

# The Role of Leadership in Library Digitalization: How Digital Technology Innovation in Enhancing Cognitive and Literacy Development in Local Communities

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## **Abstract**

*This study investigates the impact of leadership and library digitalization on cognitive and literacy levels within diverse communities across nine regions in Indonesia. Study aims to examines how visionary leadership, strategic planning, stakeholder engagement, and resource allocation by government representatives, along with the managerial effectiveness and innovation practices of librarians, influence library services' modernization and community literacy. Mixed-methods approach were employed, including qualitative and quantitative data which were collected to evaluate the relationship between leadership effectiveness and digital library implementation. Findings reveal that strong leadership and strategic resource allocation are critical in overcoming barriers to library digitalization, fostering digital literacy, and improving community access to knowledge. Data highlights the role of feedback-driven user-centric approaches and training programs in equipping librarians with the skills required for effective service delivery. The insights derived contribute to understanding the dynamics of leadership in advancing digital library initiatives, offering practical recommendations for policymakers and librarians aiming to bridge literacy gaps in the digital age.*

## **1. Introduction**

Indonesia is one of the countries that upholds the provision of equitable education in aspects of processes, instruments and services which underlies the increase in the level of education from the status of students to the status of all levels of society so that the statement "equal education is the right of all nations" is always a top priority for implemented. Law Number 20 of 2003 concerning the National Education System Article 11 Paragraph 1, stated that "*The*

*government and regional governments are obliged to provide services and facilities and guarantee the implementation of quality education for every citizen without discrimination".* Enhancing regional libraries is one way that regional governments can help their inhabitants, particularly those at all societal levels, receive high-quality education. According to the findings of several studies, public libraries are essential for the empowerment and development of local communities because they offer free access to information, knowledge, and resources that promote education, skill development, and lifelong learning (Abu et al., 2011; Malipatil, 2021; Saefullah & Yuliarti, 2018). A library acts as community hubs, fostering social inclusion and collaboration through programs such as digital literacy training, cultural events, and workshops (Nygren, 2014).

Tacit and explicit knowledge of local communities is the main aspect of community cognitive power and has a positive correlation with information literacy as it increases knowledge or cognitive which eventually leads to literacy improvement (Rahmah et al., 2024). Possumah (2018) stated that one of the programs from PNPM (*National Community Empowerment Program*) promoted by the central government to strengthen the welfare of community education in an area or village is through regional libraries. The fact shows us regional governments have built regional libraries according to their proportions and Indonesia has entered the era of digitalization but people's cognition and analytical power towards information is still at the lower limit. The OECD, which is responsible for administering PISA in 2022, shows that Indonesia was in the 11th lowest ranking of the 81 countries recorded, which is an indication that the quality of Indonesia's human resources is relatively low (Kemdikbudristek RI, 2023)

The quality of human resources is influenced by community cognitive level and analytical thinking as whole (Sari & Biduri, 2021; Heslina & Syahrini, 2021; Widén et al., 2023). Therefore, assessment by PISA reflects an indication of lack expertise (cognitive and analytical thinking) among the people. Additionally, fake news and non-credible information become more grounded as people might fail to criticize information and jeopardize the truth (Cohen-Almagor, 2010; Suyanto et al., 2018; Adeeb & Mirhoseini, 2023). Unreliable information or hoaxes, often designed to mislead and evoke strong emotional reactions, diminishing cognitive and analytics of the people by promoting reliance on false or oversimplified information (Aliyah & Yuliana, 2024; Lewandowsky et al., 2017; Kim & Yang 2017).

Central and regional governments require strong and effective policy and leadership to literate their people in order to maintain the social balance. In the process, ability of a leader(s) to set a vision, build consensus, and drive policy implementation effectively is crucial. Leadership qualities such as strategic thinking, adaptability, and collaborative decision-making directly influence how policies address local needs and challenges. A study by Bennis & Nanus (1985) highlights that transformational leadership fosters innovation and engagement, which are critical for developing impactful and sustainable regional policies. Correspond by Bass & Riggio (2006) in *Transformational Leadership* shows that such leadership styles enhance organizational commitment and foster a culture of collaboration

and innovation essential for achieving long-term success. Transformational leaders inspire and motivate their followers to achieve remarkable results while fostering their development into leaders themselves. They achieve this by addressing individual needs, empowering their followers, and aligning personal and organizational goals to create synergy. Research has shown that transformational leadership not only encourages followers to surpass performance expectations but also enhances their satisfaction and commitment to the team and the organization (Bass, 1985, 1998a). Effective leadership in regional libraries is multidimensional, involving strategic vision, policy implementation, and adaptability to innovation. Indicators such as vision clarity, policy adherence, and innovation adoption are critical in assessing leadership impact.

Related to the Library management strategy theories focus on frameworks and approaches to effectively organize, operate, and adapt libraries to meet user needs and institutional goals. Theories such as Total Quality Management (TQM) emphasize continuous improvement in library services to enhance user satisfaction, while Change Management highlights the importance of flexibility in adopting new technologies and practices. Additionally, models like Resource-Based View (RBV) stress the strategic utilization of a library's unique resources, such as collections and staff expertise, to maintain a competitive edge in information dissemination and user engagement (Trosow, 2000; Gwyer, 2009; Koizumi, 2016).

Therefore, this research focuses on aspects of regional government leadership in developing and enforcing policies to encourage library performance, digitalization of regional libraries, their sustainability and the accessibility of regional libraries to local communities so that they can become a forum for cognitive development and literacy development in local communities. This study aims to explore the relationship between leadership and the success of library digitalization efforts, with a particular focus on how managerial quality influences the process. Additionally, we evaluate the impact of library digitalization on cognitive and literacy outcomes in the community.

## **2. Research Method**

Research evaluates both government representatives and librarian(s) as leader which corresponds to literacy development and local communities as the user of the library. Qualitative assessment done to appraise leadership and quality (which reflects the managerial aspects) of current regional library in South Sulawesi.

Sociodemographic such as domicile, education level, latest CGPA and occupation were collected as the basis for categorization. Two sample groups (library user and non-library user) were collected with the same education level. Initially, about 260 people were contacted to get involved in the study. However, only about 183 were collected completely, 47 were blank in some items, while the rest were declined the invitation. Minimum sample following Hair et al. (2020), which counted all possible causality and multiply by 5 to 10. The result for minimum samples were 20 to 40 as only 4 variables were included in the study (leadership,

library digitalization, cognitive, and literacy).

**Table 1. Leadership assessment instrument for govt. representatives and librarians**

| Focus Sample               | Indicators                       | Description                                                     | Items                                                                                                            |
|----------------------------|----------------------------------|-----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Government Representatives | Visionary Leadership             | Ability to set clear goals and objectives                       | What is your vision for regional library development?<br>How do you align library policies with community needs? |
|                            | Strategic Planning               | Development and implementation of strategic plans               | Can you describe the strategies implemented to enhance library digitalization and accessibility?                 |
|                            | Stakeholder Engagement           | Collaboration with librarians, educators, and community members | How do you involve librarians and community stakeholders in decision-making processes?                           |
|                            | Resource Allocation              | Effectiveness in allocating budgets and resources               | How do you prioritize funding for library services and digital initiatives?                                      |
|                            | Policy Implementation            | Success in enforcing policies and ensuring compliance           | What mechanisms are in place to monitor policy compliance in libraries?                                          |
| Librarians                 | Managerial Effectiveness         | Competence in overseeing daily operations                       | How do you manage library staff and services to meet user needs effectively?                                     |
|                            | Innovation and Change Management | Adoption of new technologies and innovative practices           | How have you incorporated digital tools or new services in the library?                                          |
|                            | Communication Skills             | Ability to communicate effectively with staff and users         | How do you ensure clear and effective communication within the library team and with users?                      |
|                            | Training and Development         | Commitment to staff capacity building                           | What initiatives are in place to train and develop library staff in digital literacy or managerial skills?       |
|                            | User-Centric Approach            | Responsiveness to user needs and feedback                       | How do you incorporate feedback from library users into service improvement?                                     |

Additionally, community appraisal was also collected.

**Table 2. Community appraisal to the local library**

| Aspects       | Indicators     | Description             | Questions                |
|---------------|----------------|-------------------------|--------------------------|
| Accessibility | Digital Access | Availability of digital | How often do you use the |

|                      |                     |                                                                                                                      |                                                                                                                                                                 |
|----------------------|---------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Service Quality      | Physical Access     | platforms (e.g., e-books, databases)<br>Availability of devices (computers, tablets) for accessing digital resources | library's digital resources (e-books, databases, etc.)? [Q1]<br>Are there sufficient devices available in the library for users to access digital content? [Q2] |
|                      | Usability           | Ease of navigating digital platforms                                                                                 | How easy is it to find and use the library's digital resources? [Q3]                                                                                            |
|                      | Technical Support   | Availability of support staff for digital tools                                                                      | Have you received adequate support when using digital platforms in the library? [Q4]                                                                            |
|                      | Training            | Access to digital literacy workshops or training                                                                     | Have you attended any library-provided training sessions for using digital resources? [Q5]                                                                      |
| Content Quality      | Relevance           | Availability of diverse and relevant digital materials                                                               | Are the digital materials available in the library relevant to your needs (e.g., education, research, general)? [Q6]                                            |
|                      | Timeliness          | Regular updates of digital resources                                                                                 | Are the library's digital materials updated frequently enough to remain useful? [Q7]                                                                            |
| Community Engagement | Feedback Mechanisms | Opportunities to provide feedback on library digitalization                                                          | Have you been asked to provide feedback on the library's digital services? [Q8]                                                                                 |
|                      | Participation       | Involvement in workshops or programs                                                                                 | Have you participated in library-led digital literacy programs or community engagement events? [Q9]                                                             |
| User Satisfaction    | Satisfaction Level  | Overall satisfaction with digitalization initiatives                                                                 | How satisfied are you with the digital services provided by the library? [Q10]                                                                                  |
|                      | Future Expectations | Community needs for further digitalization                                                                           | What additional digital services or resources would you like the library to offer? [Q11]                                                                        |

Study sites were includes 9 local libraries which spread across 3 cities and 6 districts were chosen as study locus (2 adjacent districts of each city in the province), which are *Makassar-Gowa-Maros*, *Pare-Sidrap-Pinrang*, and *Palopo-Luwu-Luwu Timur* (*city-district*).

Furthermore, cognitive and literacy assessed using a combination of qualitative and quantitative approaches. Cognitive development underpins the capacity for critical thinking and information processing, vital for educational and societal progress. The variable measured using the *Wechsler Adult Intelligence Scale* (WAIS). In the other hand, literacy

extends beyond reading and writing, which includes digital literacy essential in today's information-rich environments. Literacy levels were assessed using the Rapid Literacy Assessment Tool (RLAT), focusing on functional literacy, including reading comprehension, writing proficiency, and critical thinking in real-world contexts. Additionally, digital literacy was evaluated using the Mobile Device Proficiency Questionnaire (MDPQ) as suggested by Oh et al. (2021) for more generalizable digital literacy measurement for adult.

**Table 3. Instrument development matrix for each variable**

| Variable              | Instrument    | Indicators           | Description                               |
|-----------------------|---------------|----------------------|-------------------------------------------|
| Cognitive Development | WAIS          | Verbal Comprehension | Vocabulary and comprehension tasks        |
|                       |               | Working Memory       | Memory recall and arithmetic tasks        |
|                       |               | Processing Speed     | Symbol coding and completion              |
| Literacy Levels       | RLAT and MDPQ | Functional Literacy  | Reading comprehension<br>Writing accuracy |
|                       |               | Digital Literacy     | Ability to navigate digital platforms     |
|                       |               |                      | Proficiency in online research            |

A set of questions will be asked on the online survey, which developed according to indicators at *Table 3*. The questions will be assessed to mapped cognitive and literacy level of the community as additional evaluation of respondents' latest CGPA. Below the question set written according to general knowledge of Indonesia and related to *Table 3*.

**Table 4. Question set to evaluate cognitive and literacy**

|                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------|
| <b>WAIS (Wechsler Adult Intelligence Scale)</b>                                                                    |
| <b>Verbal Comprehension (VC)</b>                                                                                   |
| What is the synonym of the word mulia in Indonesian? [VC1]                                                         |
| Explain the meaning of the phrase "Bagai air di daun taro". [VC2]                                                  |
| Mention the opposite of the word <i>gelap</i> . [VC3]                                                              |
| <b>Working Memory (WM)</b>                                                                                         |
| $50+23-5(5*8/(4^{0.5}))/33-9-4 =$ [WM1]                                                                            |
| <b>Processing Speed (PS)</b>                                                                                       |
| How many vowels are there in the word Library? [PS1]                                                               |
| Arrange the following words according to area: District, Province, Continent, Regency/City, Country, Village [PS2] |
| <b>RLAT (Rapid Literacy Assessment Tool)</b>                                                                       |
| What is the capital of South Sulawesi Province? [RLAT1]                                                            |
| Mention two countries that directly border Indonesia. [RLAT2]                                                      |
| <b>MDPQ (Mobile Device Proficiency Questionnaire)</b>                                                              |

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### Digital Literacy (DL)

Mention the first step to search for articles on search engines like Google. [DL1]

How to check the authenticity of information found on the internet? [DL2]

Mention the digital platforms that are usually used to read electronic books (e-books). [DL3]

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### Proficiency in Online Research (POR)

How many islands are officially recognized in Indonesia according to RPUL data? [POR1]

Find and write the population of Indonesia from official sources. [POR2]

Mention one way to correctly cite information from a website. [POR3]

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Data was collected through an online survey, semi-structured interviews with library users and non-users, and observations of library activities. The data was analyzed using descriptive methods to summarize community demographics, literacy levels, and digital literacy scores, and correlative methods to examine relationships between leadership qualities, library performance, and literacy outcomes. Leadership was further analyzed through thematic analysis of policy documents and interviews with government officials, identifying key themes around vision, policy, and innovation. Additionally, digitalization progress was assessed using an integrative framework that looked at accessibility, infrastructure, content relevance, and user satisfaction, with results combined from surveys, interviews, and observations. Study methodology simplified as shown below.

#### Methodological Framework

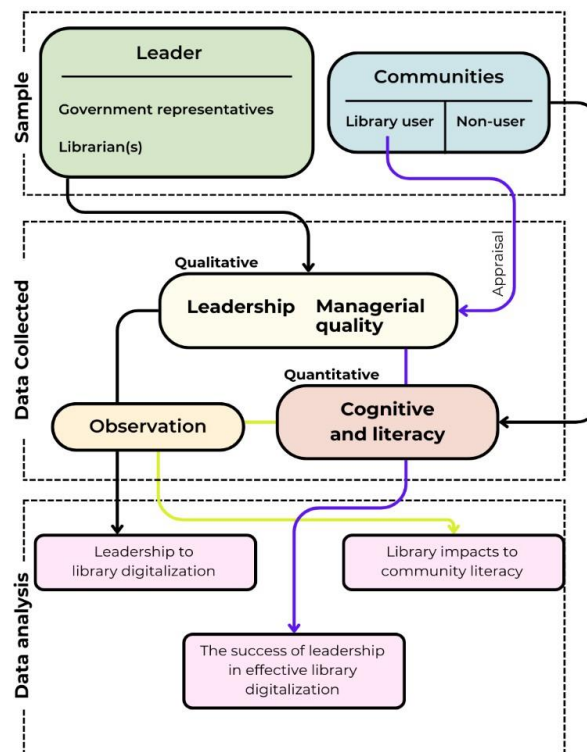


**Figure 1. Study methodological frameworks, consists of sampling, data collection, and analysis involved.**

### 3. Results and Discussion

#### Results

##### *Sociodemographics*

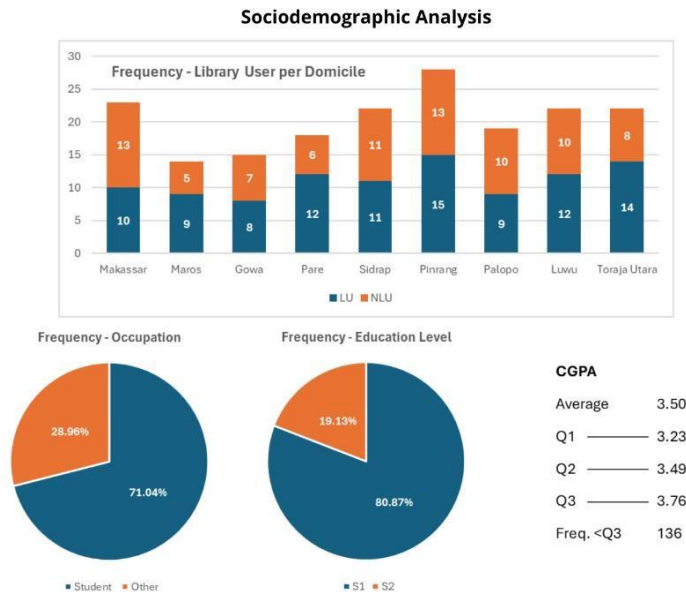


**Figure 2. Respondents frequency by sociodemographics**

The sample for this study consists of 183 respondents, divided into two distinct categories: **Library Users (LU)** and **Non-Library Users (NLU)**, with the LU group comprising 100 respondents and the NLU group consisting of 83 respondents. Dominantly respondent live at Pinrang (15.30%) then Makassar (12.57%). The education level of the respondents is predominantly **S1 (baccalaureate)**, which accounts for over **80%** of the sample, indicating a highly educated group. The rest of the respondents hold an **S2 (post-graduate)** degree, which suggests that we involved common library users. This distribution is a key factor in understanding their behaviors or attitudes, especially regarding library usage, as higher education levels are often linked to greater awareness of or engagement with academic resources, including libraries.

Regarding occupation, more than 70% of the respondents are students, which could indicate that the sample predominantly consists of individuals who are actively engaged in formal education. The remaining respondents are engaged in academic-based professions such as lecturers, teachers, private mentors, trainers, and other related roles, suggesting that these individuals are likely to have higher levels of academic engagement and may be more frequent users of libraries for professional development or research purposes.

Lastly, latest CGPA average is 3.50 with most of the respondent (74.32%) possess below 3.76 as the third quartile. This distribution suggests that the respondents are generally academically competent, with the majority of the sample achieving satisfactory academic performance.

### ***Leadership in Library Digitalization***

Leadership data collected from government representatives (public servant) and librarians across sampling locus. Data collected from 3 government representatives from Makassar, Gowa, and Pinrang Regions, also 4 librarians from Makassar, Gowa, Sidrap, and Palopo regions. Interview results analyzed qualitatively according to Miles et al. (2022), as follows:

**Table 5. Coding and quotation from interviews**

| Government Representatives |                                                                                                  |                                                                                                                                                             |                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Indicators                 | Questions                                                                                        | Main Narrative                                                                                                                                              | Quotation                                                            |
| Visionary Leadership       | What is your vision for regional library development?                                            | A public servant has a vision to make the library a center for inclusive learning, a place for literacy, creativity, and local-based community empowerment. | "My vision is to make the library a center for lifelong learning..." |
|                            | How do you align library policies with community needs?                                          | Alignment is done through surveys, focus groups, and collaboration with stakeholders such as local communities, schools, and universities.                  | "Survey and research are our main ways..."                           |
| Strategic Planning         | Can you describe the strategies implemented to enhance library digitalization and accessibility? | Strategies include developing an online catalog, providing an e-library, and digital training for the community, including vulnerable groups.               | "We have built a user-friendly online catalog..."                    |
| Stakeholder Engagement     | How do you involve librarians and community stakeholders in                                      | Librarians, the community, and stakeholders are involved in                                                                                                 | "Regular discussion forums are where we engage many parties..."      |

|                          |                                                                              |                                                                                                                                          |                                                                  |
|--------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
|                          | decision-making processes?                                                   | discussion forums, satisfaction surveys, and forming work teams.                                                                         |                                                                  |
| Resource Allocation      | How do you prioritize funding for library services and digital initiatives?  | Funds are prioritized for technology development, digital collections, and staff training.                                               | "Our priority is to fund the collection digitization program..." |
| Policy Implementation    | What mechanisms are in place to monitor policy compliance in libraries?      | Monitoring is done through periodic evaluations, reporting systems, and transparent accountability reports to leaders and the community. | "We implement regular evaluation..."                             |
| Librarian                |                                                                              |                                                                                                                                          |                                                                  |
| <b>Indicators</b>        | <b>Questions</b>                                                             | <b>Main Narrative</b>                                                                                                                    | <b>Quotation</b>                                                 |
| Managerial Effectiveness | How do you manage library staff and services to meet user needs effectively? | Effectiveness of staff management through clear division of tasks, regular meetings, and performance evaluations.                        | "We clearly divide the tasks..."                                 |
| Innovation & Change Mgmt | How have you incorporated digital tools or new services in the library?      | Librarians actively use online catalogs, e-books, social media, and conduct digital literacy training.                                   | "We have developed an online catalog..."                         |
| Communication Skills     | How do you ensure clear and effective communication within the library?      | Communication is built through regular team meetings, complaint                                                                          | "We create an open working atmosphere..."                        |

|                        |                                                                                                            |                                                                                                      |                                        |
|------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|----------------------------------------|
|                        | team and with users?                                                                                       | services, and the use of communication technologies such as email and social media.                  |                                        |
| Training & Development | What initiatives are in place to train and develop library staff in digital literacy or managerial skills? | Digital and managerial training is conducted through workshops, seminars, and comparative studies.   | "We send staff to workshops..."        |
| User-Centric Approach  | How do you incorporate feedback from library users into service improvement?                               | Feedback is taken through satisfaction surveys, suggestion boxes, and direct interaction with users. | "User satisfaction surveys help us..." |

Local government leadership and librarians play crucial roles in shaping the future of regional libraries. Visionary leadership, aligned with local needs, drives strategic development. Digitalization initiatives, such as e-libraries, enhance accessibility and service delivery, while community engagement ensures that library services are tailored to local demands. Effective staff management, training, and communication are essential for providing high-quality services. By prioritizing digitalization, community engagement, and staff development, libraries can become dynamic centers of learning and innovation.

### ***Community Appraisal***

Community appraisal is focused on LU only and analyzed across regions. LU from Palopo, Pare, and Luwu reported the highest frequency of digital resource usage, while LU from Gowa reported the lowest. Most regions perceived device availability as sufficient, with LU from Luwu expressing the highest satisfaction. Moreover, LU from Sidrap and Pare reported the easiest access to digital resources. LU from Maros reported the highest satisfaction with support services, while Gowa reported the lowest. Furthermore, LU from Pare and Palopo reported the highest satisfaction with training programs. Palopo and Luwu reported the highest relevance of digital materials to user needs. Palopo reported the highest satisfaction

with the frequency of material updates, while LU from Gowa reported the lowest. Additionally, LU from Luwu reported the highest level of user engagement in providing feedback, while LU from Maros reported the lowest. LU from North Toraja reported the highest satisfaction with the digital literacy and community engagement program. Lastly, LU from Pare and Makassar reported the highest overall satisfaction with digital library services, while LU from North Toraja and Gowa reported the lowest.

**Table 6. Community appraisal filtered by domicile**

| Appraisal |              |              |       |              |              |         |              |              |              |
|-----------|--------------|--------------|-------|--------------|--------------|---------|--------------|--------------|--------------|
| Questions | Makassar     | Maros        | Gowa  | Pare         | Sidrap       | Pinrang | Palopo       | Luwu         | Toraja Utara |
| Q1        | 4.200        | 4.333        | 3.750 | 4.417        | 4.182        | 4.267   | <b>4.556</b> | 4.417        | 4.214        |
| Q2        | 4.400        | 4.444        | 4.375 | 4.417        | <b>4.455</b> | 4.267   | 4.333        | 4.500        | 4.357        |
| Q3        | 4.100        | <b>4.667</b> | 3.875 | 4.500        | 4.545        | 4.267   | 4.333        | 4.333        | 4.214        |
| Q4        | 4.200        | <b>4.556</b> | 3.750 | 4.500        | 4.273        | 4.267   | <b>4.556</b> | 4.250        | 4.143        |
| Q5        | <b>4.500</b> | 4.222        | 4.125 | 4.167        | 4.182        | 4.333   | 4.444        | 4.333        | 4.143        |
| Q6        | 4.200        | 4.222        | 4.000 | 4.083        | 4.273        | 4.333   | <b>4.444</b> | 4.417        | 4.286        |
| Q7        | 4.300        | 4.333        | 4.000 | 4.250        | 4.091        | 4.267   | <b>4.444</b> | 4.250        | 4.286        |
| Q8        | 4.300        | 3.889        | 4.000 | 4.333        | 4.273        | 4.200   | 4.444        | <b>4.500</b> | 4.000        |
| Q9        | 4.400        | 4.222        | 4.125 | 4.333        | <b>4.636</b> | 4.333   | 4.444        | 4.750        | 4.143        |
| Q10       | 4.200        | 4.333        | 4.000 | <b>4.417</b> | 4.182        | 4.133   | 4.333        | 4.167        | 4.000        |

Moreover, the analysis of responses to the question "What additional digital services or resources would you like the library to offer?" reveals distinct patterns and preferences across the nine studied regions: Makassar, Maros, Gowa, Pare, Sidrap, Pinrang, Palopo, Luwu, and Toraja Utara. The total frequencies and percentages indicate varying demand for five specific facilities: e-books and audiobooks, online courses and tutorials, more research databases, virtual events and webinars, and access to software tools.

The highest demand overall is for access to software tools, requested by 70% of respondents in Makassar and as high as 83.33% in Luwu. This need aligns with the increasing reliance on digital applications for education, research, and professional development. Similarly, e-books and audiobooks are a prominent request, with 81.82% of respondents in Sidrap and 64.29% in Toraja Utara identifying this as a key priority, reflecting a widespread need for diverse and flexible digital reading materials. The preference for virtual events and webinars is also noteworthy, particularly in regions like Sidrap (72.73%) and Luwu (66.67%). This trend suggests an appetite for interactive and community-based digital engagement, likely driven by a desire for continuous learning and professional networking. Online courses and tutorials rank lower in overall preference but remain significant in certain regions, such as Pare (66.67%) and Gowa (62.50%), indicating localized interest in structured learning opportunities. The request for more research databases is relatively balanced across regions, with frequencies ranging from 33.33% in Maros to 60% in Pinrang. This highlights the ongoing need for access to high-quality research tools, though it appears less urgent

compared to software tools and audiobooks.

**Table 7. Expected additional facilities needed by LU per domicile**

| Facilities Needed            | Frequency : Percentage |              |              |              |              |              |              |               |              | Total |
|------------------------------|------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|-------|
|                              | Makassar               | Maros        | Gowa         | Pare         | Sidrap       | Pinrang      | Palopo       | Luwu          | Toraja Utara |       |
| E-books and audiobooks       | 2 ;<br>20.00           | 5 ;<br>55.56 | 4 ;<br>50.00 | 5 ;<br>41.67 | 9 ;<br>81.82 | 7 ;<br>46.67 | 4 ;<br>44.44 | 6 ;<br>50.00  | 9 ; 64.29    | 51    |
| Online courses and tutorials | 3 ;<br>30.00           | 3 ;<br>33.33 | 5 ;<br>62.50 | 8 ;<br>66.67 | 7 ;<br>63.64 | 8 ;<br>53.33 | 3 ;<br>33.33 | 4 ;<br>33.33  | 5 ; 35.71    | 46    |
| More research databases      | 3 ;<br>30.00           | 3 ;<br>33.33 | 3 ;<br>37.50 | 4 ;<br>33.33 | 4 ;<br>36.36 | 9 ;<br>60.00 | 4 ;<br>44.44 | 6 ;<br>50.00  | 6 ; 42.86    | 42    |
| Virtual events and webinars  | 6 ;<br>60.00           | 3 ;<br>33.33 | 3 ;<br>37.50 | 7 ;<br>58.33 | 8 ;<br>72.73 | 7 ;<br>46.67 | 4 ;<br>44.44 | 8 ;<br>66.67  | 4 ; 28.57    | 50    |
| Access to software tools     | 7 ;<br>70.00           | 3 ;<br>33.33 | 5 ;<br>62.50 | 7 ;<br>58.33 | 4 ;<br>36.36 | 5 ;<br>33.33 | 7 ;<br>77.78 | 10 ;<br>83.33 | 7 ; 50.00    | 55    |

### ***Cognitive and Literacy among community***

An assessment of cognitive and literacy skills was conducted across nine regions: Makassar, Maros, Gowa, Pare, Sidrap, Pinrang, Palopo, Luwu, and Toraja Utara. Six key indicators were evaluated: verbal comprehension, working memory, processing speed, rapid literacy assessment, digital literacy, and online research proficiency.

The overall assessment revealed mixed levels of competency. While working memory and processing speed demonstrated relatively strong performance, categorized as "Competent," verbal comprehension, rapid literacy assessment, digital literacy, and online research proficiency were classified as "Basic," indicating areas for improvement.

**Table 8. Cognitive and literacy average marks and grade for each indicators**

| Items                                 | Average | Description |
|---------------------------------------|---------|-------------|
| Verbal Comprehension                  | 75.23   | Basic       |
| Working Memory                        | 81.42   | Competent   |
| Processing Speed                      | 80.60   | Competent   |
| RLAT (Rapid Literacy Assessment Tool) | 77.32   | Basic       |
| Digital literacy                      | 79.78   | Basic       |
| Proficiency in Online Research        | 77.05   | Basic       |

A closer examination of the data reveals significant regional variations in cognitive and literacy skills. LU from Pare consistently excelled in verbal comprehension, particularly in understanding complex verbal information. In contrast, LU from Maros exhibited lower scores, indicating a need for targeted interventions to enhance foundational comprehension skills. Regarding working memory, LU from Luwu demonstrated superior cognitive retention

abilities, while LU from Maros and Pinrang exhibited relatively weaker short-term memory capabilities. In terms of processing speed, LU from Pare, Toraja Utara, and Palopo excelled in efficient information processing, while LU from Maros lagged behind. For rapid literacy assessment, LU from Luwu displayed strong foundational literacy skills, while LU from Gowa and Pinrang encountered challenges in literacy comprehension. In digital literacy, LU from Makassar and Luwu led in digital proficiency, while LU from Sidrap and Pinrang required enhanced digital literacy programs. Finally, in online research proficiency, LU from Gowa excelled in research skills, while LU from Pare struggled with navigating digital platforms for research purposes. These regional disparities highlight the need for tailored interventions to address specific needs and improve overall cognitive and literacy outcomes.

**Table 9. Cognitive and literacy test average marks per domicile**

| Items | Makassar | Maros | Gowa   | Pare   | Sidrap | Pinrang | Palopo | Luwu  | Toraja Utara |
|-------|----------|-------|--------|--------|--------|---------|--------|-------|--------------|
| VC1   | 86.96    | 57.14 | 66.67  | 88.89  | 59.09  | 78.57   | 68.42  | 68.18 | 81.82        |
| VC2   | 86.96    | 64.29 | 86.67  | 72.22  | 72.73  | 75.00   | 57.89  | 72.73 | 81.82        |
| VC3   | 78.26    | 92.86 | 66.67  | 100.00 | 72.73  | 75.00   | 68.42  | 72.73 | 72.73        |
| WM    | 82.61    | 71.43 | 93.33  | 72.22  | 81.82  | 71.43   | 78.95  | 95.45 | 86.36        |
| PS1   | 86.96    | 57.14 | 86.67  | 94.44  | 68.18  | 71.43   | 94.74  | 72.73 | 86.36        |
| PS2   | 82.61    | 71.43 | 86.67  | 83.33  | 63.64  | 85.71   | 84.21  | 90.91 | 81.82        |
| RLAT1 | 65.22    | 92.86 | 66.67  | 72.22  | 68.18  | 67.86   | 73.68  | 90.91 | 77.27        |
| RLAT2 | 73.91    | 71.43 | 93.33  | 88.89  | 77.27  | 89.29   | 78.95  | 90.91 | 59.09        |
| DL1   | 86.96    | 64.29 | 93.33  | 83.33  | 81.82  | 75.00   | 84.21  | 90.91 | 86.36        |
| DL2   | 82.61    | 78.57 | 86.67  | 88.89  | 86.36  | 85.71   | 68.42  | 72.73 | 81.82        |
| DL3   | 69.57    | 71.43 | 73.33  | 72.22  | 81.82  | 64.29   | 78.95  | 77.27 | 86.36        |
| POR1  | 82.61    | 64.29 | 100.00 | 55.56  | 86.36  | 75.00   | 84.21  | 81.82 | 77.27        |
| POR2  | 69.57    | 71.43 | 73.33  | 88.89  | 77.27  | 57.14   | 89.47  | 72.73 | 68.18        |
| POR3  | 86.96    | 78.57 | 86.67  | 83.33  | 72.73  | 75.00   | 84.21  | 81.82 | 68.18        |

These findings underscore the need for customized interventions to address specific regional needs. While certain regions, such as Pare, Luwu, and Toraja Utara, exhibit strengths in particular areas, consistent challenges in literacy and digital skills are evident in regions like Maros, Gowa, and Sidrap. In particular, digital literacy and online research proficiency emerged as significant areas of concern, with most scores falling within the "Basic" range. Given the increasing importance of these skills in modern education and the workforce, targeted digital literacy programs are crucial. Regional variations further emphasize the importance of localized interventions to address specific needs and improve overall cognitive and literacy outcomes.

## Discussion

### *Leadership to library digitalization*

Leadership is crucial in the digital transformation of libraries, enabling them to evolve from

traditional knowledge repositories into dynamic, digital hubs for learning, collaboration, and innovation. Effective leadership involves visionary thinking, strategic planning, stakeholder engagement, resource allocation, and policy implementation. Visionary Leadership provides the foundation for successful digitalization by setting clear goals and fostering a shared vision. Leaders who advocate for the role of digital libraries in enhancing community literacy inspire collective action and innovation (Ouakouak et al., 2020; Prakasa et al., 2020; Reunanen & Eckhaus, 2020). For example, a public servant from Makassar envisioned regional libraries as inclusive centers for literacy and community empowerment, aligning with Vasilescu (2019) transformational leadership theory, which emphasizes the role of visionary leaders in driving change.

Moreover, strategic planning is essential for the systematic development of digital services. Successful regions like Luwu have prioritized digital content, training programs, and infrastructure upgrades, improving user satisfaction. This approach aligns with Total Quality Management (TQM) principles, focusing on continuous improvement. In contrast, regions like Gowa struggled with inadequate planning, highlighting the negative impact of weak leadership. Stakeholder Engagement strengthens library digitalization by involving librarians, educators, and community members in decision-making. Collaborative processes, such as feedback forums and surveys, foster ownership and ensure services meet local needs. Dahlgaard et al. (2007) highlight that such engagement drives innovation and strengthens commitment to shared goals.

Furthermore, resource allocation is critical for digitalization success. Effective leaders prioritize funding for technology, digital collections, and training. In Sidrap, resource allocation for digitization and training improved user access and satisfaction, aligning with the Resource-Based View (RBV) framework, which emphasizes leveraging unique resources for competitive advantage. However, regions like Maros, with limited investment, experienced slower progress. Policy Implementation ensures that digital initiatives are executed effectively. Leaders in Makassar have used regular assessments and feedback mechanisms to refine policies and adapt to user needs. These mechanisms promote continuous improvement and help adapt strategies to evolving digital landscapes.

### ***The success of leadership in effective library digitalization***

The effectiveness of leadership in library digitalization is evident in the ability to achieve measurable outcomes that enhance accessibility, engagement, and community impact. Strong leadership facilitates the integration of innovative digital tools and services, which in turn improve user satisfaction and contribute to cognitive and literacy development. The qualitative data, community appraisal, and cognitive-literacy assessments in this study underscore the critical role of leadership in shaping these outcomes.

Effective leaders prioritize strategies that address both the operational and user-centered aspects of library digitalization. For instance, qualitative data from interviews with government representatives and librarians highlight that strategic planning, stakeholder engagement, and adaptive resource allocation are central to success. Leaders from regions such as Luwu and Makassar emphasized the importance of participatory decision-making

processes, where community feedback informs the design and delivery of library services. These practices align with the principles of transformational leadership, as outlined by Crews et al., (2019) and O'Connor & Kearney, (2023), which emphasize collaboration, innovation, and the alignment of organizational goals with community needs.

Quantitative findings from the community appraisal reveal a correlation between leadership practices and user satisfaction. For example, regions like Luwu and Pare, where leadership demonstrated a strong commitment to digital literacy training and e-library development, reported high satisfaction scores for digital services (Q9: 4.750 in Luwu, Q10: 4.417 in Pare). Conversely, areas with less proactive leadership, such as Gowa, recorded lower satisfaction levels (Q10: 4.000), indicating gaps in meeting user expectations. These variations emphasize the importance of leadership in driving user-centric initiatives that cater to diverse community needs.

Moreover, cognitive and literacy data further illustrate the impact of effective leadership on community outcomes. Regions with robust digitalization initiatives, such as Pare and Palopo, showed higher scores in indicators like processing speed (Pare: 94.44) and digital literacy (Palopo: 84.21), suggesting that well-executed digital library services enhance cognitive capabilities. In contrast, regions like Maros and Pinrang, which faced challenges in leadership effectiveness, demonstrated lower scores in verbal comprehension (Maros: 57.14) and online research proficiency (Pinrang: 57.14). These disparities align with findings from Purba et al. (2021) and Phippen et al. (2021), which highlight that libraries with well-implemented digital strategies can significantly enhance users' cognitive and analytical skills.

The success of leadership in these contexts also extends to fostering community engagement. Leaders in regions like Sidrap prioritized virtual events and webinars, resulting in high user participation and satisfaction (72.73% demand for virtual events). This approach demonstrates the ability of effective leaders to create environments that encourage active learning and collaboration, reinforcing libraries as hubs of community interaction. Such initiatives are consistent with the Total Quality Management (TQM) framework, which emphasizes continuous improvement and stakeholder involvement to enhance service quality. However, the qualitative data also reveal challenges that limit the full realization of leadership success. In regions like Gowa, the lack of consistent resource allocation and limited training opportunities for librarians resulted in lower performance across multiple appraisal metrics, such as training satisfaction (Q5: 4.125) and material updates (Q7: 4.000). These findings suggest that while visionary leadership is critical, its effectiveness is contingent on the availability of resources and the capacity to implement strategies.

### ***Library impacts to community literacy***

Libraries, as centers of knowledge dissemination, play a pivotal role in enhancing community literacy. The transition from traditional to digital libraries has expanded the scope of these impacts, enabling broader access to resources and fostering the development of cognitive and digital literacy. This study's findings highlight the significant influence of library digitalization on improving community literacy levels, with variations reflecting regional leadership effectiveness, resource availability, and user engagement. The cognitive and literacy data

illustrate the multidimensional contributions of digital libraries to literacy improvement. Indicators such as verbal comprehension, working memory, processing speed, and digital literacy reflect how libraries contribute to both foundational and advanced skills. For instance, regions with robust digital library services, such as Palopo and Luwu, demonstrated higher scores in digital literacy (Palopo: 84.21; Luwu: 90.91) and proficiency in online research (Palopo: 89.47; Luwu: 81.82). These findings align with the concept of information literacy, as defined by the American Library Association (ALA), which underscores the importance of individuals being able to locate, evaluate, and use information effectively in various contexts. Libraries offering well-structured digital tools and training equip users with these competencies, fostering a literate and critically engaged community.

The role of digital libraries extends beyond individual cognitive benefits to collective societal impacts. Digital literacy programs, e-library services, and virtual events organized by libraries encourage lifelong learning and community collaboration. For example, community appraisal data revealed high participation rates in digital literacy programs in regions like Sidrap (Q9: 4.636), demonstrating the ability of libraries to act as catalysts for skill development and social interaction. Moreover, libraries contribute to reducing literacy disparities by tailoring their services to local needs. Regions like Pare and Makassar, where leadership effectively aligned library policies with community demands, reported higher satisfaction with resource relevance (Q6: Pare 4.083, Makassar 4.200) and content updates (Q7: Pare 4.250, Makassar 4.300). Such alignment underscores the transformative potential of libraries in bridging literacy gaps across socio-economic and geographic divides. This is consistent with UNESCO (2022) assertion that libraries are instrumental in fostering inclusive knowledge societies by addressing the diverse literacy needs of their communities.

However, challenges persist in regions where library digitalization efforts are less developed. For instance, lower scores in digital literacy and online research proficiency in regions like Maros (DL3: 71.43; POR3: 64.29) indicate gaps in access to quality resources and training programs. These disparities reflect the limitations of resource allocation and program delivery, emphasizing the need for targeted interventions to ensure equitable access to literacy-enhancing services.

### ***Limitations***

this study has certain limitations that should be acknowledged. First, the sample size, though sufficient for the analytical framework, may limit the generalizability of the findings to larger or more diverse populations. The study primarily focuses on nine regions within South Sulawesi, which may not fully represent the broader socio-cultural and administrative diversity of other provinces in Indonesia. Second, the reliance on self-reported data from community appraisals and qualitative interviews introduces the potential for response bias, which could affect the objectivity of certain findings. Third, while the study explores the relationship between leadership and library digitalization, it does not examine the long-term sustainability of these efforts or their impacts on subsequent generations. Lastly, external factors such as technological infrastructure, government budgetary constraints, and community digital readiness were not deeply explored, which could influence the outcomes

of library digitalization.

### **Future Prospects**

Future research should address these limitations by expanding the scope of the study to include a larger and more diverse sample across different regions in Indonesia or other comparable contexts. Longitudinal studies are recommended to examine the long-term impacts of library digitalization on cognitive and literacy outcomes, particularly how these changes influence future generations. Furthermore, future investigations could explore the role of external factors such as infrastructure, funding, and digital equity in shaping the success of library digitalization efforts. Comparative studies across regions with differing leadership styles and technological capabilities could provide deeper insights into best practices for library management.

### **4. Conclusion**

This study underscores the importance of effective leadership in driving library digitalization. Strong leadership, strategic planning, and resource allocation are crucial for transforming libraries into dynamic hubs of knowledge and innovation. By prioritizing digital initiatives, engaging communities, and ensuring equitable access, regional governments can significantly enhance library services, improve literacy rates, and foster lifelong learning.

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