

# The Role of Open and Distance Education in Digital Ecosystem Transformation: A Qualitative Study on Enhancing Educational Accessibility

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## Abstract

**Background of study:** The use of Open and Distance Education (ODE) has become an essential approach for enhancing educational accessibility, especially in isolated regions.

**Aims and scope of the paper:** This paper aims to support the efficacy of ODE in rural regions should concentrate on evaluating the influence of infrastructure on learning outcomes in rural environments through access to technology.

**Methods:** This method used a qualitative study, which allows learners to progress at their speed and convenience, diminishing reliance on conventional educational infrastructure, which is frequently constrained in rural areas. ODE enables instructors to engage a broader audience through economical resources.

**Results:** Its performance depends on critical elements such internet connectivity, teacher readiness, and favorable government regulations.

**Conclusion:** Utilizing appropriate tactics, Open and Distance Education can function as a viable alternative for improving educational quality and accessibility, hence cultivating an empowered and informed society, even in the most isolated regions.

## A. Introduction

The term Digital Ecosystem in Learning is currently a very popular thing today, especially during the online era and the development of Covid-19, considering that learning is carried out entirely online (Nguyen & Tuamsuk, 2022; Sarnok et al., 2019). Digital learning ecosystem is a word among learning and development in the world of technology and information that has emerged and is quite searched for in recent times (Alenezi, 2023; Putri et al., 2024). This is an idea that is quite an important issue; A concept that is offered to help organizations and agencies run and think strategically, critically and interrelated about learning and training, and can help to achieve goals that have been set in the short and long term in planning.

The obstacles encountered by pupils in rural regions, especially regarding educational accessibility, have been intensified by the COVID-19 pandemic (Belay, 2020). These problems highlight the essential function of Open and Distance Education (ODE) in revolutionizing digital ecosystems to improve educational accessibility.

A learning ecosystem is a system that aligns users, content creators, technological advancements, cultural diversity, and strategies, both inside and outside the organization, all of which impact the formal and informal learning that takes place within the organization (Harahap et al., 2023). The word "ecosystem" is the keyword in the system to be developed, the term ecosystem does refer to nature, but it can be harmonized with technological advances (Cai et al., 2020; Gill & Germann, 2022). A learning ecosystem is an equal part and also a development in a journey process such as the term ecosystem in the wild. In principle, living ecosystems that have many species, environments, and complex relationships that interact between one part and another and are also interrelated and related to each other, meaning that they will be disrupted in one phase if the other phase is problematic (García-Holgado & García-Peñalvo, 2019; Kowch, 2018).

The learning ecosystem has many users who generate and produce diverse content that is relevant in learning, in different learning roles and contexts as well as diverse and complex relationships. Just like ecosystems in the course of the environment and life, learning ecosystems can be healthy, sick, maintained, threatened, independent or can become extinct. So, to achieve the goal of building an ecosystem both digitally, we must be able to map the organization and be aware of its own ecosystem, including its parts and the internal and external forces that shape it, the threats it faces and future opportunities for massive optimization of its work (Nguyen et al., 2023).

The scarcity of research about the efficacy of On-Demand Education (ODE) in rural regions may be ascribed to various variables (Jung, 2019; Yilmaz & Karataş, 2022). On-Demand Education denotes flexible learning provided to students as needed, usually via digital platforms or mobile applications (Decuyper et al., 2021; Whalley et al., 2021). Nonetheless, investigations on its implementation and efficacy in rural regions remain insufficiently established in numerous global locations.

To address this disparity, forthcoming research on the efficacy of ODE in rural regions should concentrate on evaluating the influence of infrastructure on learning outcomes in rural environments through access to and usability of technology. Modification of ODE platforms, tailoring educational material to more effectively accommodate the requirements of rural students. Community engagement in investigating the ways in which local communities may facilitate the implementation and sustainability of ODE solutions. Hybrid learning models in analysing the integration of conventional and on-demand educational methodologies to enhance efficacy. Addressing these concerns may enhance research and implementation techniques for ODE in rural areas, hence increasing educational outcomes in disadvantaged communities.

## B. Research Methods

The research employs a qualitative methodology grounded in a literature review, utilizing data sourced from scientific journals, academic publications, and pertinent online pieces. Literature was chosen based on subject pertinence, recency (recent 5 years), and source dependability (Habibi et al., 2023). The data are thematically analyzed through ecosystem processes, classification, observation, and synthesis to elucidate the relationship among institutional roles, technologies, requisite systems, and transformation models in digital learning, yielding findings that are pertinent and applicable to future education (Habibi et al., 2023). Time of research was conducted in 2024 in online for about 3 months with small group for students.

## C. Results and Discussion

### 1. Results

During the pandemic, learning processes and systems have evolved from *Teacher-centric* to *Content-Centric* and then to *Learner-centric*. This change in evolution goes hand in hand with changes in learning, especially during the pandemic, when all services change from face-to-face to remote, making a cultural change that has been carried out always face-to-face to no longer function because of policies and directions to carry out activities at home and also do it online so that they are forced to switch to virtual classes (Riady et al., 2024). The future of this major paradigm shift learning ecosystem will be based on:

- a. Competence: Knowledge is the competence of students, and the learning model has shifted from theoretical knowledge to focusing on competence and efficiency of practical learning, so this change becomes a slightly different thing because there are things that can be used to the maximum and different components of assessment.
- b. Content and Reduction of Learning Time: As the learning system develops from offline to online, there are materials and content that need to be updated, so that with the progress and development

- made in such a way that it must be adjusted in the learning system and various ideas and applications are made to facilitate learning so that it is easier to interact with students.
- c. Adaptation of New Habits: after the prevailing trend of learning from home, there needs to be an adjusted curriculum adjustment, so that a flexible curriculum design will be formed and made to facilitate learning both online and offline as well as a combination of the two.
  - d. Social Interaction: Humans are social learners and therefore their learning pattern is also necessary, with online learning, social interaction becomes greatly reduced so that there is a need for socialization and interaction between fellow students and teachers.
  - e. AR and VR: Educational Content shifts its gear to Augmented & Virtual reality to maximize the learning that can be created to facilitate understanding and learning between teachers and students, as well as emerging developments and ideas to be used during online learning.
  - f. Appropriate: The design of the learning experience and its systems takes an important role in the learning process and changes in the digital ecosystem, currently with the advancement of technology and information can be applied to understand student behavior and provide a learning experience that can give a good impression and comprehensive understanding to students.
  - g. Independent Learning: The main and important thing in learning is the implementation of an independent learning system, because when doing online learning, independence is the key to success in learning, one of the things that can be applied is the use of a *Learning Management System* or LMS which is made and designed with customized materials, this allows learners and users to provide understanding to them now.

## 2. Discussion

The study found that the performance of Open and Distance Education (ODE) depends on critical elements such as internet connectivity, teacher readiness, and favorable government regulations. The study concluded that with appropriate tactics, ODE can serve as a viable alternative for improving educational quality and accessibility, even in the most isolated regions. This research also highlights the crucial role of ODE in revolutionizing the digital ecosystem to enhance educational accessibility, particularly in rural areas, a need exacerbated by the COVID-19 pandemic.

The findings of this study align with relevant previous research from the last 10 years (2015-2025). Numerous studies in the past decade consistently emphasize ODE's crucial role in expanding educational access, particularly in remote and rural areas, and for underserved populations. ODE is seen as a solution to overcome geographical and socioeconomic barriers to education (Adedoyin & Soykan, 2020). Research in recent years consistently highlights that the availability and quality of technological infrastructure, especially stable internet connectivity, are fundamental prerequisites for successful ODE. Deficiencies in this aspect remain a major challenge, particularly in rural areas (Adedoyin & Soykan, 2020; Barbour, 2022). The digital divide, where students in rural areas often have limited or inadequate access to devices and internet connections, continues to be an issue hindering the effectiveness of distance learning. Strong government policy support, including investment in digital infrastructure, development of relevant curricula, and regulations that support distance learning, are important elements needed (Adedoyin & Soykan, 2020; Hodges et al., 2020).

### 2.1. Implications

The Digital Learning Ecosystem has various parts in it, so that the running of this ecosystem can be beneficial from one part to another and produce conditions that can rotate between one and another (Budiman et al., 2024). The following are the components of the digital learning ecosystem:

1. Independence and Discipline  
The most important part of the concept of a digital learning ecosystem is yourself, through independence, the book of isa produces new products or materials that can be useful for other things, with independence and discipline can direct activities and the ecosystem can run and rotate and can get and give rise to things, ideas, ideas to various other new information.
2. Management  
To be able to learn, we also have to organize ourselves, which is a key component here. Through the plan that will be carried out and what can be given, then set goals, and provide input and suggestions so that it produces the latest things again.
3. Technology  
The most certain thing that can also help the overall digital ecosystem by moving and also developing through technology, various ideas and applications that have emerged in recent years make technology

play a fast role and we must be able to adapt so as not to be left behind and drowned. New technologies are constantly creating opportunities and challenges when it comes to designing and delivering content. For learners, technology and information, modern LMS systems, and new tools (such as learning and access technologies such as zoom, teams, gmeet) offer unprecedented access to knowledge and skills, as well as the opportunity to interact with virtually in learning without any space and time limits. The same advancements that make learning easier in your organization have also made it easier for content from outside the agency or organization to enter and reinforce and enrich the material already created. Various sources such as Open Educational Resources, journals and others are unlimited sources of information.

4. Learning Culture

When entering and coming into a learning ecosystem, the culture of learning is part of the background, this is what tells people what to expect. So, it is very important to pay attention to the learning culture that we have and question ourselves regarding the learning experience, motivation, desires and goals.

5. Strategy

Learning and development decisions must be made from a strategic perspective so that they can run well and smoothly, based on all components of the learning ecosystem pointing towards the achievement of the organization's strategic goals and also through a good strategy will achieve the desired goals. Without a strategy, the teaching and learning process and also the technology system can run quickly into parts and designs that have been set but sometimes do not go well or create patterns that are not in accordance with the plan at the beginning.

## 2.2. Research Contribution

The Digital Ecosystem in Learning is the linked network of digital tools, platforms, and resources supporting both official and informal education that enables teaching and learning (Budiman et al., 2024). It includes several elements working together to improve learning experiences, increase access to educational resources, and promote cooperation among students, instructors, and other stakeholders, the key components are:

1. Advancing Togetherness

In the series of digital ecosystems, as a facilitator, a teacher can bring a community in the learning ecosystem of the digital era by shaping and stimulating the conditions and circumstances of students, teachers must have observed by looking at the strengths, shortcomings and challenges of their students, and they can develop the talents, interests and skills of each of their students. Through technology, giving rise to a sense of desire and togetherness in achieving common goals, this learning period can create and improve learning goals and the ecosystem can be easily formed because of the help from each party and the existing togetherness.

2. Create an inquiry

A teacher should design lessons or learning units in creating an atmosphere of a digital learning ecosystem by asking important and open-ended questions. This strategy makes the logic of thinking to develop and encourages students to develop additional questions for the exploration of other questions as well as the solutions that are given and offered, the questions that arise can be guided and also made to make students more active and creative.

3. Engaging Digital Content

Students need access to a lot of multimedia content, interesting both in terms of materials, content, images, colors and other things that are included in the learning ecosystem of the digital era. Teachers can model strategies for conducting searches that facilitate and direct them to get the right information needed to answer important questions from the lesson. The information can be further reviewed for accuracy, authenticity, and relevance in order to develop students' skills with digital literacy. This content can produce a new part of a large ecosystem structure.



**Figure 1.** Images of the Digital Age Learning Ecosystem and Its Changes (Source: <https://byotnetwork.com/>)

#### 4. Learning Assessment and Feedback

Teaching, learning and assessment are one of the long series in learning, this is related to preparation in the assessment of standards that have been set and agreed, because the relationship in learning is very close with tasks, assessments, and reporting that are quite numerous and repetitive. Teachers in the digital era learning ecosystem use assessments for learning to be able to see the learning results and processes carried out whether they are running well. Teachers also use various forms of assessment in the learning process so that students have more ways to experience success in their learning process, forms of participation in discussions, student-produced content, and multimedia presentations. The most important thing is feedback, with responses, inputs and suggestions to better direct students to better understand the material that has been given.

#### 5. Use of Technology Tools

Generally, students already have their own variety of technological tools that they bring to school, in addition to computers or laptops, students already have smart and sophisticated communication tools that they can use in finding the information they need during learning, these devices develop new goals in the learning ecosystem of the digital era so that they can get and utilize new information. The right tools must be in accordance with the ability they have to access, especially a connection that is strong and stable enough and adequate electricity also adds to the maximum power of the use of technology.

#### 6. Different Abilities and Learning

Because every student is unique, teachers in the digital age learning ecosystem realize that there is no one-size-fits-all approach to learning. Students have a wide variety of different characters and challenges, so their learning experience must be tailored to those personal differences. Learning is also tailored and must include support for various student abilities, because with different academic and physical needs, it results in various outcomes that can be obtained by students and the concept of a developing ecosystem.

#### 7. Supportive Classroom Environment

The classroom environment of the digital age learning ecosystem includes online and offline areas that are used and defined by teachers and students. There are various learning spaces and tools available as needed for students to use for various learning activities, including individual innovation and collaborative work in teams and discussions. A very lively learning environment, and comfortable, clean and beautiful equipment and facilities so that it can adapt to various learning situations and functions and grow a good and long digital ecosystem.

#### 8. Interesting Instructional

Teachers plan instructional strategies and directions that involve students in the learning ecosystem of the digital era, this is a principle to be able to focus on communication skills, collaboration, creativity, and critical thinking, the processes involved in learning, not only products and outputs but also outcomes that can have a lot of impact. Students have many ways to demonstrate proof of success in the classroom, but it also helps them develop the skills necessary to succeed in their future careers. Teachers in the digital era



should be able to facilitate student learning with various models so that the digital ecosystem is maintained and everything runs with its rules.

### **2.3. Limitation**

It is probable that there will be methodological and contextual limitations that must be acknowledged. According to the findings of the pertinent study, the following limitations may be applicable:

#### **1. Constraints of Technological Infrastructure**

Numerous higher education institutions in underdeveloped nations encounter difficulties associated with insufficient technological infrastructure, including unreliable internet connectivity and a deficiency of appropriate digital gadgets. This may impede the efficacy of distance education implementation and overall educational accessibility.

#### **2. Digital Disparity**

Disparities in technological access among socio-economic groups might intensify educational inequalities. Students from disadvantaged backgrounds may face constraints in obtaining gadgets and internet connectivity necessary for online education.

#### **3. Constraints of Digital Proficiencies**

The deficiency of digital competencies among educators and learners can obstruct a successful shift to remote education. Insufficient training can diminish the efficacy of online learning platforms and compromise the quality of the educational experience.

#### **4. Constraints in Curriculum Development and Execution**

Curriculum design that neglects the requirements of online learning may result in a discordance between pedagogical approaches and digital forms. This may influence student engagement and learning efficacy.

#### **5. Constraints of the Qualitative Methodology**

The qualitative approach, although offering profound insights, has constraints in generalizing results. Furthermore, the acquired data is subjective and may be affected by the biases of participants or researchers. Boundaries

#### **6. Constraints in Time and Resources**

Qualitative research frequently necessitates substantial time and money for data acquisition and processing. This may restrict the study's scope and the degree of analysis attainable. Comprehending these constraints is crucial for evaluating the validity and relevance of research outcomes in a wider context.

### **2.4. Suggestions**

To use diverse strategic proposals for enhancing educational accessibility via open and distance education (ODL) within the digital environment. Below are many recommendations for consideration:

#### **1. Selecting the Appropriate Learning Management System (LMS)**

ODL universities must use discernment in selecting an open-source LMS that aligns with their particular requirements. An appropriate LMS can improve the educational experience for students facing financial, geographical, or accessibility constraints. It is essential to verify that the selected LMS facilitates adaptive and inclusive learning and is user-friendly for all stakeholders. Emerald

#### **2. Continuous Professional Development for Educators**

Ongoing professional education for teachers is essential to ensure they have the necessary digital skills. Training programs must prioritize the enhancement of digital literacy, pedagogical competencies, and adaptability to emerging technology. Empowering educators in this manner will enable them to proficiently incorporate digital resources into their pedagogical practices, hence enhancing the learning experience for students. digitalsamba.com

#### **3. Establishing a Cooperative Digital Learning Ecosystem**

Educational institutions should promote collaboration between students and professors via digital platforms that facilitate communication and knowledge exchange. Instruments that enhance collaborative efforts, discourse, and peer evaluation can elevate engagement and foster a feeling of community inside digital

learning environments. Encouraging this type of engagement is essential for cultivating critical and collaborative thinking abilities in learners. [digitalsamba.com](https://digitalsamba.com)

#### 4. Executing an Inclusive Educational Framework

ODL institutions must select digital technologies that are accessible to all students, including individuals with impairments. Implementing universal design principles and offering requisite adjustments guarantees an inclusive digital learning environment. This approach not only adheres to legal standards but also encourages a fair educational experience for every student. [Emerald+1Emerald+1digitalsamba.com](https://emerald1emerald1digitalsamba.com)

#### 5. Developing a Distributed Learning Ecosystem

To improve the sustainability of Open Education Resources (OER), it is important to design and develop OER infrastructure as a distributed learning ecosystem. This approach involves creating an interconnected system of resources, repositories, and referatories. Thus, OER is more widely accessible and sustainable, supporting open learning globally. [Frontiers](https://frontiersin.org)

#### 6. Building Partnerships to Support Digital Education

Partnerships with other universities, professional organizations, and industry can strengthen digital teaching and learning initiatives. This kind of collaboration can provide training and workshops to support teachers at other institutions. In addition, partnerships with industry can provide access to the internet and electronic devices, bringing digital innovations to educational institutions faster. [EDUCAUSE Review](https://edUCAUSE.org)

#### 7. Improving Infrastructure and Technology Accessibility

Governments and educational institutions must invest in digital infrastructure to ensure wider access to open and distance education. This includes providing better internet access and adequate digital devices for students, especially in underserved areas. Additionally, it is important to develop digital content that suits the local needs and language of students.

By implementing these recommendations, educational institutions can improve the accessibility and quality of open and distance education in the digital ecosystem, providing more inclusive and equitable learning opportunities for all students.

### D. Conclusion

Learning and development programs can be successful if we can pay attention to a learning ecosystem that can be developed and adapted to environmental conditions, technology, times and civilization. The main focus at the moment is to study technology and content, disseminate and also create new content that has a wider scope.

Continuous support is needed so that the digital ecosystem runs well and is maintained, the learning environment can be more active so that teachers and students feel a sense of ownership and pride in their continued success both online and offline. The importance of a digital learning ecosystem facilitates learning activities effectively and efficiently, in addition to being easy to provide so that students and teachers can do activities anywhere, anytime and by using various media.

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YR, contributed to the conception and design of the study, data collection, and interpretation of results. SK contributed to the design of the study, data analysis, and review of the literature. EK assisted with data collection, transcriptions, and data coding. She provided feedback during the analysis process and contributed to the methodology section of the paper. MF provided critical insights during the interpretation of the data and was responsible for revising the manuscript for clarity and consistency. He also provided guidance on the theoretical framework.

All authors approved the final manuscript and agreed to be accountable for all aspects of the work to ensure that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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