachable at work once there is no access to the internet required to retrieve information. According to Munyengabe et al. (2017b), Beauchamp and Parkinson (2008), integrating technology into education systems effectively requires a funding plan to attain all needed material and tools that would enhance the gain of enough information. The barrier of budget constraint is the main root of poor accomplishment of all plans in the integration of ICT in education as well in many other working agencies that would serve ICT as their primary tools to develop their human resources (Kayisire & Wei, 2016).

It is also important to mention here that different studies have highlighted other barriers such as lack of proper vision and planning as well as social, cultural and political realities. School leaders and teachers' negative attitude towards technology use; lack of knowledge and skills required; time shortage are among the major barriers that

hinder successful use of technological tools that would enhance the attainment of required skills in different working sectors (Asongu & LeRoux, 2017; Muhametjanova & Cagiltay, 2012; UNESCO, 2015). The lack of proper vision and planning also hinder proper integration of ICT into different activities at schools or at any other working organization. In addition to the above, it is also known that poor planning may cause unequal distribution of ICT equipment in different sectors of working organizations (UNESCO, 2015).

In case the political will of the leaders who are on power does not support the ICT related policies, this may affect negatively the attainment of needed changes and innovations that would be gained through the successful use of technological tools (UNESCO, 2003). Munyengabe et al. (2017) largely underlined lack of required knowledge required to manipulate all the ICT tools as the barrier that teachers and learners face for success in the implementation of One Laptop Per Child project that is nowadays envisaged in different developing countries. In some circumstances, teachers don't have time to integrate, develop and incorporate technology into the teaching and learning situations which also affects the real use of ICT tools. Mukama (2009), in his study asserted that teachers need time to learn how to use the computer hardware and software, to plan, and to collaborate with other teachers.

Purpose of the Study

Today's needs require the adoptions of different skills, changes and innovations. However, to attain these needs, it requires the development of the required human resource that can contribute in needed changes in human behavior. The integration of ICT in all pedagogical activities is one among ways that can be adopted in the generation of the smart required manpower that can fit in today's major activities for change. This study has sorely the aim of investigating the role of ICT in developing the manpower requirement that can fit into different working sectors through its integration in educational activities. It investigates different perceptions of employees towards the needed changes and required skills for 21st century by responding to the following research questions:

1. What are the employees' perceptions on the integrations ICT into pedagogical activities for generating required smart manpower requirements?
2. Does ICT help employees to attain the required skills to contribute to the achievement of the organizational' goals and targets?
3. What are challenges that hinder employees to acquire the needed ICT' skills required for 21st century fitting into the organizational and industrial needs?

MATERIAL AND METHODS

The choice of the methods was based on the nature of data to be reported in this study. Based on this, the qualitative data were the most preference. The study of Denzin and Lincoln (2003) showed how qualitative research is important once the study reports the views and individuals' behaviour towards a certain topic. In this study, it was important to use the qualitative approach because the study reported the employees' perceptions concerning the role of ICT in transforming the education sector in the essence of fulfilling the need of generating the required smart manpower suitable to the needed changes of 21st century. In addition, the researchers collected the data through the interview processes which also facilitated them to choose the qualitative method. Based on the above, qualitative data for this research was crucial because through the interviews and conversations, participants were given enough time to discuss and deeply report about their experiences (Creswell, 2000; Denzin & Lincoln, 2003). Views were interpreted through interpretive processes to understand the general individual perceptions and experiences (Guba & Lincoln, 1994; Munyengabe et al., 2017b).

Participants

The participants of this research were composed by employees of different careers. These included industrial, educational and managerial sectors. It included thirty-six different employees as shown in **Figure 1**. The selection was based on volunteerism of senior employees having the experience of more than 10 years who were ready to share their experience concerning the importance of ICT in the development of their working level in different working sectors. The study also included both male (80%) and female (20%) interested to participate in the study. The researchers were assisted by a research assistant in order to match all information obtained from different areas.

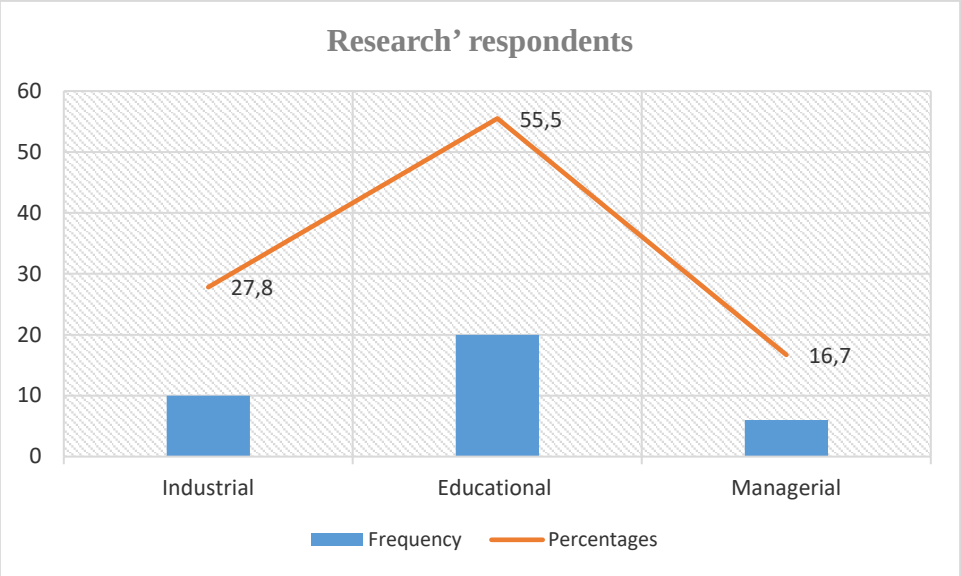

Figure 1. Respondents by working areas

Procedures

Different people were approached to encourage them to participate freely in the research. The researchers believed that the data collected through three working sectors would contribute in illustrating the perceptions of employees towards the required skills to generate a smart manpower requirement for 21st century. The researchers first briefed the assistant to be aware of the target of the research and requirements to be followed for conducting a good research. All collected data were obtained by conducting interviews with respondents from different working sectors as shown in **Figure 1**. In-depth interview process took 18 days in total. Each respondent informed and consented to be available and the researchers with the assistant organized the time to meet all respondents accordingly. Each respondent was given enough time ranging from 30minutes to one hour so that they can express themselves at large in order get the accurate information. All collected data were recorded for analysis. All recorded data were analyzed by thematic analysis (Creswell, 2000). The thematic analysis was the best choice to analyze this type of data because it involves deductive and inductive coding (Boyatzis, 1998). Deductive coding focuses on categories and themes in light of the existing literature, whereas inductive coding focuses on themes and variations that emerge from the data (Altınay-Gazi & Altınay-Aksal, 2017; Munyengabe et al., 2017c; Zhou, 2014). Similar results were put together, discussed and compared with existing literature in the field.

Ethical Consideration

Full confidentiality and secrecy were guaranteed to the respondents by the following activities: The name of respondents had not to appear anywhere in the research report; respondents who were interested to sign the informed consent were allowed to sign and finally similar data from different respondents were grouped together and then analyzed.

RESULTS

The results from interview conducted with all respondents were based on and presented strictly following the research questions. The responses showed different behaviors and perceptions of employees in different sectors towards the catalyst role of ICT in changing the educational activities in generation of a smart manpower required for 21st century. Finally, barriers that hinder the generation of smart required human resources for different sectors were identified and ranked with the appropriate percentages.

Employees' Perceptions on the Integrations ICT into Pedagogical Activities for Generating Required Smart Manpower Requirements

All employees who participated in the interview believe that the integration of ICT into pedagogical activities may influence positively the quality of content to be attained before, during and after the pedagogical activities. Here are assumptions that were recorded from the interviews process. Results are presented in groups according

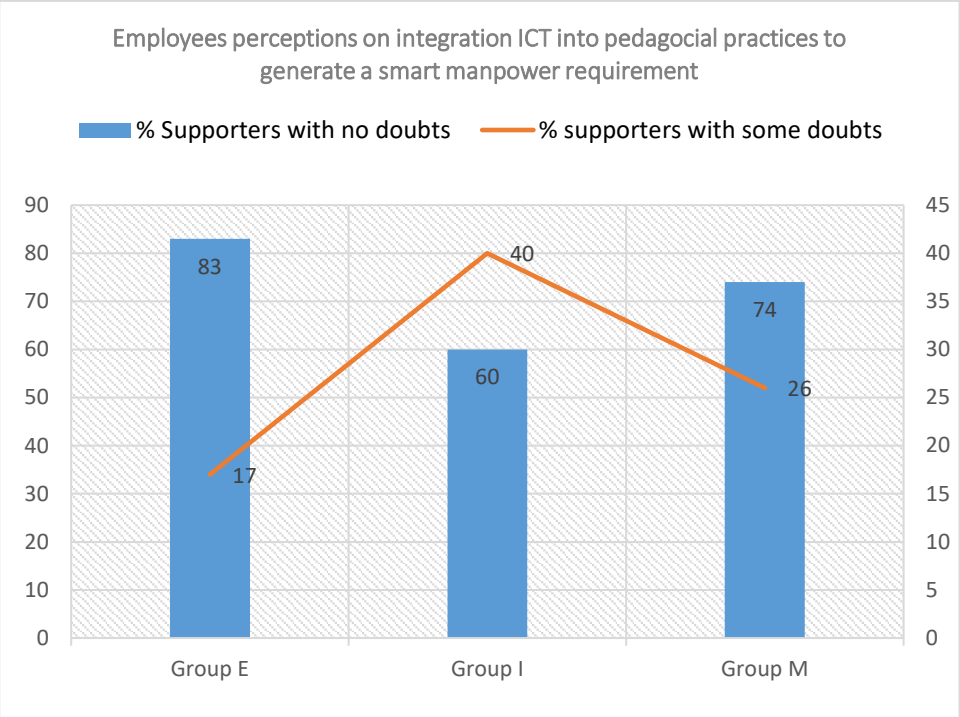

Figure 2. % by category of employees' perceptions on ICT role in changing pedagogical practices for a creation of a smart manpower requirement

to the type of employees who intervened in this study. These groups include: Group E combining assumptions yielded from educational sector, group I that combines staffs from industrial sector and group M that represents participants in managerial sector.

Results were classified into two categories of responses: Those who support that ICT has or can be used in pedagogical activities to train and create a smart manpower required for this century and those who support with some doubts. Here below are assumptions yielded from the interviews with employees:

> [Supporters]: "There is a high probability that a smart learner may become a smart employee rather than the weak learner to become a smart employee in the future. Nowadays, ICT is needed to be integrated in all educational activities. It is also good that learners start to learn how to use ICT tools at early age because ICT can enhance the abilities of learners that supports individualized learning able to help learners in developing their self-esteem and confidence to solve their problem encountered in learning processes. The use of ICT tools can enhance the learner centred method where the learners are allowed to explore the new content and then guided by the instructor.
>
> [Supporters with some doubts]: "ICT is helpful, but it must be used along with other different skills. If not well controlled learners might use ICT wrongly and mislead them".

The Role of ICT for Employees to Attain the Required Skills to Fit into the Organizational Goals and Targets

Employees were also asked if the use of ICT enhanced their working conditions and contributed to the attainment of skills required at their work. The results collected showed two categories of people: Those who attain more skills by exploring new skills through ICT tools and those who use ICT tools but also consider other different pedagogical alternatives. The percentages of employees highly and less supported by ICT are given in the **Figure 3**.

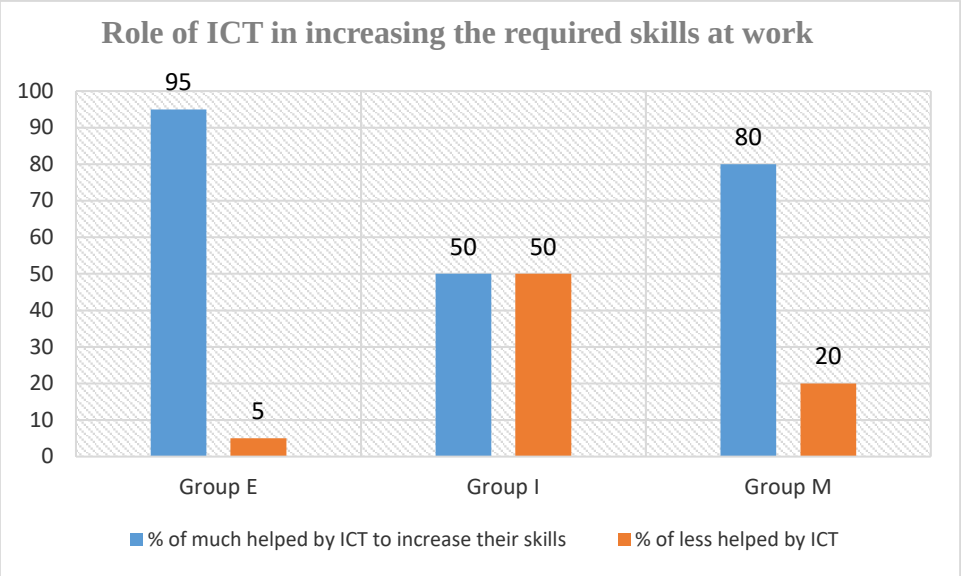

Figure 3. The % of employees' perceptions about ICT role in increasing the required skills at work

The following are two assumptions collected from the interviewed employees in different categories of working sectors:

> [Much helped by ICT means]: "ICT has influenced and improved my working condition linked to different searches and shared experiences. Using ICT tools increased my performances and skills required at work. When I started my work it was difficult to communicate easily with other employees of the same career but nowadays I can learn by myself anything or required skills for the betterment of my carrier job. ICT has a high percentage in the increment of my working skills and performance".
>
> [Less helped by ICT]: "I sometimes use ICT to explore some new skills when my senior is not near. I have also been trained a lot and gained experience from the work. I am convinced that ICT has a crucial influence for junior compared to senior staffs".

Challenges that Hinder Employees to Acquire the Needed ICT Skills Required for 21st Century to Fit the Organizational and Industrial Needs

Results related to different challenges that hinder the integration of ICT into pedagogical practices for the generation of smart manpower requirement were ranked and presented in **Figure 4**. The researchers wanted to explore the impact of some well-known common barriers that have been identified as handicap of ICT use for real pedagogical changes. The corresponding percentages of employees recognizing the existence of barrier are given in **Figure 4**.

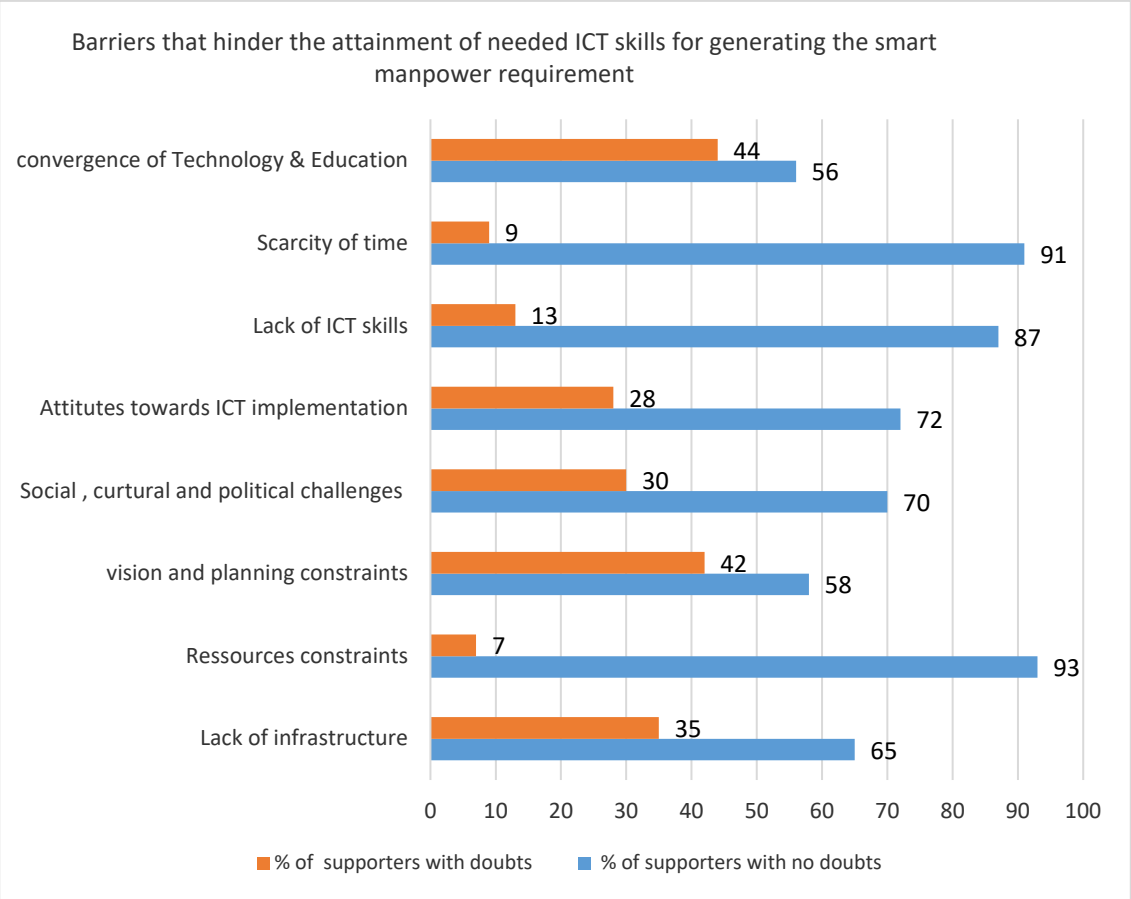

Figure 4. % of barriers that hinder the use of ICT for the generation a smart manpower requirement

DISCUSSIONS

The role of ICT in education has been shown in different studies (Asongu & LeRoux, 2017; Muhametjanova & Cagiltay, 2012; Munyengabe et al., 2017b; UNESCO, 2015). The discussions in this research focused on research questions to be answered. We explored senior employees' perception on the impact of ICT use for changing pedagogical practices for generating a smart manpower requirement for 21st century. We also identified the ICT role in increasing the level of skills required at working places. Later, all barriers that hinder the attainment of required skills by the means of ICT use are discussed.

Similar to findings of Tarus et al. (2015), Munyengabe et al. (2017b), Bornman (2016), Beauchamp and Parkinson (2008), Asongu and Le Roux (2017), employees in this study have demonstrated good perceptions towards the integrations of ICT into pedagogical practices because they believe that ICT may serve as the catalyst required for enhancing and giving the required skills required at work. For example, 83% of employees interviewed among Educational staffs, 60% of employees from industrial sector and 74% from managerial sector believe with no doubt that ICT serve as a catalyst to bring the required changes in pedagogical activities for generating a required smart manpower requirement to cover the gaps of the current situation. The remaining percentage in each category of interviewed employees also were supporting this idea but by introducing some other necessities such as sufficient control of ICT use for positive required skills.

The study of Bornman (2016); Asongu and LeRoux (2017) have illustrated how ICT have largely influenced teaching and learning processes. ICT tools were found to be not only crucial for teachers but also help learners in their everyday-learning experience. According to Munyengabe (2017a); Anderson (2006) and UNESCO (2015), the integration of ICT helps in more focused teaching, tailored to students' strengths and weaknesses, through better analysis of attainment data. In addition, ICT may facilitate easy communication between teachers, learners, parents and others educational stakeholders (Munyengabe et al., 2017b).

The results from employees' beliefs were that the use of ICT in pedagogical changes can result into a smart employee hence a smart learner would be generated through quality education where ICT serves as catalyst for accessing adequate content.

The findings of this study conform to other studies where ICT tools were shown to be influential to learners because they benefit from the improved pastoral care and behavior management through better tracking of students (Anderson, 2006; Munyengabe et al., 2017b). It is well understood that the generation of smart manpower requirement must be planned and processed through the access of quality education where ICT plays a vital role in the provision of the adequate content to be taught. The significant role of ICT in education for learners is understanding and analytical skills, including improvement in reading and comprehension (Jaarsveldt & Wessels, 2015; UNESCO, 2003) which leads to the quality of education that also justifies the quality of future employees.

Smart learners who are encouraged to carry out independent and active learning, and self-responsibility for learning through ICT means develop more capabilities and become smart employees with adequate skills, able to adapt to all changes required in working organizations (Muhametjanova & Cagiltay, 2012).

Employees in all categories have also demonstrated the impact of ICT in the attainment of the required skills in addition to those they got at schools. For example 95%, 50% and 80% of employees respectively from educational, industrial and managerial sectors confirmed that they attained most of required new skills in their career thanks to ICT tools. The remaining percentages also attach the ICT tools roles to other factors including experience and guidance from seniors.

The findings related to the role of ICT in increasing the required skills in working organizations are quite similar to those of Hinze and Plautz (1998), Heeks (2008), who reported in their studies that ICT has an influential role in helping employees in attaining new skills. ICT can be one of tools that can be used by employees to get some needed skills as also reported in the study of Marshall and Tucker (1992) who found that the labour force suffers from deficiencies of knowledge and ability when compared to the requirement for increasingly complex problem-solving abilities and asserted that education systems should respond to deficiencies that were identified.

Respondents also showed their perceptions towards the barriers that hinder the attainment of required skills through the use of ICT means. 56% of employees "supported without doubt" that lack of convergence of technology and education is one of the barriers that inhibit the attainment of required skills by the means of ICT tools. Lack of enough time was also reported as the second barrier where 91% of respondents reported to be challenged by the time shortage. Lack of ICT skills was also reported by 87% of employees, which means that in order to be able to retrieve useful information required in working places, it is quite indispensable to be knowledgeable of the use of ICT tools and related software. Employees' perceptions towards other barriers were ranked as following: Attitudes towards ICT implementation (72%); Social, cultural and political challenges (70%) and Vision and planning constraints (58%). The remaining percentages regarding barriers were employees who supported the assumptions with some doubts where they associate the challenges with other factors such lack of internal and external motivations towards a desired goal. Employees who associated the barriers with other factors were in agreement with the recent research of Munyengabe et al. (2017a) who emphasized the role of motivated employees in the attainment the organizational goals. Kayisire and Wei (2016) in their study have identified external and internal barriers to ICT integration. External barriers are classified as shortage of equipment, unreliability of equipment, shortage of technical support and other related resources whereas organizational culture, teacher-level factors, their beliefs about teaching and openness to change are the internal barriers to ICT incorporation. Many other findings such as those of Asongu and Le Roux (2017), Bornman (2016) and Tabira and Otieno (2017) also reported that the shortage of training, of time, of equipment are also the barriers to technology incorporation. The findings of this study are also in agreement with another recent study of Munyengabe et al. (2017b) who illustrated: (1) Lack of adequate skills required to integrate ICT into teaching and learning processes; (2) Lack of adequate technological tools; (3) Lack of adequate infrastructures and (4) Lack of teaching motivation are associated with teachers' financial payments as the main barriers for integrating ICT into teaching and learning processes.

CONCLUSION

It is much indispensable for a country or any working organization to help employees increasing their skills required at work by means of ICT tools. The employees' perceptions on ICT integration in schools at all levels of education systems confirm the role of ICT in transforming today's students or employees into a smart manpower required for the 21st century. As revealed by employees' perceptions, ICT has been utilized as a catalyst to increase the skills required at work by employees of educational, managerial and industrial sectors. From the analysis of this study therefore, the following recommendations should be taken into consideration in order to counter different challenges that hinder the use of ICT as a catalyst for pedagogical changes for a better generation of a smart manpower requirement for different working sectors:

- The provision of infrastructure required for using ICT at working places.
- The provision of adequate time that can help employees /students to explore different skills required for their activities.
- Help employees to attain the required ICT skills for exploring the benefits of using ICT in their career.
- Positively influence the employees attitudes towards integrating ICT use into their everyday' activities for solving their challenges situation by the means of ICT.
- Integrate ICT into social, cultural and political sectors as well as remove the constraints identified in this study.
- Proper planning based on the situational analysis and therefore not copying the approaches of other countries or working organizations without being aware of their real causes.
- Remove the main possible cause of poor funding of the activities that would enhance and improve the use of ICT in schools or in working organizations.
- To link technology use with educational activities for an early use ICT in different levels of education.

Barriers that were identified are not alone to affect the positive influence of ICT in improving employees' skills. Further researches should be undertaken to explore more challenges and different perceptions of employees at working places that would be enhanced in transforming the current or future employees into a smart manpower requirement.

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