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The Concept of Information and Communication Technology on Human Capital Development: Content Analysis Method Approach

Diah Rusminingsih[1], Sri Harnani[2], Lina Damayanti[3]
STIE Jaya Negara Tamansiswa Malang[1,2,3]
Jl. Tumenggung Suryo No. 17, Bunulrejo, Kec. Blimbing, Malang, Jawa Timur, 65123, Indonesia
Correspondence Email: damayanti@stiekn.ac.id

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ABSTRACT

This study investigates the concepts of human capital management through information and communication technology (ICT). This study analyzes the notion of knowledge technology. Content analysis was used to examine various scientific literature in ICT and human resources management areas. The results reveal that artificial intelligence (AI) is one of the most important technologies in today's widely used ICT in Industry 4.0. The AI-generated by ICT is essential in implementing current and future ICT projects. ICT professionals should consider their work environment as a pleasant condition that substantially affects performance. ICT offers the advantage of assisting communication and interaction more effectively. ICT is very important in fulfilling various human needs. As part of communication science, ICT closely determines human resources' quality.

Keywords: Communication, Content Analysis, Digital Era, Human Capital, ICT.

JEL Classification: J24, O15, O31

INTRODUCTION

The following three critical components of Industry 4.0 should be considered when it comes to human capital: workforce architecture with unique interactions, embracing future human capital, and the topology that results in the competencies that human capital requires (Flores, Xu, & Lu, 2019). Education plays a role in absorbing and adapting to technological advances and economic growth in the context of human capital management (Puspaningtyas & Harnani, 2021). We consider that investing in education and welfare is a crucial component of generating economic success via human capital investment. Healthcare and education have the potential to be the two key instruments for reawakening, developing, and re-establishing the economy in the event of a pandemic and its aftermath (Widarni & Wilantari, 2021). The investigation of structural cracks demonstrates a decade-by-decade change in the value of human capital. It even increased in the 1980s low-skilled sectors and 1990s high-skilled industries. However, praise was mostly based on skill (Lentini & Gimenez, 2019).

The four components of communication capital are legal capital, an organization's resources, human capital, and capital employed. They are highly recommended and certainly are capital that facilitates closer communication with organizations (Malmelin, 2007; Hamilton & Sodeman, 2020). A strong buyer-oriented platform, customer relationship management (CRM), and Information management in CRM were all identified as important success drivers of Small and Medium Enterprises (SMEs), while CRM organization tools were not. Furthermore, it was shown that the essential links between performance and customer focus, and knowledge management are unaffected by human capital but moderate the associations among CRM organization, platform CRM, and productivity. There is an inseparable relationship between communication science and the quality of human resources (McCartney et al., 2020).

The economics-derived concept is that computers are machines concerned with transforming information that can be applied to other kinds of information technologies. On this premise, it is recommended to see information technology as a field of study dealing with data conversion from one medium or form to another. Technical development phases are defined as invention, innovation, and dissemination (Warner, 2000). Based on the current innovation, there is a lot of evidence that broad knowledge and communication technology (ICT) promotes society's economic well-being. When it comes to ICT, while it has been shown that intellectual capital is the determinant element of production in the research and education system, this does not mean that the human intellect must dominate its structure (Gani & Clemes, 2006). Artificial intelligence (AI) is among the most commonly utilized systems ever produced by ICT in Industry 4.0. However, equipment (computers and the internet) prevent the possibility of increasing indicators of the ICT system's efficiency and competitiveness from being opened. Science and education will bring it up to speed with today's digital issues. However, there is a relationship between artificial intelligence and human intellectual capital. This highlights the critical importance of scientific data digitization and educational institutions based on technological achievements, where AI generated via ICT must be a fundamental component (Vodenko & Lyausheva, 2020).

LITERATURE REVIEW

A pleasant and comfortable ICT work environment is a smart use of technology that creates positive psychology and is particularly beneficial for ICT employees to help improves job performance and outcomes (Melitski et al., 2008). One of the reasons for the relevance of ICT is that when we evaluate material, we employ communication science methodologies to make predictions about what will be presented and how it will be delivered (Abhayawansa, 2011). The relevance of ICT is addressed in effectively communicating and dealing with the state (Grieco & Bhopal, 2005). ICT is expected to satisfy a variety of human requirements; among the primary causes why individuals use ICT is to benefit from it by supporting various human needs (Zhang, 2007). ICT is critical for urban communities; they constantly create and deploy ICT intelligence to affect change in their surroundings (Chapuzet & Bawono, 2021).

Rural librarians in the southern and central regions of Appalachia recognize the critical nature of information and communication technology knowledge for the younger generation. Young librarians have conducted additional computer training to facilitate learning of information and communication technology, as well as the importance of the principles of intellectual intelligence in applied information technology in rural areas. Students produce information technology services/products as part of their computer information technology learning process in developing social capital in rural environments (Mehra et al., 2017). In the use of information and communication technology (ICT) in a developing nation, these countries may leverage underutilized human capital in handicapped ranks to increase the number of workers in society (Priyanto et al., 2022). Education affects economic growth via expanding human capital. This highlights the critical impact of people resources economic up high as technology has a significant positive effect on the economy. Human capital development and technological advancement are critical components of Indonesia's efforts to accelerate economic growth (Widarni & Bawono, 2021).

In the Uni Emirat Arab (UAE), human capital has increased from the usage of information and communication platforms, confirming the notion that solid education and communication skills may result in economic development advantages (Al-Khateeb et al., 2007). This mainly happens because underdeveloped nations are attempting to enter the twenty-first-century information age. However, their progress is hampered by a lack of suitably qualified personnel and informed information technology professionals capable of engaging with both online and offline sources of information (Owei et al., 2006). When a country empowers its citizens with ICT, it can be predicted that the country's human capital will increase in productivity, job vacancies, education, and knowledge, and then the information will be disseminated quickly and accurately, resulting in poverty reduction (Ahmed & Al-Roubaie, 2013; Alim et al., 2021). Transformational leaders have the power to shape their workers' attitudes and educate them on human capital's worth. Additionally, the leader has the greatest opportunity to maximize these advantages by including people in the knowledge management process, fostering communication, and instilling the value of ICT among workers (Birasnav et al., 2011).

RESEARCH METHOD

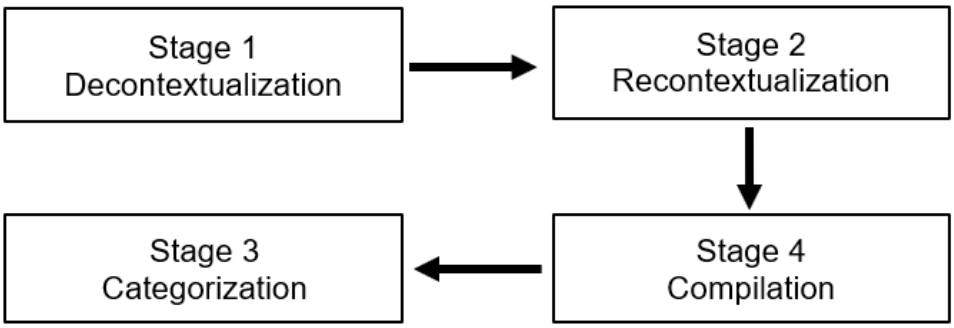
We aim to investigate the concept of previous studies on human capital through ICT. We used content analysis to analyze a variety of scientific articles from reputable journals and literature authored by authorities in ICT & human resource management. We analyzed a collection of scientific articles through a systematic literature study. Our research used a qualitative research method so that the output is a hypothesis from all research results from previous studies. We conducted a study starting with the quality of human capital because every improvement of human capital is never separated from ICT. Therefore, we examined the study system related to improving human capital. ICT is very influential and has played an important role in human capital in every sense until nowadays. Now and in the future, ICT is possible and will always be applied to affect and improve human capital. From our preliminary study, we determined four main themes in understanding the important role of ICT in enhancing the quality of human capital, as follows:

1. Human capital
2. ICT
3. Why do we need ICT
4. Correlation between ICT and human capital

Each theme can develop comprehension following the results of our examination of thousands of research journals. The theme analysis that we carried out was an attempt to analyze the relationship of the variables we identified with the possible factors that could raise the bar for people management value for now and going onward. Not only that, but we also analyzed the relationships between human resources and ICT to form a conceptual framework.

To do content analysis, we adopted the analysis system from Bengtsson (2016) using the following steps:

Figure 1. Content Analysis Stage Diagram



We begin at the point described in each stage:
Stage 1: Decontextualization via the identification of meaningful units.
Stage 2: Recontextualization Distance between "content" and "dross."
Stage 3: Categorization (distinguish between homogenous groupings Investigators' triangulation).
Stage 4: Compilation (make reasonable inferences member verification, colleague interviews, and audit inquiries were conducted). The findings of which are reported in table 1 and figure 2 as report interpretation.

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RESULTS

The analysis reveals the relationship between topics, namely (1) human capital; (2) what ICT is; (3) why we need ICT; and (4) what the correlation between ICT and human capital is.

Report Interpretation

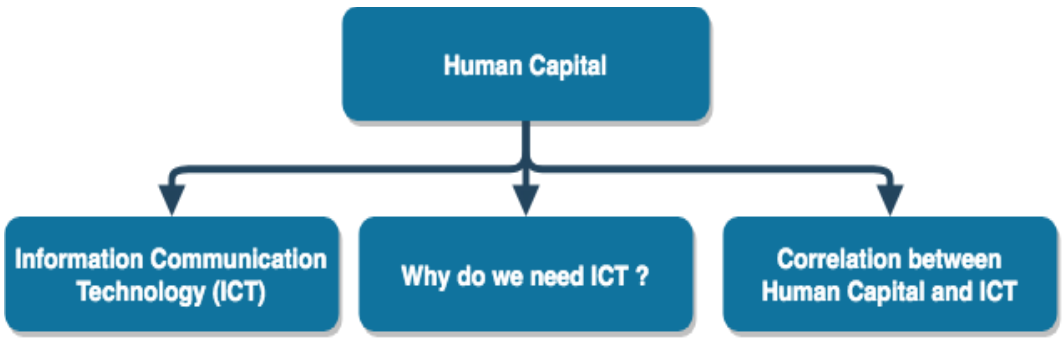
Table 1 presents the result of content analysis based on our theme. There are four primary themes that we identified, and we found the findings by conducting different triangulation to improve the results, then we provided them in the table. After that, we attempted to link the flow of connections between themes and present it in Figure 2.

Table 1. Content Analysis

Theme	Content Analysis
Human capital	Only eight articles we searched on education and human capital are relevant to our inquiry. However, they all explain how human capital can develop and how to develop it.
Information and Communication Technology	Only three papers we looked for regarding ICT are relevant to our inquiry. These journals explain what and how we apply ICT to achieve the target.
Why do we need ICT	Only five publications we searched on Why do we need ICT are relevant to our inquiry. They all explain the importance of ICT and why it is so influential in people's lives.
Correlation between ICT and human capital	Only four articles we searched in Correlation to ICT and people resources are relevant to our inquiry. They all explain the importance of ICTs and the enormous benefits to human capital when ICTs are applied.

There are four major themes that we discovered in our research, and we discovered them through different triangulation and development of the data, which we provide in the table. Following that, we attempt to link the flow of connections between topics, which we depict in Figure 1.

Figure 2. Content Analysis Diagram



Human capital is inseparably linked to ICT, which is completely connected and evolves in lockstep with technological advancements. Human capital is classified differently in different countries, but most developing countries face difficulties when attempting to

enter developed countries due to a lack of human resources with ICT skills. Therefore, ICT and human capital are inevitably linked and will reap numerous benefits when combined. It has been demonstrated that human capital will inevitably increase when we implement ICT in an organization or country.

Human Capital

For human capital, there are three critical components of Industry 4.0 to consider: workforce architecture with novel interactions, the embrace of future human capital, and the topology that leads to the competencies that human capital demands (Flores, Xu, & Lu, 2019). In addition, education plays a role in absorbing and adapting to technological advances and economic growth in the context of human capital management (Puspaningtyas & Harnani, 2021).

We believe that investing in education and health is a critical component of improving human capital in order to generate economic progress. Piltch-Loeb et al. said that knowledge and well-being care are two primary tools for reawakening, growing, and re-establishing the economy during and after a pandemic (as cited in Widarni & Wilantari, 2021). The examination of structural fractures reveals that the value of human capital has shifted decade after decade. It is even valued in lesser occupations in the 1980s and high-skilled industries in the 1990s. However, appreciation was mostly based on ability (Lentini & Gimenez, 2019). Communication capital consists of four components: juridical, organizational, human, and relational capital. These four capitals are highly recommended and most definitely support closer interaction and communication with organizations that are expected to operate well in strategy and business (Malmelin, 2007).

This study found that even though a strong consumer centricity, CRM based on technology, organizational learning, and CRM are all effective SME drivers for success, CRM management features were not. Furthermore, that was shown employee engagement lacks regulating power influence on the critical client priority and information administration links optimizing function, but moderates the associations with CRM organizational success and platform CRM, accordingly. The connection between communication science and human capital development is very closely related. There are six important competencies that will be analyzed by HR in the human capital section, Specifically, consultancy, technological expertise, data fluency, data analysis, human resources, and business savvy, as well as research and discoveries and narrative, as well as communication (McCartney et al., 2020).

Knowledge & Communication Innovation

This study mainly discusses the understanding of information technology. The notion that computers as machines are pertaining to the transformation of data extends to another kind of information technology in a position derived from economics. On this premise, it is recommended to see Considering information technology as a field of study on the translation from a single form or medium of signals to another. Technical development is divided into three stages: invention, innovation, and dissemination (Warner, 2000).

According to the present invention, there is considerable evidence that the widespread adoption of new ICT benefits society's economic well-being (Gani & Clemes, 2006). It has been demonstrated in the scientific and educational systems regarding ICT. However, intellectual capital is the determinant component of production, and the human brain does not have to predominate within the composition. Artificial intelligence (AI) is among the more widely used technologies developed by Industry 4.0. (computer and internet). However, it is science and education that will bring it into correspondence with

modern challenges based on digitalization. This demonstrates the need for digitalization of scientific and education systems, but on the basis of technological advancements, in which AI developed by ICT must be one of the keys (Vodenko & Lyausheva, 2020). A comfortable environment in the ICT work environment is one of the reasons we have to work in a comfortable environment, especially ICT workers, because a comfortable environment will produce positive psychology to improve work performance and good work results. With our positive work environment can use technology positively and strategically (Robelski et al., 2019).

Why Do We Need ICT?

One of the importance of ICT is to facilitate communication of scientific methods to draw conclusions about what and how the result will be delivered (Abhayawansa, 2011). At the harbor of Malaysia, it is stated that ITC had an important role in communicating and dealing with the state efficiently (Grieco & Bhopal, 2005).

ICT have to support the basic human needs which help individuals to complete their basic needs (Zhang, 2007). ICT plays an important role for communities living in urban areas, they always develop and implement ICT intelligence as a vision to make a change in their environment (Romanelli, 2020).

In the southern and central Appalachian regions, rural librarians realize the importance of ICT knowledge for the next generation. They have conducted further computer training to make it easier to learn ICTs coupled with the role from the project's beginning through the graduation of rural librarians; CI concepts are used. Features real-world examples of IT services/products generated by students as part of their ICT learning process and tailored for their SCA setting (Mehra et al., 2017).

The Correlation Between ICT Versus People Management

In applying ICT in a developing country, these countries can take advantage of neglected human capital in the ranks of persons with disabilities to increase the group of workers in society.

Increasing human capital via education has an impact on economic development. This demonstrates the importance of human capital investment in economic development. Technology has a big beneficial impact on the economy. Human resources and technological development are essential components in Indonesia's attempts to boost economic growth (Widarni & Bawono, 2021). In the UAE, there has been a growth in human capital caused by ICT, which supports the idea that good education and good communication skills can benefit economic development (Al-Khateeb et al., 2007).

Underdeveloped nations are attempting to enter the twenty-first century's information era. Their development, however, is impeded by a scarcity of well-trained, talented, and informed ICT professionals who are capable of engaging with both online and offline sources of information (McCrisken & Moran, 2018). When a country empowers its citizens with ICTs, it can be ascertained that there will be an increase in the productivity of its human capital in such a country. There will also be an increase in job vacancies, education, and knowledge, then promote the dissemination of information quickly and accurately, which will reduce poverty (Ahmed & Al-Roubaie, 2013; Alim et al., 2021).

Transformational leaders have the ability to shape their workers' perspectives and educate them on the value of human capital. Besides, the leader also has the ultimate ability to amplify these benefits by adding those to the KM process or information governance by building a company's environment, fostering conversation, and applying the principle of the importance of ICT one of workers (Birasnav et al., 2011).

DISCUSSION

When it comes to human resources, there are three critical components of Industry 4.0 that should be considered, namely workforce architecture with new interactions, embracing future human resources, and topology that leads to the competencies expected by human resources. In this study, we also discovered and highlighted the importance of education in the absorption and adaption of technical advancements that positively influence economic growth in the context of human capital. On the other hand, we've discovered that education and health are critical approaches and things that can be coupled to invest in human capital development that positively affects economic growth. According to our research analysis, the assessment of structural fractures demonstrates that the value of human capital does not necessarily remain constant over time but rather fluctuates from decade to decade. According to the research, human capital was valued in very low-skilled businesses in the 1980s, whereas extremely high-skilled industries existed in the 1990s. However, this appraisal is mostly reliant on human capital skills.

The concept of information technology is analyzed in this study. The economics-inspired assumption that computers are machines engaged in the consistently increasing trend rather than matter or resources is used for further technological advancement. On this basis, an appreciation for information technology is portrayed as a sort of information about the conversion of symbols across different forms of media. The stages of technological development are defined as invention, innovation, and diffusion. Additionally, according to journalistic findings of ICT, this discovery contains a wealth of evidence that the widespread adoption of new ICT benefits the community's economic welfare.

Although ICT has often been applied in science and education systems. However, intellectual capital is a major factor in developing information and communication technology in education. With intellectual capital, humans can perform various ICT activities, but with human intelligence alone, humans are not required to dominate or take over the entire structure of AI. AI is amongst the most extensively employed ICTs in Industry 4.0. to help people at work. In the field of ICT, solving complex problems cannot be separated from the use of computers and the internet. Still, the use of computers and the internet also hinders other potentials in work, such as the increasing dependence on electricity resources and the increasingly massive dependence on internet connections. This demonstrates that the demand for the digitalization of science and education is real, and we must experience and develop it. However, the knowledge we have discussed is a science that must be founded on digital technology breakthroughs, with AI developed through ICT serving as a critical component of implementing ICT programs now and in the future.

Apart from discussing how and what type of ICT develops and exists, ICT workers must also consider their job environment because, according to our selected journal analysis, a comfortable working place significantly affects workers' achievement. This has become one of the critical reasons why we can and should work in a comfortable environment, particularly for ICT workers. According to the researchers, a comfortable environment will be extremely influential and undoubtedly create positive psychology, encouraging work performance improvement. As a result, we generate a positive work environment. Additionally, we can readily use technology beneficially and strategically. Therefore, ICT plays various critical roles in our lives, and we need it. A straightforward example is that whenever we evaluate material or research, we are inevitably linked to the communication science approach, in which ICT plays a critical role. Therefore, it is

essential to draw and get numerous findings that are relevant and consistent with our goals about what and how the material will be distributed.

There are several additional examples of how and what the benefits of ICT are. For instance, in a Malaysian port, the benefits and importance of ICT in communicating and dealing efficiently with the trading country were mentioned; the existence of ICT greatly aids them. Therefore, we infer that ICT is critical in supporting various human needs. The purpose of this statement is to emphasize that when we apply ICT, we must be prudent and precise in our application. It also has one fundamental reason why humans should and must use ICT. One of the reasons is to support human welfare by meeting various human needs. ICT has been critical for people living in urban areas; they have always developed and used ICT intelligence as a vision for changing their environment. Likewise, ICT is also vital in rural regions. For example, rural librarians in the Appalachian highlands of southern and central Appalachia recognize the critical nature of ICT knowledge for their future generations. Because they are aware and understand how essential ICT is for them, they have conducted additional and in-depth computer training in the hope of making it easier to learn ICT along with the assistance of Information communication.

Sometimes, certain countries have difficulty implementing ICT. For example, many developing countries can utilize neglected human capital in the people's ranks with disabilities to increase the group of employees in society. This is why developing countries must apply ICT in their area. This demonstrates the critical role of investing in creating human resource programs and systems in order to increase economic growth.

As we all know, technology has an impact and is extremely helpful to a country's economic growth. We can take a look at Indonesia as an example; one of the crucial aspects of personal development resources is technology. It is obvious that technology plays a critical role in supporting Indonesia's efforts to promote economic growth. Additionally, the relationship between communication science and the quality of human capital is very closely related. There are six critical competencies that will be analyzed by HR's human capital section, namely consulting, technical knowledge or technical understanding, fluency with data and data analysis, HR and business, and the intellectual intelligence of HR.

Considering the present position and circumstances, all developing nations are attempting to turn into advanced countries by embracing the information age in the twenty-first century. However, many of them report that their progress is hampered by a lack of ICT workers with adequate skills or who are trained, skilled, and knowledgeable. They also report a lack of workers capable of interacting with online and offline information sources. As a result of the preceding statement, if a country empowers its citizens with adequate and well-targeted ICT knowledge, it is obvious that the country's human resource productivity will increase. To the extent that knowledge is increased and then reliably dispersed, knowledge will experience the rapid and correct distribution of information; naturally, this will result in poverty alleviation.

The application of ICT in an organization or leadership cannot be separated from the presence of transformational leaders. These transformative leaders have the power to drastically alter their workers' perspectives and instill in them an appreciation for human capital. Additionally, leaders with a transformational spirit, by including people in the knowledge management process, have the most significant potential to exploit the advantages of ICT or encourage communication and application of the principles of ICT's importance among employees.

CONCLUSION

Three important components of human resources in Industry 4.0 are workforce architecture with new interactions, embracing future human resources, and topologies that generate competencies anticipated by person resources. This study on ICT analyzes the notion of information technology. Artificial intelligence (AI) is among the best widely used ICT in Industry 4.0. AI generated by ICT is essential in implementing current and future ICT projects. ICT professionals should also consider their work environment as a pleasant condition that substantially affects performance and results. ICT is capable of assisting humans in communicating and interacting effectively. Thus ICT is very important in fulfilling various human needs. Communication science and the quality of human resources are closely related. This is why governments in developing countries must incorporate ICT into their operations. Important education and well-targeted ICT skills will have a substantial effect on economic growth. By embracing the digital era, developing countries are surely deserved in thriving to become developed countries. This study is limited by the availability of literature in the database that we use and is limited by the time of the study. It is because the literature update continues, which may impact the results of this study caused by updating the literature database in the future.

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