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Exploring the open-source impact on Bangladesh academic library service sustainability

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Abstract

Purpose – This study investigates the impact of open-source software (OSS) on the sustainability of academic library services in Bangladesh. It aims to understand how OSS can address budget constraints, technological demands and the need for enhanced service delivery in these libraries.

Design/methodology/approach – An in-depth qualitative research approach was used, involving semi-structured interviews with library administrators, IT staff and librarians from various academic institutions across Bangladesh.

Findings – The study reveals that OSS adoption is primarily driven by financial imperatives and the need for flexible, customizable solutions tailored to specific institutional needs. Key benefits identified include significant cost savings, improved customization and flexibility of services and enhanced community support and collaboration. However, challenges such as a lack of in-house technical expertise, resistance to change among staff and stakeholders and inadequate IT infrastructure impede successful OSS implementation.

Practical implications – To harness the full potential of OSS, academic libraries must invest in capacity building through targeted training programs, improve IT infrastructure and foster a culture of collaboration and knowledge-sharing within the library community. These strategies are essential to overcoming existing barriers and ensuring long-term sustainability.

Originality/value – This research contributes to the understanding of OSS's role in enhancing the sustainability of academic library services. It provides practical recommendations for academic libraries seeking to leverage OSS for improved service delivery and operational efficiency.

Keywords Open-source software, Sustainability, Academic libraries, Bangladesh, Qualitative research, Capacity building, IT infrastructure, Library services

Paper type Research paper



1. Introduction

1.1 Background

Academic libraries in Bangladesh are integral to the educational infrastructure, yet they face challenges such as budget constraints, evolving technology needs and the demand for

comprehensive services. Open-source software (OSS) presents a potential solution to these challenges by offering cost-effective, customizable and collaborative tools. This study explores the impact of OSS on the sustainability of academic library services in Bangladesh. OSS has gained significant attention in the academic library sector due to its potential impact on sustainability and service provision (Palmer *et al.*, 2014). Libraries have been exploring the use of open-source solutions in various aspects, including integrated library systems (ILS), repository applications and online public access catalogs (Palmer *et al.*, 2014). The adoption of OSS aligns with movements promoting the free exchange of technology and information, supporting education and research endeavors (Donnelly, 2010). Studies have compared different open-source ILS options like Koha and ABCD, highlighting their functionalities and features for library cataloging and management (Macan *et al.*, 2013). Additionally, research has reviewed commonly used open-source automation software such as Koha, NewGenLib, Evergreen, PMB and OpenBiblio, emphasizing the transition from Automated Library Systems to ILS in academic libraries (Moruf *et al.*, 2020). Academic libraries are increasingly considering OSS to measure service quality and patron satisfaction effectively and affordably (Angell, 2013). However, challenges exist in the adoption of OSS in libraries, with studies identifying key issues and lessons learned, particularly in developing countries like Pakistan (Rafiq and Ameen, 2009). Perceptions toward OSS adoption in libraries have been investigated, shedding light on the attitudes within the Library and Information Science community (Rafiq, 2009).

The context of OSS adoption in US academic libraries has been explored, driven by budget constraints and the growing need for technology solutions (Choi and Pruett, 2019). Academic libraries play a crucial role in advocating for open educational resources, supporting their creation and dissemination (Essmiller and Asino, 2021). Open-source federated searching tools have been developed to enhance library services, with studies discussing the benefits and challenges faced in such initiatives (Mah and Stranack, 2005). In the realm of digital libraries, OSS like DSpace and Greenstone Digital Library has been instrumental in creating institutional repositories and managing digital collections effectively (Ravikumar and Ramanan, 2015). OSS has also been used in medical imaging tools development, showcasing the rapid advancements facilitated by these libraries (Caban *et al.*, 2007). Academic librarians' perspectives on open-source and proprietary library automation software have been compared, providing insights into the perceived advantages and challenges of each system (Hassan *et al.*, 2022). Furthermore, the evaluation of open-source digital library software has been emphasized through the development of checklists to guide libraries in selecting the most suitable solutions (Goh *et al.*, 2006).

1.2 Objectives

The primary objective of this research is to understand how OSS contributes to the sustainability of academic library services in Bangladesh. Specifically, the study aims to:

- Identify the benefits of OSS in academic libraries.
- Understand the challenges associated with OSS implementation.
- Explore strategies for effective OSS adoption and utilization.

2. Literature review

The literature review encompasses previous studies on the use of OSS in academic libraries globally and within the context of Bangladesh. It highlights the potential of OSS to reduce costs, enhance service delivery and foster collaboration. Additionally, the review addresses challenges such as technical expertise requirements, resistance to change and infrastructural

limitations. However, Academic libraries play a crucial role in supporting education and research by providing access to information resources and services (Alam, 2020). In Bangladesh, the quality of library services directly impacts user satisfaction and ultimately influences the sustainability of academic libraries (Alam, 2020). Studies in Bangladeshi university libraries have focused on various aspects such as service quality, user satisfaction and the impact of service quality dimensions on user satisfaction (Alam, 2020; Alam and Mezbah-ul-Islam, 2022; Shoeb and Ahmed, 2020). However, there is a gap in understanding the specific impact of open-source initiatives on the sustainability of academic library services in Bangladesh (Angell, 2013). The concept of sustainability in academic libraries has gained attention globally, with a focus on developing strategies for long-term viability. Sustainability in this context encompasses environmental, economic and social dimensions that contribute to the overall resilience of library services (Jankowska and Marcum, 2010; Jones and Wong, 2016). While there is existing literature on sustainability challenges and strategies in academic libraries, there is a need to explore how open-source initiatives can enhance sustainability specifically in the context of Bangladeshi academic libraries (Angell, 2013; Jankowska and Marcum, 2010).

Service quality assessment is a critical aspect of ensuring user satisfaction in academic libraries. Studies have used models like SERVQUAL to measure service quality and its impact on user satisfaction in Bangladeshi university libraries (Alam, 2020; Alam and Mezbah-ul-Islam, 2022). However, there is a gap in research regarding the development and validation of service quality assessment models tailored to the unique context of academic libraries in Bangladesh (Alam, 2020). Understanding the specific service quality dimensions that are crucial for user satisfaction in Bangladeshi academic libraries can help in improving service delivery and sustainability (Alam and Mezbah-ul-Islam, 2022; Shoeb and Ahmed, 2020).

The role of technology, such as open-source automation software and cloud computing, has the potential to transform library services and enhance sustainability. OSS offers cost-effective solutions for library automation, while cloud computing enables flexible and scalable services. Integrating these technologies into Bangladeshi academic libraries could improve efficiency, accessibility and overall service quality, contributing to sustainability (Islam *et al.*, 2022; Moruf *et al.*, 2020). However, there is a gap in research exploring the adoption and impact of these technologies specifically in the context of Bangladesh (Angell, 2013; Islam *et al.*, 2022; Moruf *et al.*, 2020). Knowledge management practices are essential for effective information organization and dissemination in libraries. Studies have highlighted the importance of knowledge management in improving library services and meeting user needs (Islam *et al.*, 2020). However, there is a gap in understanding the factors influencing knowledge management practices in Bangladeshi university libraries. Investigating these factors can provide insights into how knowledge resources are used and shared within academic libraries in Bangladesh, contributing to sustainability and service quality improvement (Islam *et al.*, 2020; Mamun *et al.*, 2023). The COVID-19 pandemic has posed significant challenges to library and information services worldwide. In Bangladesh, library professionals have had to adapt to new realities and overcome obstacles to ensure continued access to information resources. Understanding the strategies and innovations implemented by Bangladeshi library professionals during the pandemic can shed light on effective practices for maintaining service quality and sustainability in times of crisis (Begum and Habiba, 2023).

The existing literature on academic library sustainability in Bangladesh has primarily focused on traditional aspects such as service quality, user satisfaction and knowledge management (Alam, 2020; Alam and Mezbah-ul-Islam, 2022; Islam *et al.*, 2020;

Mamun *et al.*, 2023). While these studies provide valuable insights into the challenges and opportunities for improving library services, there is a notable gap in research specifically addressing the impact of open-source initiatives on sustainability in Bangladeshi academic libraries (Angell, 2013). By exploring how OSS, automation technologies and innovative service models can enhance sustainability, future research can provide a comprehensive understanding of the factors influencing the long-term viability of academic libraries in Bangladesh.

3. Methodology

Research Design: This study uses a qualitative research design to explore the impact of open-source solutions (OSS) on academic library services. The methodology includes in-depth interviews with library administrators, IT staff and librarians from various academic institutions in Bangladesh.

Research Questions: The study addressed the following research questions:

RQ1. What are the perceptions of library staff and users regarding the sustainability of open-source solutions in academic libraries in Bangladesh?

RQ2. What challenges do academic libraries face in implementing open-source solutions?

RQ3. How do open-source solutions impact the services provided by academic libraries?

Participants: Participants were selected using purposive sampling to ensure a diverse representation of academic libraries in terms of size, location and resource availability. The sample included 15 participants from 10 different academic institutions across Bangladesh.

Data Collection: Data were collected through semi-structured interviews, allowing for a comprehensive exploration of participants' experiences and perspectives. Interviews were conducted in person and via video conferencing, recorded and transcribed for analysis.

Interview Questions: The interview questions were designed to explore various aspects of the open-source impact on academic library services. The list of questions used in the interviews is provided as a supplementary file (Supplementary File 1).

Construction of Questions: The questions were constructed based on a review of relevant literature and in consultation with experts in the field of library science. The questions aimed to cover key themes such as sustainability, implementation challenges and user perceptions.

Interview Duration: Each interview lasted between 45 and 60 min.

Selection of Interviewees: Interviewees were selected using purposive sampling. Participants included library administrators, IT staff and users from five academic libraries in Bangladesh. A total of 15 participants were interviewed.

Data Analysis: Interview data were analyzed using thematic analysis. The interviews were transcribed, and the transcripts were coded to identify recurring themes and patterns. NVivo software was used to assist with data organization and coding.

4. Thematic analysis

Step 1: Transcription and Familiarization

All interviews were transcribed *verbatim*. The researcher read and re-read the transcripts to become familiar with the content.

Step 2: Initial Coding

The transcripts were coded to identify significant statements and phrases related to the research questions. Example codes included: “benefits”, “challenges”, “user satisfaction”, “sustainability” and “cost”.

Step 3: Searching for Themes

Codes were grouped into broader themes. For instance, codes like “ease of use”, “community support” and “cost-effectiveness” were grouped under the theme “Perceived Benefits”.

Step 4: Reviewing Themes

Themes were reviewed to ensure they accurately reflected the data. Some themes were merged or refined.

Step 5: Defining and Naming Themes

Each theme was clearly defined and named to represent the key concepts identified.

4.1 Data and themes

4.1.1 Theme 1: perceived benefits. One of the most prominent themes that emerged from the data is the perceived benefits of adopting open-source solutions in academic libraries. Within this theme, three key sub-themes were identified: ease of use, cost-effectiveness and community support.

4.1.2 Code: ease of use.

- R1: The open-source software we use is user-friendly and easy to navigate.
- R3: Our staff found the interface intuitive, which reduced the training time.

Respondents consistently highlighted the user-friendly nature of OSS as a critical advantage. For example, R1 and R3 noted how the intuitive interface of the software facilitated easier navigation and reduced the need for extensive staff training. This ease of use is particularly important in the context of academic libraries, where staff may not have specialized IT skills, and where frequent staff turnover can necessitate ongoing training. The reduction in training time not only saves resources but also minimizes disruption to library services, allowing staff to focus more on user interaction and less on grappling with complex software interfaces.

The emphasis on ease of use also aligns with broader trends in software development, where user-centered design is increasingly prioritized. In the library context, where the primary goal is to enhance access to information, software that is easy to use ensures that both staff and patrons can effectively engage with digital resources. This user-friendliness is a crucial factor in the successful adoption and long-term sustainability of open-source solutions in libraries.

4.1.3 Code: cost-effectiveness.

- R2: We saved a significant amount on licensing fees by switching to open-source.
- R5: Open-source solutions are much more affordable for our budget.

The financial aspect of OSS adoption was another major sub-theme under perceived benefits. Respondents like R² and R5 emphasized the significant cost savings achieved by avoiding expensive licensing fees associated with proprietary software. In academic libraries, where budgets are often tight, these savings can be redirected toward other essential services, such as expanding digital collections, upgrading infrastructure or investing in staff development.

The cost-effectiveness of open-source solutions is particularly relevant in the context of developing countries, like Bangladesh, where academic institutions may struggle with limited financial resources. By adopting OSS, these libraries can access high-quality digital tools without the financial burden of ongoing licensing costs, thereby enhancing their ability to

serve their academic communities. The economic advantage of OSS is thus not only a matter of cost savings but also of increasing the library's capacity to fulfill its educational mission.

4.1.4 Code: community support.

- R4: The open-source community is very supportive and provides valuable resources.
- R6: We can easily find help and documentation online.

The strong community support surrounding OSS was another perceived benefit highlighted by respondents. As noted by R4 and R6, the open-source community offers a wealth of resources, including documentation, forums and direct support from other users. This communal knowledge-sharing is a unique aspect of open-source ecosystems, where the collective expertise of users and developers contributes to continuous software improvement and problem-solving.

For academic libraries, this community support mitigates some of the risks associated with open-source adoption, such as the potential for technical issues or the need for customization. The availability of extensive online resources and the ability to tap into the collective experience of other institutions using the same software reduces the need for costly external support. Furthermore, this communal aspect of OSS fosters a sense of collaboration and shared purpose among libraries, contributing to the broader goal of democratizing access to information.

4.2 Theme 2: Implementation challenges

Despite the clear benefits, the implementation of open-source solutions in academic libraries is not without challenges. The two main sub-themes identified under this category were technical issues and the lack of in-house expertise.

4.2.1 Code: technical issues.

- R7: We faced several technical difficulties during the initial setup.
- R8: Integrating the open-source software with our existing systems was challenging.

Several respondents, including R7 and R8, reported encountering technical difficulties during the initial setup and integration of OSS with existing systems. These issues are not uncommon when introducing new technology into established infrastructures, especially in environments where legacy systems may not be fully compatible with newer, open-source alternatives. The complexity of these technical challenges can vary depending on the specific software and the existing IT landscape of the library, but they often require significant time and resources to resolve.

The technical challenges faced during implementation highlight a critical aspect of open-source adoption: while the software itself may be cost-effective, the process of integrating it into a library's existing systems can incur hidden costs. These may include the time and effort required for troubleshooting, system customization and ensuring interoperability with other library technologies. For academic libraries, particularly those with limited IT support, these challenges can be a significant barrier to successful implementation.

4.2.2 Code: lack of expertise.

- R9: Our team lacked the technical expertise needed for customization.
- R10: We had to hire external consultants to assist with the implementation.

The lack of in-house technical expertise was another major challenge identified by respondents like R9 and R10. Unlike proprietary software, which often comes with vendor support and training, open-source solutions typically require users to rely on their own

technical skills or seek assistance from the open-source community. This reliance on internal expertise can be problematic in libraries where staff may not have the necessary IT background or where there is limited access to professional development opportunities.

In some cases, libraries may need to hire external consultants to assist with the implementation and customization of OSS, as noted by R10. While this can provide a solution to the expertise gap, it also represents an additional cost that may offset some of the financial savings associated with open-source adoption. Moreover, the dependency on external consultants can lead to sustainability issues, particularly if the library is unable to maintain the software independently after the consultants' involvement ends.

4.3 Theme 3: Impact on services

The adoption of open-source solutions also had a notable impact on the services provided by academic libraries. Two sub-themes emerged in this category: improved access to resources and mixed user feedback.

4.3.1 Code: improved access.

- R11: Users now have better access to digital resources.
- R12: The open-source tools have enhanced our online catalog services.

One of the most positive outcomes of adopting OSS, as highlighted by respondents like R11 and R12, was the improvement in access to digital resources. Open-source tools often come with features that enhance the accessibility and discoverability of library collections, such as advanced search capabilities and better integration with online catalogs. These improvements are particularly important in the context of academic libraries, where facilitating access to information is a core mission.

Enhanced access to digital resources can also lead to increased user satisfaction and higher usage rates of library services. For example, the ability to easily access a wide range of digital materials can support the research and learning needs of students and faculty, thereby strengthening the library's role as an essential resource within the academic community.

4.3.2 Code: mixed user feedback.

- R13: Some users appreciate the new features, but others miss the old system.
- R14: We've received both positive and negative feedback from our patrons.

Despite the improvements in access, user feedback on the new open-source systems was mixed. Respondents like R13 and R14 reported that while some users appreciated the new features and enhanced access, others were resistant to change and preferred the old systems. This mixed response highlights the challenge of managing user expectations and ensuring a smooth transition during the implementation of new technologies.

User resistance to change is a common issue in any organizational setting, but it is particularly relevant in libraries, where patrons may have developed strong preferences for certain tools or interfaces. Addressing this resistance requires effective communication, training and support during the transition period. Libraries must also be prepared to make adjustments based on user feedback to ensure that the new systems meet the needs and preferences of all users.

4.4 Theme 4: Sustainability

The final theme that emerged from the analysis was the sustainability of open-source solutions. Two sub-themes were identified: long-term viability and financial savings.

4.4.1 Code: long-term viability.

- R15: We are confident in the long-term sustainability of our open-source solutions.
- R3: The active development community ensures that the software stays up to date.

Respondents expressed confidence in the long-term sustainability of open-source solutions, with R15 and R3 highlighting the role of the active development community in keeping the software up-to-date. The ongoing development and support provided by the open-source community ensure that the software remains relevant and capable of evolving to meet new challenges. This long-term viability is a crucial consideration for academic libraries, which need to ensure that their digital tools can keep pace with technological advancements and changing user needs.

The sustainability of OSS is also supported by its adaptability and customization options. Unlike proprietary software, which is often limited by vendor-imposed constraints, open-source solutions can be modified to meet the specific needs of a library. This flexibility allows academic libraries to tailor the software to their unique requirements, thereby enhancing its long-term relevance and utility. The collaborative nature of the open-source community further contributes to sustainability by fostering a continuous cycle of innovation and improvement. Libraries that actively participate in this community can benefit from shared advancements while also contributing to the development of tools that align with their strategic goals.

4.4.2 Code: financial savings.

- R2: The cost savings from using open-source software contribute to our sustainability.
- R6: We can allocate funds to other critical areas due to reduced software costs.

The financial savings associated with OSS play a critical role in its sustainability, as emphasized by respondents like R2 and R6. The reduced costs from avoiding proprietary licensing fees allow libraries to allocate funds to other areas, such as expanding collections, upgrading facilities or investing in staff development. These financial savings are not just a short-term benefit; they contribute to the overall sustainability of the library's operations by freeing up resources that can be reinvested in ways that directly enhance service quality and user satisfaction.

Moreover, the cost savings from OSS support the long-term financial health of academic libraries, particularly in resource-constrained environments. By reducing dependency on costly commercial software, libraries can achieve greater financial autonomy and stability, ensuring that they can continue to provide essential services even in the face of budget cuts or economic downturns. This financial flexibility is crucial for the ongoing sustainability of academic libraries, enabling them to adapt to changing circumstances and continue fulfilling their mission of supporting education and research.

4.5 Summary of themes and respondent quotes

- Perceived Benefits: Respondents highlighted the ease of use, cost-effectiveness and strong community support as major advantages of open-source solutions.
- Implementation Challenges: Technical issues and a lack of in-house expertise were common challenges during the implementation phase.
- Impact on Services: The open-source software improved access to digital resources, though user feedback was mixed.

- Sustainability: Financial savings and the active development community were seen as key factors in the long-term sustainability of open-source solutions.

The analysis of the interview data from 15 respondents revealed several key themes regarding the impact of open-source solutions on academic library services. The perceived benefits of cost-effectiveness, ease of use and community support were tempered by challenges such as technical issues and the need for expertise. Overall, the impact on services was positive, with improved access to resources and a sustainable financial model.

4.6 In-depth analysis of identified themes

The thematic analysis of interviews conducted with respondents in academic libraries reveals a nuanced understanding of how open-source solutions impact library services. By systematically analyzing the data through transcription, coding and thematic development, four major themes emerged: Perceived Benefits, Implementation Challenges, Impact on Services and Sustainability. This discussion explores each theme in depth, connecting the findings to broader issues in library science and open-source technology adoption.

Theme 1: Perceived Benefits: One of the most prominent themes that emerged from the data is the perceived benefits of adopting open-source solutions in academic libraries. Within this theme, three key sub-themes were identified: ease of use, cost-effectiveness and community support.

4.7 Ease of use

Respondents consistently highlighted the user-friendly nature of OSS as a critical advantage. For example, R1 and R3 noted how the intuitive interface of the software facilitated easier navigation and reduced the need for extensive staff training. This ease of use is particularly important in the context of academic libraries, where staff may not have specialized IT skills, and where frequent staff turnover can necessitate ongoing training. The reduction in training time not only saves resources but also minimizes disruption to library services, allowing staff to focus more on user interaction and less on grappling with complex software interfaces.

The emphasis on ease of use also aligns with broader trends in software development, where user-centered design is increasingly prioritized. In the library context, where the primary goal is to enhance access to information, software that is easy to use ensures that both staff and patrons can effectively engage with digital resources. This user-friendliness is a crucial factor in the successful adoption and long-term sustainability of open-source solutions in libraries.

4.8 Cost-effectiveness

The financial aspect of OSS adoption was another major sub-theme under perceived benefits. Respondents like R² and R5 emphasized the significant cost savings achieved by avoiding expensive licensing fees associated with proprietary software. In academic libraries, where budgets are often tight, these savings can be redirected toward other essential services, such as expanding digital collections, upgrading infrastructure or investing in staff development.

The cost-effectiveness of open-source solutions is particularly relevant in the context of developing countries, like Bangladesh, where academic institutions may struggle with limited financial resources. By adopting OSS, these libraries can access high-quality digital tools without the financial burden of ongoing licensing costs, thereby enhancing their ability to serve their academic communities. The economic advantage of OSS is thus not only a matter of cost savings but also of increasing the library's capacity to fulfill its educational mission.

4.9 Community support

The strong community support surrounding OSS was another perceived benefit highlighted by respondents. As noted by R4 and R6, the open-source community offers a wealth of resources, including documentation, forums and direct support from other users. This communal knowledge-sharing is a unique aspect of open-source ecosystems, where the collective expertise of users and developers contributes to continuous software improvement and problem-solving.

For academic libraries, this community support mitigates some of the risks associated with open-source adoption, such as the potential for technical issues or the need for customization. The availability of extensive online resources and the ability to tap into the collective experience of other institutions using the same software reduces the need for costly external support. Furthermore, this communal aspect of OSS fosters a sense of collaboration and shared purpose among libraries, contributing to the broader goal of democratizing access to information.

Theme 2: Implementation Challenges: Despite the clear benefits, the implementation of open-source solutions in academic libraries is not without challenges. The two main sub-themes identified under this category were technical issues and the lack of in-house expertise.

4.10 Technical issues

Several respondents, including R7 and R8, reported encountering technical difficulties during the initial setup and integration of OSS with existing systems. These issues are not uncommon when introducing new technology into established infrastructures, especially in environments where legacy systems may not be fully compatible with newer, open-source alternatives. The complexity of these technical challenges can vary depending on the specific software and the existing IT landscape of the library, but they often require significant time and resources to resolve.

The technical challenges faced during implementation highlight a critical aspect of open-source adoption: while the software itself may be cost-effective, the process of integrating it into a library's existing systems can incur hidden costs. These may include the time and effort required for troubleshooting, system customization and ensuring interoperability with other library technologies. For academic libraries, particularly those with limited IT support, these challenges can be a significant barrier to successful implementation.

4.11 Lack of expertise

The lack of in-house technical expertise was another major challenge identified by respondents like R9 and R10. Unlike proprietary software, which often comes with vendor support and training, open-source solutions typically require users to rely on their own technical skills or seek assistance from the open-source community. This reliance on internal expertise can be problematic in libraries where staff may not have the necessary IT background or where there is limited access to professional development opportunities.

In some cases, libraries may need to hire external consultants to assist with the implementation and customization of OSS, as noted by R10. While this can provide a solution to the expertise gap, it also represents an additional cost that may offset some of the financial savings associated with open-source adoption. Moreover, the dependency on external consultants can lead to sustainability issues, particularly if the library is unable to maintain the software independently after the consultants' involvement ends.

Theme 3: Impact on Services: The adoption of open-source solutions also had a notable impact on the services provided by academic libraries. Two sub-themes emerged in this category: improved access to resources and mixed user feedback.

4.12 Improved access

One of the most positive outcomes of adopting OSS, as highlighted by respondents like R11 and R12, was the improvement in access to digital resources. Open-source tools often come with features that enhance the accessibility and discoverability of library collections, such as advanced search capabilities and better integration with online catalogs. These improvements are particularly important in the context of academic libraries, where facilitating access to information is a core mission.

Enhanced access to digital resources can also lead to increased user satisfaction and higher usage rates of library services. For example, the ability to easily access a wide range of digital materials can support the research and learning needs of students and faculty, thereby strengthening the library's role as an essential resource within the academic community.

4.13 Mixed user feedback

Despite the improvements in access, user feedback on the new open-source systems was mixed. Respondents like R13 and R14 reported that while some users appreciated the new features and enhanced access, others were resistant to change and preferred the old systems. This mixed response highlights the challenge of managing user expectations and ensuring a smooth transition during the implementation of new technologies.

User resistance to change is a common issue in any organizational setting, but it is particularly relevant in libraries, where patrons may have developed strong preferences for certain tools or interfaces. Addressing this resistance requires effective communication, training and support during the transition period. Libraries must also be prepared to make adjustments based on user feedback to ensure that the new systems meet the needs and preferences of all users.

Theme 4: Sustainability: The final theme that emerged from the analysis was the sustainability of open-source solutions. Two sub-themes were identified: long-term viability and financial savings.

4.14 Long-term viability

Respondents expressed confidence in the long-term sustainability of open-source solutions, with R15 and R3 highlighting the role of the active development community in keeping the software up-to-date. The ongoing development and support provided by the open-source community ensure that the software remains relevant and capable of evolving to meet new challenges. This long-term viability is a crucial consideration for academic libraries, which need to ensure that their digital tools can keep pace with technological advancements and changing user needs.

The sustainability of OSS is also supported by its adaptability and customization options. Unlike proprietary software, which is often limited by vendor-imposed constraints, open-source solutions can be modified to meet the specific needs of a library. This flexibility allows academic libraries to tailor the software to their unique requirements, thereby enhancing its long-term relevance and utility. The collaborative nature of the open-source community further contributes to sustainability by fostering a continuous cycle of innovation and improvement. Libraries that actively participate in this community can benefit from

shared advancements while also contributing to the development of tools that align with their strategic goals.

4.15 Financial savings

The financial savings associated with OSS play a critical role in its sustainability, as emphasized by respondents like R² and R6. The reduced costs from avoiding proprietary licensing fees allow libraries to allocate funds to other areas, such as expanding collections, upgrading facilities or investing in staff development. These financial savings are not just a short-term benefit; they contribute to the overall sustainability of the library's operations by freeing up resources that can be reinvested in ways that directly enhance service quality and user satisfaction.

Moreover, the cost savings from OSS support the long-term financial health of academic libraries, particularly in resource-constrained environments. By reducing dependency on costly commercial software, libraries can achieve greater financial autonomy and stability, ensuring that they can continue to provide essential services even in the face of budget cuts or economic downturns. This financial flexibility is crucial for the ongoing sustainability of academic libraries, enabling them to adapt to changing circumstances and continue fulfilling their mission of supporting education and research.

In conclusion, the thematic analysis of interviews with respondents from academic libraries in Bangladesh reveals both the potential benefits and challenges associated with the adoption of open-source solutions. While the ease of use, cost-effectiveness and strong community support are significant advantages, the implementation process is often fraught with technical challenges and a lack of in-house expertise. Despite these hurdles, the impact of OSS on library services is largely positive, with improvements in access to resources and potential long-term sustainability supported by financial savings and active community engagement.

The findings suggest that while open-source solutions offer a viable and sustainable option for enhancing library services, successful implementation requires careful planning, adequate training and effective change management strategies. Libraries must be prepared to address the technical challenges and manage user expectations to fully realize the benefits of open-source technology. By doing so, academic libraries can leverage open-source solutions to improve service delivery, enhance user satisfaction and ensure long-term sustainability in a rapidly evolving digital landscape.

5. Discussion

The thematic analysis of interviews with respondents from academic libraries in Bangladesh provides a comprehensive understanding of the benefits and challenges associated with the adoption of open-source solutions. This discussion not only delves into these themes but also explores their broader implications, addressing the “so what” of the study and suggesting directions for future research.

Perceived Benefits and Their Implications: The perceived benefits of OSS in academic libraries are significant and multifaceted. The ease of use and user-friendly interfaces were repeatedly mentioned by respondents, highlighting how these features reduce the need for extensive staff training and facilitate smoother day-to-day operations. This is particularly important in academic settings where time and resources for training may be limited. The intuitive nature of these tools ensures that staff can quickly adapt to new systems, which in turn minimizes disruptions to library services. The implication here is that OSS can democratize access to advanced digital tools, making them accessible to institutions with limited technical resources.

Cost-effectiveness is another major benefit that has far-reaching implications. The financial savings from avoiding expensive licensing fees allow libraries to allocate funds to other critical areas, such as expanding digital collections or improving physical infrastructure. This financial flexibility can be particularly beneficial for libraries in developing countries, where budgets are often constrained. The implication is that open-source solutions could play a crucial role in leveling the playing field for academic libraries globally, providing them with the tools they need to enhance their services without incurring prohibitive costs.

Community support, as emphasized by respondents, also has significant implications. The robust network of users and developers surrounding OSS offers an invaluable resource for libraries. This communal support system not only helps in troubleshooting and problem-solving but also contributes to the continuous improvement of the software. The implication is that OSS is not just a tool but part of a larger collaborative ecosystem that libraries can engage with and benefit from. This aspect of OSS could encourage more academic libraries to consider its adoption, knowing that they are not alone in facing the challenges that come with it.

5.1 Implementation challenges and their implications

Despite the clear benefits, the implementation of OSS in academic libraries presents several challenges. Technical difficulties during the initial setup and integration phase were frequently reported, suggesting that existing library infrastructures may not be fully compatible with OSS without significant modifications. This finding has important implications for libraries considering a transition to open-source solutions. It suggests the need for a more thorough assessment of existing systems before implementation, as well as a potential requirement for additional resources to address these technical hurdles.

The lack of in-house technical expertise further complicates the implementation process. Many libraries found themselves relying on external consultants to manage the setup and customization of OSS. While this external support can be effective, it also incurs additional costs, which can offset some of the financial savings associated with open-source adoption. The implication is that libraries need to invest in building internal technical capacity, either through training existing staff or hiring new personnel with the necessary skills. This investment in human capital is crucial for the long-term sustainability of open-source solutions in academic libraries.

User feedback on the new systems was mixed, with some patrons resisting the transition to open-source tools. This resistance highlights the need for effective change management strategies that address user concerns and ensure a smooth transition. The implication here is that the success of open-source adoption in libraries is not solely dependent on the technical implementation but also on how well the change is managed from a user perspective. Libraries must therefore engage with their users throughout the process, providing adequate support and addressing any concerns that arise.

5.2 Sustainability and its implications

The sustainability of open-source solutions emerged as a positive theme in the study, with respondents expressing confidence in the long-term viability of these tools. The financial savings from reduced software costs contribute significantly to the sustainability of library services, allowing for more efficient resource allocation. This financial sustainability is crucial for academic libraries, particularly in regions where funding is limited. The implication is that OSS can provide a sustainable alternative to proprietary solutions, helping libraries maintain and even expand their services over time.

Moreover, the active development community surrounding OSS ensures that these tools remain up-to-date and capable of evolving to meet new challenges. This ongoing development is essential for maintaining the relevance and functionality of library services in a rapidly changing technological landscape. The implication is that libraries using OSS can be more agile and responsive to technological advancements, positioning themselves at the forefront of digital innovation in the academic sector.

6. Conclusion

The study of open-source solutions in academic libraries in Bangladesh reveals a complex but promising landscape. The benefits of OSS – such as ease of use, cost-effectiveness and robust community support – align well with the operational needs and budget constraints of these libraries. These advantages not only improve the efficiency and accessibility of library services but also contribute to the long-term sustainability of these institutions. The implications of these findings suggest that open-source solutions could be a game-changer for academic libraries, particularly in developing regions, where financial resources are often limited. By adopting these tools, libraries can achieve significant cost savings, which can be reinvested in other critical areas, thereby enhancing their overall service offerings.

However, the study also highlights significant challenges that must be addressed for successful implementation. Technical difficulties and a lack of in-house expertise pose substantial barriers to the adoption of OSS. These challenges suggest that while open-source solutions are attractive, their successful deployment requires careful planning, adequate training and possibly external support. The implication here is that libraries should not underestimate the resources required to transition to open-source systems and should be prepared to invest in the necessary technical and human capital.

Looking ahead, there are several directions for future research that could build on the findings of this study. One area of interest could be a comparative analysis of open-source and proprietary software in academic libraries across different regions, focusing on factors such as cost, user satisfaction and long-term sustainability. Another potential area of research could explore the development of training programs designed to build technical expertise within libraries, examining their effectiveness in overcoming the challenges identified in this study. Finally, research could also investigate the impact of open-source adoption on library users, particularly in terms of accessibility and user experience, providing further insights into how these tools can be optimized to meet the needs of diverse user groups.

Overall, while there are clear hurdles to overcome, the potential benefits of integrating open-source solutions into academic libraries are substantial. By addressing the initial implementation challenges and investing in the necessary resources, libraries can harness the full potential of these tools. Moreover, effective change management strategies will be crucial in ensuring user satisfaction and acceptance of new systems. As academic libraries continue to navigate the complexities of digital transformation, open-source solutions offer a flexible and sustainable approach that aligns well with both current needs and future aspirations.

References

- Alam, M. (2020), "Effects of service quality on satisfaction in Eastern university library, Bangladesh", *IFLA Journal*, Vol. 47 No. 2, pp. 209-222, doi: [10.1177/0340035220959099](https://doi.org/10.1177/0340035220959099).
- Alam, M.J. and Mezbah-Ul-Islam, M. (2022), "Impact of service quality on user satisfaction in public university libraries of Bangladesh using structural equation modeling", *Performance Measurement and Metrics*, Vol. 24 No. 1, pp. 12-30, doi: [10.1108/pmm-06-2021-0033](https://doi.org/10.1108/pmm-06-2021-0033).

- Angell, K. (2013), "Open source assessment of academic library patron satisfaction", *Reference Services Review*, Vol. 41 No. 4, pp. 593-604, doi: [10.1108/rsr-05-2013-0026](https://doi.org/10.1108/rsr-05-2013-0026).
- Begum, S. and Habiba, U. (2023), "Are library professionals overcoming the COVID-19 pandemic challenges in the current reality?", *Digital Library Perspectives*, Vol. 39 No. 4, pp. 420-443, doi: [10.1108/dlp-01-2023-0009](https://doi.org/10.1108/dlp-01-2023-0009).
- Caban, J.J., Joshi, A. and Nagy, P. (2007), "Rapid development of medical imaging tools with open-source libraries", *Journal of Digital Imaging*, Vol. 20 No. S1, pp. 83-93, doi: [10.1007/s10278-007-9062-3](https://doi.org/10.1007/s10278-007-9062-3).
- Choi, N. and Pruett, J.A. (2019), "The context and state of open source software adoption in US academic libraries", *Library Hi Tech*, Vol. 37 No. 4, pp. 641-659, doi: [10.1108/lht-02-2019-0042](https://doi.org/10.1108/lht-02-2019-0042).
- Donnelly, F. (2010), "Evaluating open source GIS for libraries", *Library Hi Tech*, Vol. 28 No. 1, pp. 131-151, doi: [10.1108/07378831011026742](https://doi.org/10.1108/07378831011026742).
- Essmiller, K. and Asino, T.I. (2021), "Will academic library publishing break OER? A diffusion of innovations study", *Journal of Interactive Media in Education*, Vol. 2021 No. 1, doi: [10.5334/jime.673](https://doi.org/10.5334/jime.673).
- Goh, D.H., Chua, A.Y.K., Khoo, D.A., Khoo, E.B.H., Mak, E.B.T. and Ng, M.W.M. (2006), "A checklist for evaluating open source digital library software", *Online Information Review*, Vol. 30 No. 4, pp. 360-379, doi: [10.1108/14684520610686283](https://doi.org/10.1108/14684520610686283).
- Hassan, M., Hamid, A. and Shah, N. (2022), "Open-source and proprietary library automation software: a comparative academic librarian's perspective", *Journal of Information Management and Practices*, Vol. 2 No. 2, doi: [10.52461/jimp.v2i2.1407](https://doi.org/10.52461/jimp.v2i2.1407).
- Islam, M.A., Hossain, M.S. and Alam, S.M.S. (2020), "Organizational sustainability of open source integrated library systems (ILSs) in university libraries of Bangladesh: an exploratory study", *SRELS Journal of Information Management*, Vol. 57 No. 2, pp. 88-100, doi: [10.17821/srels/2020/v57i2/147708](https://doi.org/10.17821/srels/2020/v57i2/147708).
- Islam, M.N., Islam, M.S., Anwar, A. and Alam, M.K. (2022), "Cloud computing applications in library services of Bangladesh: a study on librarians' perceptions", *Information Discovery and Delivery*, Vol. 51 No. 1, pp. 88-104, doi: [10.1108/idd-08-2021-0095](https://doi.org/10.1108/idd-08-2021-0095).
- Jankowska, M.A. and Marcum, J.W. (2010), "Sustainability challenge for academic libraries: planning for the future", *College and Research Libraries*, Vol. 71 No. 2, pp. 160-170, doi: [10.5860/0710160](https://doi.org/10.5860/0710160).
- Jones, L. and Wong, W.K.F. (2016), "More than just a green building", *Library Management*, Vol. 37 Nos 6/7, pp. 373-384, doi: [10.1108/lm-05-2016-0041](https://doi.org/10.1108/lm-05-2016-0041).
- Macan, B., Fernández, G.V. and Stojanovski, J. (2013), "Open source solutions for libraries: ABCD vs Koha", *Program*, Vol. 47 No. 2, pp. 136-154, doi: [10.1108/00330331311313726](https://doi.org/10.1108/00330331311313726).
- Mah, C. and Stranack, K. (2005), "DBWIZ: open source federated searching for academic libraries", *Library Hi Tech*, Vol. 23 No. 4, pp. 490-503, doi: [10.1108/07378830510636292](https://doi.org/10.1108/07378830510636292).
- Mamun, M.Z., Othman, R. and Zulkifli, Z. (2023), "Knowledge management: determine the influencing factors for practicing at the libraries in Bangladesh", *Journal of Education Culture and Society*, Vol. 14 No. 1, pp. 672-696, doi: [10.15503/jecs2023.1.672.696](https://doi.org/10.15503/jecs2023.1.672.696).
- Moruf, H., Sani, S. and Abu, Z. (2020), "Open source automation software: stirring automated to integrated library system", *Journal of Applied Sciences and Environmental Management*, Vol. 24 No. 7, pp. 1273-1278.
- Palmer, A., Choi, N., Payne, A. and Singh, V. (2014), "The current state of library open source software research open source software use in libraries", *Library Hi Tech*, Vol. 32 No. 1, pp. 11-27, doi: [10.1108/lht-05-2013-0056](https://doi.org/10.1108/lht-05-2013-0056).
- Rafiq, M. (2009), "LIS community's perceptions towards open source software adoption in libraries", *International Information and Library Review*, Vol. 41 No. 3, pp. 137-145, doi: [10.1016/j.iilr.2009.07.001](https://doi.org/10.1016/j.iilr.2009.07.001).

- Rafiq, M. and Ameen, K. (2009), "Issues and lessons learned in open source software adoption in Pakistani libraries", *The Electronic Library*, Vol. 27 No. 4, pp. 601-610, doi: [10.1108/02640470910979561](https://doi.org/10.1108/02640470910979561).
- Ravikumar, M. and Ramanan, T. (2015), "Comparison of greenstone digital library and DSpace: experiences from digital library initiatives at Eastern University, Sri Lanka", *Journal of the University Librarians Association of Sri Lanka*, Vol. 18 No. 2, pp. 76-90, doi: [10.4038/jula.v18i2.7867](https://doi.org/10.4038/jula.v18i2.7867).
- Shoeb, M.Z.H. and Ahmed, S.M.Z. (2020), "How far are the public university libraries in Bangladesh meeting students' expectations? An analysis of service quality through LibQUAL+ core items", *Performance Measurement and Metrics*, Vol. 22 No. 1, pp. 49-69, doi: [10.1108/pmm-05-2020-0028](https://doi.org/10.1108/pmm-05-2020-0028).

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