Article **ECORFAN Journal-Republic of Peru**
June 2023, Vol.9 No.16 1-13

Considerations for digital literacy in rural communities in the context of ITC4D implementation in emerging economies

Consideraciones para la alfabetización digital en comunidades rurales en el contexto de la implementación de ITC4D en economías emergentes

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DOI: 10.35429/EJRP.2023.16.9.1.13 Received January 10, 2023; Accepted June 30, 2023

Abstract

This work addresses the problem of the digital divide and social exclusion in the context of technological innovation. The digital divide has become a constituent of social and economic inequality, and there are factors that aggravate it in rural areas, such as technological factors, community literacy in ICT and the government's commitment to its development. The adoption of ICT is essential to prevent rural depopulation and promote the social and economic development of these communities, so it is necessary to address digital literacy and comprehensive actions to consolidate it. This work documents a literature review to investigate the aspects that must be considered to achieve digital literacy in rural areas of emerging economies and the conditions that must prevail for a successful implementation of ICT4D, for which a six-step process is proposed, and emphasis is placed on the authors' proposals to promote digital literacy.

Digital Literacy, ITC4D, Rural Communities

Resumen

El presente trabajo aborda el problema de la brecha digital y la exclusión social en el contexto de la innovación tecnológica. La brecha digital se ha convertido en un constituyente de desigualdad social y económica, y hay factores que la agravan en las zonas rurales, tales como los tecnológicos, la alfabetización comunitaria en TIC y el compromiso del gobierno con su desarrollo. La adopción de las TIC es esencial para prevenir la despoblación rural y promover el desarrollo social y económico de esas comunidades, por lo que es necesario abordar la alfabetización digital y acciones integrales para consolidarla. En este trabajo se documenta una revisión de literatura para investigar los aspectos que deben considerarse para lograr la alfabetización digital en áreas rurales de economías emergentes y las condiciones que deben prevalecer para una implementación exitosa de la TIC4D, para la cual se propone un proceso de seis etapas y se hace énfasis en las propuestas de autores para promover la alfabetización digital.

Alfabetización digital, TIC4D, Comunidades rurales

Citation: ALONSO-CALPEÑO, Mariela Juana, SANTANDER-CASTILLO, Julieta and RAMÍREZ-CHOCOLATL, Yuridia. Considerations for digital literacy in rural communities in the context of ITC4D implementation in emerging economies. ECORFAN Journal-Republic of Peru. 2023. 9-16:1-13.

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Introduction

Technological innovation does not reach everyone at the same time and with it, a new marginalisation and social exclusion arises (Cabero and Ruiz, 2017). The so-called digital divide is a quantitative and comparative expression of the development of specific societies that use digital media in their work. It has become a factor of social and economic inequality among the population, as it divides them into those connected and those not connected to the internet and therefore, users or not, of Information and Communication Technologies (ICT) (Micheli and Valle, 2018), which is why it represents a new situation of vulnerability that significantly affects different groups and profiles, with a special incidence on those who are already in a situation of marginalisation and social exclusion (Gómez, Hernández and Romero, 2017). According to Martínez (2021), the cost of the service is the main constraint for internet connectivity in rural and urban households; in addition, in both contexts, older individuals are more likely not to access and use the internet due to a lack of digital skills, which is related to education. Juditha and Islami (2018) also add that there are at least three factors that cause the digital divide in rural areas: technological factors, the level of community ICT literacy and government commitment to rural development.

Rural areas have been gradually subjected to a natural marginalisation that also includes, among others, poor public infrastructures and little or no investment in the sustainability of productive models, which leads to a whole series of shortcomings (Del Pino and Camarero, 2017). The relevance that ICTs offer as tools for transformation in rural areas is undeniable, enabling not only the revitalisation of their social dynamics, but also business, education and employment, which is why their adoption is considered essential to prevent their depopulation (García et al., 2021). It is therefore urgent that, as technologies advance, governments in all countries support and assist enterprises, including small and medium-sized enterprises (SMEs) and informal and artisanal micro-enterprises in all sectors, to enable the basic use of these technologies and their subsequent adoption in areas such as market research, product development, sourcing, production, sales and after-sales services (UNCTAD, 2023).

It is also undeniable that ICT diffusion has an impact on poverty reduction through access to information, efficiency in communication, skills acquisition, more effective promotion of social programmes, and improved governance and political participation (Tandi & Zozimus, 2019).

In rural areas, farmers can expect benefits from access to ICTs that can range from promoting greater inclusion in the economy, reducing production and transaction costs, increasing production through the use of technological innovations, and boosting linkages with other businesses in the sector with the possibility of generating productive chains (Deichmann, Goyal, & Mishra, 2016). To harness the potential of ICTs by productive sectors and individuals, especially rural ones, access to digital technologies is essential; However, this is not enough, digital literacy must also be provided for an optimal use of them and this must be accompanied by comprehensive actions to consolidate their use and appropriation (Domínguez and Navarro, 2020), since it has been demonstrated that ICTs generate socio-economic changes in rural communities, but only to the extent that their benefits are exploited by those who use them, that is, ICTs alone do not generate changes, but when used, they are re-signified (Lopera Molano, 2022).

The aim of this paper is to investigate, through a literature review, what aspects should be taken into account to achieve digital literacy in the rural sector in emerging economies and what conditions should prevail in order to apply it successfully.

This work is relevant because the issue of digital literacy has been addressed mostly in terms of ICT uses, but this has not allowed for evidence of appropriation or adoption, especially in rural areas. In addition, although these studies reach the generalised conclusion that communities need to be trained or empowered, this stage is not described. Research focused on developing digital skills or capacities in communities is very limited, even though the literature has pointed out that this is the approach most likely to be successful in developing social appropriation processes (Lopera Molano, 2022), so this research paper makes a significant contribution to this under-addressed topic.

ISSN-On line: 2414-4819

The first part of this document explores the theoretical context corresponding to the central themes of this work, followed by a description of the methodology followed to achieve the stated objective, and then the results obtained are shown in two parts: the first focuses on the considerations for the implementation of ICT for development (ICT4D) in emerging economies and, in the second part, the aspects to be considered according to various studies and interventions carried out for digital literacy in rural communities.

Theoretical context

Digital literacy

Literacy, defined by the Royal Spanish Academy (RAE) as the process of "teaching someone to read and write", no longer refers exclusively to the use of pencil and paper, but now extends to the use of ICTs, requiring that these literacy processes are also oriented towards learning to use, appropriate and understand them to access global information and generate knowledge, currently called digital literacy (George, 2020).

Digital literacy, which was recognised as a competence by the European Commission in 2006 among the eight key competences for lifelong learning for digital citizenship, has gone from being recommended to being essential (Pérez-Escoda et al., 2019). As a result, it is assumed that people who are not able to incorporate ICTs into the world of work, education, social and even personal life are being marginalised, and have fewer possibilities to develop and develop at all social levels (Cabero, 2016).

Digital literacy should be seen as a process of knowledge acquisition that must respond critically to the demands of an increasingly extensive and complex information environment, in which learning about new cognitive mechanisms to search, filter, categorise and use relevant information is required in order to achieve relevant and relevant educational purposes in an accurate and relevant way (George y Avello-Martínez, 2021).

George (2020), categorises digital literacy into four components: use of technology, critical understanding, online collaboration and knowledge creation and socialisation. The first focuses on reading critically and reflectively in digital media, the second on learning to select and analyse information accumulated in virtual media efficiently, the third on sharing information and content to communicate and interact effectively and safely while maintaining a digital identity and, finally, the fourth on writing texts and hypertext and hypermedia content with digital tools. This implies that in order to develop digital literacy programmes, the aim must be to provide knowledge that achieves a favourable conceptualisation of the relationship between ICTs and contemporary citizenship (know what), practical knowledge so that they can develop digital experiences (know how), and to link both knowledge to determine what can be done with technological tools (know how to be). It is also a priority to recognise that rural areas need differential and appropriate strategies for digital inclusion, and therefore a generic approach cannot be applied (Roberts et al., 2017).

ICT4D

ICT for development (ICT4D) is a multidisciplinary area of study concerned with the provision and use of ICTs to advance the progress of developing communities (Thomas et al., 2022). Broadly speaking, ICT4D projects are contextualised in low- and middle-income countries, which, while representing a heterogeneous group, share many common human development challenges (Karanasios, 2014).

Methodology

To meet the objective of this paper, an integrative literature review (Torraco, 2005) was conducted among different authors who have historically made contributions to the theoretical body of the topic, in order to establish a new framework by conceptualising and expanding the theoretical foundations (Snyder, 2019).

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The literature review was conducted using the search and evaluation for inclusion methodology (Xiao and Watson, 2019) as shown in Figure 1, by searching open sources for theories, perspectives and frameworks related to creativity, the factors of which are applicable to the level of work teams in organisational studies as shown in Figure 1.

From the literature review, the components were derived for the proposal of the present work.

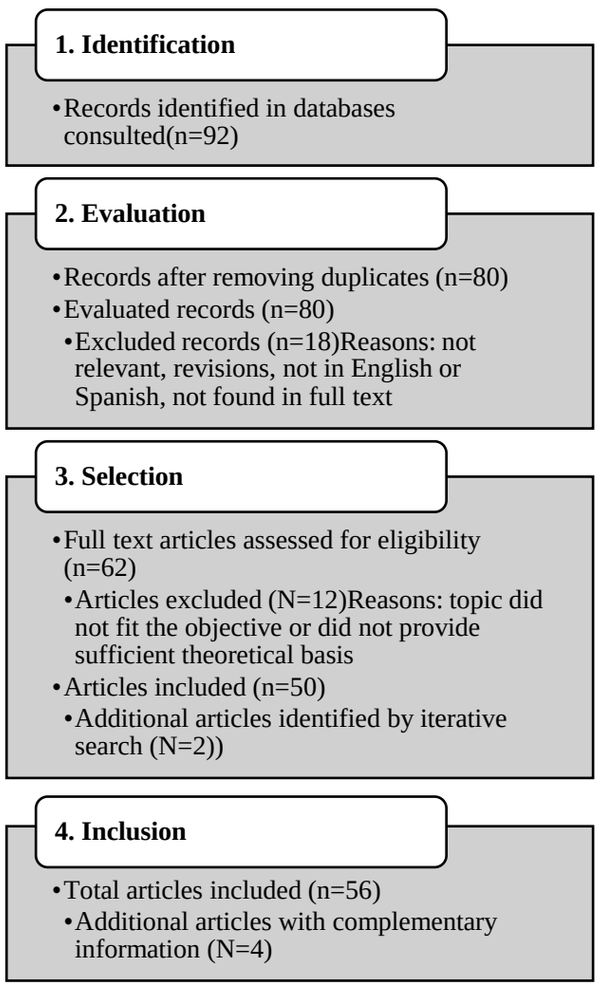

Figure 1 Methodology
Source: Adapted from (Torraco, 2005; Snyder, 2019; Xiao and Watson, 019)

Results

Stratton and Nemer (2020) highlight in their research the paucity of studies on Information Technologies for Development (ICT4D) in Latin America and recommend that researchers broaden their scope to other countries in the region to look for new contexts and environments.

This can lead to the development of theories and interventions that benefit the lives of people living in the most extreme conditions and achieve social justice for the most marginalised and persecuted groups.

Implementing ITC4D in emerging economies can be a complex process that requires careful planning and strategic execution (Woetzel et al., 2018) for which different authors propose different actions that have been categorised under the following six headings that can be configured into steps of an overall process:

1. Identify needs and challenges.
2. Develop an implementation strategy.
3. Invest in technological infrastructure.
4. Training and education.
5. Encourage innovation and research.
6. Implement and evaluate.

Step 1: Identifying needs and challenges

Identifying ICT4D needs and challenges in developing countries requires drawing on multiple theoretical streams, firstly, fundamental theories on technology, context and socio-economic development (Thapa and Omland, 2018). Secondly, middle-range theories can shed light on specific issues of ICT-related phenomena in the context of developing countries (Avgerou, 2017). It is also suggested to conduct field research with disadvantaged communities in developing countries that can help identify common factors and challenges associated with ICT4D projects (Potnis, 2016). It is also crucial to manage the scope, time, costs, quality, human resources, communication and risks to address these challenges (Estevez and Montoya, 2015). The absorptive capacity of different societies needs to be understood and human and institutional capacities need to be developed to harness the potential of ICT4D in developing countries (Omland and Thapa, 2017).

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Other studies suggest that identifying the needs and challenges for ICT4D in developing countries involves addressing issues such as tradition, experience, contextually appropriate technologies and long-term viability, using a multidisciplinary and mixed-methods research approach (Bezuidenhout et al., 2022; Sebbane, 2022; Yim and Gomez, 2021; Lee and Primi 2020, Sinha and Alvarado, 2020).

Step 2: Develop an implementation strategy:

To develop an implementation strategy for ICT4D in developing countries, it is important to understand the underlying mechanisms that link ICT and development (Thapa and Omland, 2018). This requires investigating how and why ICTs work in the specific contexts of developing countries. A four-step methodological approach based on critical realism can be used to identify these mechanisms (Kwabiah, 2019). In addition, it is crucial to focus on empowering people and enabling widespread multi-stakeholder participation and collaboration. (Malik y Khan, 2021). Lessons learned from previous phases of implementation should also be incorporated into the strategy (Botha and Herselman, 2015). The strategy should also consider the specific needs and challenges of the target country, including policies, processes, technology and business models (Dahan and Hammer, 2015), while still taking into account the most appropriate approach (Dahan and Hammer, 2015).

Furthermore, ICT4D implementation strategies in developing countries can be carried out through project management standards (Cidav et al., 2020; Kühn, 2021), and also the capability approach can help to design ICT4D interventions considering users' capabilities, such as prior knowledge and financial incapacity, to maximise their impact on socio-economic and human development (Hoque, 2020).

Step three: Invest in technological infrastructure

Investing in technological infrastructure to implement ICT4D in developing countries requires consideration of several factors. First, it is important to identify genuine local needs and ensure local ownership of projects, where governments take the leading role (Mozelius et al., 2009; Wynn and Jones, 2020).

Realistic constraints and a competent network of people must also be taken into account (Estache et al., 2015; Pérez-García, 2021). A communication strategy and a planning horizon are crucial for successful implementation (Gurara et al., 2018). The documentation of measurable results and the availability of resources for sustainability are also important aspects to consider (da Silva and Fernandez, 2013; Silva and Fernandez, 2020). Furthermore, ensuring fun and motivation in projects can contribute to their success (Heeks and Alemayehu, 2009). It is also necessary to adapt funding schemes to the institutional constraints present in each specific context in order to target them appropriately and achieve a positive impact (Chatterjee, 2020).

Step four: Training and education

ICT4D training and education in developing countries can be implemented by prioritising computer science education, despite challenges such as limited internet bandwidth and shortages of academic staff that affect student motivation and teacher performance (Bissyandé et al., 2015). Universities can play a crucial role in supporting ICT4D projects by providing resources and expertise (López et al., 2012). Each country must develop its own solutions based on local conditions and strategic priorities; developing states may face financial, human and other resource constraints, so in-depth analysis of local conditions and strategic planning can help overcome these challenges (Mozelius, 2014). Measurable, sustainable and scalable design solutions are essential to achieve the UN Sustainable Development Goals in ICT4D (Wagner, 2018).

Step 5: Fostering innovation and research

It is possible to foster innovation and research for ICT4D in developing countries through several strategies. First, there is a need to promote collaboration and entrepreneurship between different disciplines, as this can create alternative local products and contribute positively to the developing economy through networking and institutional anchoring (Seifu et al., 2020; Pandey et al., 2021; Nyerhovwo, 2022). Second, it is important to focus on digital innovation and the impact of digital technologies in developing countries, as this area has been largely overlooked in current research (Al-Zaroog and Baqir, 2020; Saweo, 2023).

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Furthermore, fostering innovation ecosystems with the help of Artificial Intelligence (AI) can also play an important role in promoting ICT4D in developing countries (Nielsen, 2017). Also, it is crucial to conduct critical research in ICT4D, focusing on transformation and change, and to engage in closer collaboration between researchers and practitioners to ensure policy impact (Cortés et al., 2021; De et al., 2018; El-Ferik and Al-Naser, 2021; Harris, n.d;). Innovation and research for ICT4D in developing countries can also be fostered through the adoption of sound policies and investments that support education, research spending and market development. (Al-Zaroog y Baqir, 2020; Mohamed et al., 2022; Tantanee et al., 2019).

Step six: Implement and evaluate.

To implement and measure ICT4D in developing countries, it is important to consider the underlying mechanisms that link ICTs and development (Namo et al., 2020). This can be achieved through a four-step methodological approach based on critical realism, which involves identifying the mechanisms that explain how and why ICTs lead to development (Thapa and Omland, 2018). In addition, governments should allocate a significant part of their budgets to factors that improve technological capacity, science education, as well as gross enrolment in education and internet connectivity (Heeks, 2017). Policies that promote national prizes for scientists and researchers, develop international relationships, modify school curricula to emphasise creativity and spontaneity, and relax corporate taxes for environmentally friendly and economically viable innovations are also recommended (Khayyat and Lee, 2015; Pandey et al, 2021). Furthermore, it is crucial to understand that ICTs alone cannot improve people's lives, but must be integrated into broader strategies designed to make the most of these tools and techniques for human development (Hamel, 2010).

Now, in terms of aspects to consider according to various studies and interventions carried out for digital literacy in rural communities, the following was found: Juditha and Islami (2018), identify three critical success factors for ICT empowerment in rural areas:

1) There must be commitment from all stakeholders.

2) A socialisation programme must be generated to increase public awareness and education (literacy) to accelerate ICT adoption in rural communities with infrastructure development.

3) The development of an ICT ecosystem should be integrated by a network of participating villages or communities to share knowledge.

For its part, (Nedugandi et al., 2018) proposes a framework that includes seven stages to achieve digital literacy. These stages refer to:

1. identifying vulnerable populations in rural areas that require digital literacy support.

2. Developing an integrated curriculum that addresses multiple literacy topics such as, health, financial literacy and e-safety for low-literate students in low-resource settings.

3. Adaptation of mobile technology for remote areas.

4. Creation of a context-based curriculum that is tailored to the specific needs and challenges of learners in rural areas.

5. Implementation of flexible learning schedules to accommodate the constraints of learners in remote environments, such as intermittent electricity and limited internet bandwidth.

6. To provide digital literacy and awareness, the involvement of existing civil societies, schools and governmental organisations is important.

7. Conducting examinations directly in tribal settlements to reduce barriers to assessment in remote areas.

Madaio et al. (2020), found that: 1) it is critical to consider the nature of digital literacy skills needed and to quantify how widespread these skills might be over time; 2) it proposes using educational technologies as a solution to support education in low-resource rural contexts where formal schooling is insufficient to foster widespread literacy; 3) it proposes using educational technologies as a solution to support education in low-resource rural contexts where formal schooling is insufficient to foster widespread literacy.

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4) it proposes using educational technologies as a solution to support education in low-resource rural contexts where formal schooling is insufficient to foster widespread literacy.

Kurniawan et al. (2021), indicates that universities can help rural communities to become empowered in the use of ICTs. He suggests emphasising the use of email and software for writing texts.

On the other hand, Lopera Molano (2022) mentions that in order to achieve a successful outcome in the digital literacy process in rural areas, it is important to study the daily life routines of the actors involved, to introduce technology into them and not only focus on productivity. And also to carry out a situated literacy and mainly qualitative approach, where the priority is not infrastructure.

Furthermore, Norhasni et al. (2022) indicate that one should:

1. generate partnership programmes between the community and institutions to promote digital literacy skills to increase awareness and knowledge on this topic;

2. Promote virtual volunteering by professionals. Many professional employees can volunteer as virtual volunteers to enlist as teachers, mentors, and strategists, among others;

3. Engaging activities and learning modules of digital literacy programmes should be developed;

4. The role of a community leader is important as this will achieve effective results.

Tomczyk et. al. (2023), recommends combining teaching with the realisation of everyday life activities, as well as paying attention to match the pace of people's learning in order to help overcome resistance to technological innovations, and finally, highlighting the benefits of ICT implementation by demonstrating the results achieved in the development of their own activities.

Finally, Fernandez (2023) in an intervention process carried out the following activities:

1. as a starting point he contacted local councils, in order for them to contact citizens by disseminating posters and setting a date to hold an information meeting.

2. After the information meeting, the interested citizens carried out their online assessments. One to identify the level of digital competences and one to identify the digital literacy courses to be offered.

3. The training courses were focused on the stages of initiation, building new skills and others focused on the working environment such as marketing or economics.

4. The training process of these competences was facilitated and monitored by a specialised person.

5. The courses offered were: introduction to computers with Windows, introduction to office, and introduction to the internet.

6. To close the courses, another meeting was held so that the participants could self-evaluate their achievement of digital competences in order to register differences with respect to the initial evaluation.

7. Finally, they propose to evaluate the digital skills training courses in order to identify opportunities for improvement.

Conclusions

With regard to the implementation of ICT4D in emerging economies, it can be concluded that multidisciplinary and mixed methods approaches with a critical realism-based approach can be used to identify the underlying mechanisms that explain how and why ICTs lead to development in specific contexts in order to identify the needs and challenges of ICT4D.

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Also, that developing an ICT4D implementation strategy in developing countries requires fostering convergence between disparate sectoral and national ownership initiatives to achieve a more effective approach to ICT4D implementation.

Closing infrastructure gaps may require improving the efficiency of public spending, mobilising domestic resources and seeking support from development partners. Overall, a comprehensive approach that addresses these aspects is essential for successful investment in technology infrastructure for ICT4D in developing countries.

It is important to emphasise that by implementing collaborative strategies across different sectors, and with local and international partners; and, by adopting appropriate policies and sufficient investment that supports education and research spending, technology development and market development, developing countries can effectively foster innovation and research for ICT4D, and consider that once the technology is in place, it will be important to monitor and evaluate its impact, although this may involve collecting data, conducting surveys and assessing the impact of the technology on identified goals and objectives.

In terms of considerations for carrying out a digital literacy process, the authors agree that it will be easier if it is related to the activities that the participants carry out on a daily basis and highlighting the results they get from doing so. It is also emphasised that leadership in the rural community is important as well as engaging stakeholders in this process. It is essential to make a literacy plan that integrates the contents that each community needs, in which its implementation is followed up through a project management methodology. It must also be evaluated by the participants in order to improve it continuously, and there is no doubt that social, academic and governmental organisations can become volunteers to support this process, which will undoubtedly boost rural communities and in the future could reduce the digital divide that exists with respect to the urban sector.

This research also corroborates that digital literacy is addressed in the studies, although very little is said about how to implement it systematically in rural communities.

As future work, it is proposed to carry out the digital literacy exercise in a rural community and implement one of the models included in the literature, but considering the findings identified in this work as relevant factors in the process.

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