Repositioning infopreneurship as a Sustainable Economic Empowerment Strategy for Library and Information Professionals in Nigeria

By

Salihu Mahmud
Department of Library and Information Science
Federal University Lokoja
mahmud.salihu@fulokoja.edu.ng

Helen Emmanuel
Department of Library and Information Science
University of Abuja
helen.emmanuel@uniabuja.edu.ng

Abstract

This study examined infopreneurship as a sustainable economic empowerment strategy for Library and Information Professionals in Nigeria. Specifically, the study examined the extent to which LIPs have adopted infopreneurship as an income diversification strategy and assessed the sustainability of infopreneurial ventures using business survival rate and income stability indicators. A descriptive survey research design was adopted. The population comprised 43 professional librarians from the University of Abuja and Federal University Lokoja, while 36 valid responses were retrieved, representing an 86% response rate. Data were collected using paper-based and electronic questionnaires and analyzed using percentages, mean scores, and standard deviation. The findings revealed that LIPs had adopted infopreneurship mainly through research and information-search services, information consultancy, paid information/digital literacy training, online information services, knowledge management consultancy, and social media information services. However, adoption was relatively low in technology-driven and commercially oriented areas such as data analysis, database development, digital publishing, information brokerage, digital content creation, and the production and sale of information products. The findings further showed that infopreneurship provides a consistent and reliable source of additional income, but the long-term sustainability of infopreneurial ventures remains relatively low due to challenges relating to funding, technological changes, continuity of operations, income growth, operating costs, and reinvestment. The study concludes that repositioning infopreneurship requires stronger digital and entrepreneurial competencies, continuous professional development, improved access to funding and and greater commercialization of information products and services.

Keywords: Infopreneurship, Sustainable Economic Empowerment, Library and Information Professionals.

Introduction

The Information Economy of the twenty-first century has transformed information into an economic asset that is capable of being a source of innovation, entrepreneurship, employment, and development. The fast evolution in various aspects of information technology such as artificial intelligence (AI), big data, cloud computing, digital publishing, social media, and knowledge management has created unique system for individuals and organizations to generate, package, market, and monetize information goods and services. The availability of various forms of ICT, information explosion, and the ever-increasing needs of individuals, organizations and institutions for teaching, learning, research, decision making, planning, and production create increasing infopreneurship opportunities (Oyinkepreye and Jerry 2023). Kazungu (2021) defined infopreneurship as the ability to organize resources, bear risk and undertake intelligent searches to gather information from different sources, combine it into novel ways, and serve the readers' needs through internet tools as a value-added service for profit. Consequently, information has become a major source of wealth creation, giving rise to infopreneurship, an entrepreneurial practice that involves identifying information needs and developing innovative information products and services for economic and social value (Amakiri 2025). Allowing professionals to transform their knowledge of information and digital abilities into commercially sellable goods and services making infopreneurship important to library and information professionals. Through activities like information consulting, digital publishing, research support, content production, data administration, and online training, it offers chances for income diversification, self-employment, professional resilience, innovation, and economic empowerment. Additionally, it creates jobs, expands LIS services outside of typical library settings, and helps professionals adjust to new information markets and technology advancements (Olutayo et al. 2022).

In the field of library and information science, experts possess unique skills in organizing information, managing knowledge, retrieving information, curating digital content, supporting research, indexing and abstracting, managing records, promoting digital literacy, and disseminating information (Nwoka, Ihejirika and Obuah 2024). Historically, these skills have been utilized in academic, public, school, and special libraries. In addition, the evolving landscape of the information profession, diminishing job prospects in the public sector, economic unpredictability, and the increasing need for digital services compel library and information specialists to reshape their professional positions beyond traditional librarianship. Oladokun & Olatokun, (2026) argued that the future of the profession depends on integrating entrepreneurship, digital innovation, and emerging technologies into professional practice and LIS education.

The career path of many library and information professionals have continued to be impacted by underemployment, unemployment, and declining government support for libraries (Ola and Adeyeye 2026). Employment opportunities in both traditional and modern library settings have presumably, not increased accordingly, despite the annual increase of library and information science graduates. The need for alternate career pathways that may guarantee both financial sustainability and professional relevance has increased as a result of this imbalance. Such an opportunity is made possible by infopreneurship, which enables professionals turn their knowledge of information into commercially marketable goods and services like digital publishing, research support, bibliometric services, institutional repository management, data curation, online information brokerage, digital archiving, information literacy training, and information consultancy. Therefore, creating alternative income opportunities, promoting self-employment,

and reducing dependence on conventional based salaried employment (Chux-Nyehe and Nwinyokugi 2020).

Sustainable economic empowerment is the long-term process of giving people and communities the tools, skills, and resources they need to gain financial independence and control over their economic future (Shubho et al. 2025). Sustainable economic empowerment, in contrast to other job initiatives, place an emphasis on ongoing wealth generation through enterprise development, innovation, and the effective use of knowledge and skills. This can be accomplished within the field of library and information science by redefining librarians and information professionals as infopreneurs who can create successful information businesses that support both individual financial sustainability and the development of the national economy. Additionally, another important dimension of sustainable economic empowerment is its capacity to create alternative source of income and improve the financial sustainability of LIS professionals (Koweh 2026). Infopreneurship provides librarians with opportunities to apply their professional, ICT, information management, and entrepreneurial skills in generating income outside traditional library employment (Oyinkepreye and Jerry 2023). Similarly, entrepreneurial skills such as managerial, business, ICT, and information literacy skills are highly important for professionals seeking to participate effectively in entrepreneurial activities. Through marketing of information products and services, librarians can diversify their income, strengthen their professional relevance, and contribute to employment and wealth creation. Thus, infopreneurship presents a pathway for achieving sustainable income alternatives among LIS professionals, particularly in an increasingly knowledge-driven and digital economy (Akidi and Udoh 2021).

Despite the enormous opportunities presented by the digital information economy, evidence suggests that infopreneurship remains underutilized among library and information professionals in Nigeria. Aregbesola et al. (2019) revealed that although many LIS students and professionals recognize the importance of infopreneurship, participation remains relatively low because of inadequate entrepreneurial education, limited practical exposure, insufficient digital competencies, poor access to finance, weak institutional support, and inadequate awareness of emerging information markets. Collectively, these challenges can reduce the adoption, effectiveness, profitability, and sustainability of infopreneurship among LIS professionals. They may result in low entrepreneurial participation, limited income diversification, underutilization of professional skills, and missed opportunities in the emerging information economy (Oyinkepreye and Jerry 2023). These findings underscore the need to reposition infopreneurship using a sustainable development approach.

Furthermore, the field of infopreneurship has been greatly broadened by new technologies including artificial intelligence, machine learning, cloud computing, digital archives, research analytics, and online learning platforms among others. These technologies are changing the skills necessary for success in the workplace and opening up new markets for information professionals. As a result, repositioning infopreneurship is now a strategic necessity for maintaining the relevance of the library and information science profession in Nigeria, rather than just a choice. Therefore, the study explores the role of infopreneurship in enhancing professional relevance, promoting self-employment, creating alternative income opportunities, and strengthening the contribution of library and information science professionals to Nigeria's socio-economic development in the digital age.

Statement of the Problem

Globally, the nature of information profession has drastically changed due to the quick development of digital technology and the rise of the knowledge economy. Serving as information custodians and distributors, library and information professionals are expected to be creative entrepreneurs who develop, package, promote, and commercialize information products and services to satisfy society's changing demands. Consequently, library and information professionals are expected to use their digital skills and information management competences to build long-term information businesses that produce income, jobs, and support national growth. However, many library and information professionals still primarily rely on traditional salaried employment in academic, public, school, and special libraries, despite the fact that the digital economy has opened many chances for information-based entrepreneurship. This dependence continues to occur despite shrinking employment opportunities, inadequate funding of libraries, rapid technological changes, and increasing demand for entrepreneurial and digital competencies in the information profession. Leading to dependence on limited salaried employment opportunities, limiting the ability of professionals to create innovative information products and services that could generate sustainable income opportunity and enhance their economic resilience, reduces the competitiveness and relevance of library and information professionals in an increasingly digital and knowledge-driven economy among others. Furthermore, several empirical studies have been carried out relating to this study such as Adetayo & Hamzat (2021) studied Infopreneurship and Financial Satisfaction among Library Professionals in Tertiary Institutions in Ede, Osun, Nigeria among several others thereby leaving a gap in knowledge in the absence of a comprehensive study that examines how infopreneurship can be repositioned as a sustainable economic empowerment strategy for library and information professionals in Nigeria in a digital economy. Hence, necessitating the study Repositioning Infopreneurship as a Sustainable Economic Empowerment Strategy for Library and Information Professionals in Nigeria.

Objectives of the Study

The general objective of the study is to examine the repositioning of infopreneurship as a sustainable economic empowerment strategy for library and information professionals in Nigeria. However, the specific objectives are to:

i) examine the extent to which LIPs have adopted inforpreneurship as income diversification strategy.
ii) assess the sustainability level of infopreneurial ventures run by LIPs using survival rate and income stability indicators.

Research Questions

1. To what extent have Library and Information Professionals (LIPs) adopted infopreneurship as an income diversification strategy in Nigeria?

2. What is the level of sustainability of infopreneurial ventures operated by Library and Information Professionals (LIPs) in terms of business survival rate and income stability?

Methodology

Descriptive survey research design was adopted for the study and with a population of forty-three (43) professional librarians from the University of Abuja and Federal University Lokoja. Data was collected using a combination of paper-based and electronic questionnaire (Google Forms).

The data collected was analyzed using descriptive statistics (i.e., percentages, mean scores and standard deviation) with the standard deviation being used as a measure of the extent of uniformity of responses. The mean perception level of 2.50 was used as the cut-off score on the response scale and was used as the criterion for taking one of two decisions on each statement as seen below:

Level 0.1 – 2.4 = Disagree
Level 2.5 – 3.0 = Agree
Thirty-six (37) responses were successfully retrieved. The data was cleaned and prepared before analysis using Google Sheets during which one response was disqualified for analysis bringing the total responses to thirty-seven (37) out of the forty-three (43) questionnaires administered (an 86 per cent response rate).

Data Analysis and Presentation

Section A: Demography of Respondents

	Academic Qualification			
Years of Professional Experience	Ph.D	Masters degree	Bachelors degree	Total
1-5 Years	1	6	8	15
6-10 Years	4	5		9
11-15 Years	5	1	1	7
16-20 Years	3	-	-	3
20 Years and Above	2	-	-	2
Total	**15**	**12**	**9**	**36**

Table 1.0

Table 1.0 presents the demographic distribution of the respondents, cross-tabulating their years of professional experience against their academic qualifications. The analysis encompasses a total sample size of 36 Library and Information Professionals (LIPs).

The data reveals a highly educated demographic, with the vast majority holding postgraduate degrees. Specifically, the qualifications are distributed as follows:

i) 15 respondents hold a Ph.D.

ii) 12 respondents hold a Master's degree

iii) 9 respondents hold a Bachelor's degree

The distribution shows 15 respondents in the 1-5 years bracket, 9 in the 6-10 years bracket, 7 in the 11-15 years bracket, 3 in the 16-20 years bracket, and 2 with 20 years and above.

An examination of the cross-tabulated data reveals a clear structural relationship between academic progression and years of experience:

9. The most junior experience bracket (1-5 years) is predominantly occupied by professionals with Bachelor's (8 respondents) and Master's (6 respondents) degrees, alongside only 1 Ph.D. holder.
10. The mid-career brackets (6-15 years) represent a transitional phase, comprising a mix of Ph.D. (9 respondents), Master's (6 respondents), and Bachelor's (1 respondent) degree holders.
11. The most senior professional brackets (16-20 years, and 20 years and above) are exclusively occupied by Ph.D. holders (5 respondents total).

	Academic Qualification			
Sex	Bachelors degree	Masters degree	Ph.D	Total
Female	4	3	12	19
Male	5	9	3	17
Total	**9**	**12**	**15**	**36**

Table 2.

Table 2 presents the distribution of the respondents based on their gender bringing where 19 from the 36 responses females while 17 from the responses were male.
The demographic data reveals that the respondents are academically highly qualified, indicating they possess the requisite background to effectively evaluate complex, evolving concepts like infopreneurship.

Extent of Adoption of Infopreneurship

Table 3: To what extent have Library and Information Professionals (LIPs) adopted infopreneurship as an income diversification strategy in Nigeria?

S/N	Statement (n=36)	4 (VHE)	3 (HE)	2 (LE)	1 (VLE)	μ	σ	**Decision**
1.	Information consultancy services	8.33%	61.11	25.00%	5.55%	2.72	0;67	Agreed
2.	Research and information-search services.	16.67%	55.56%	22.22%	5.55%	2.83*	0.67	Agreed
3.	Information brokerage services.	-	16.67%	75.00%	8.33%	2.08	0.67	Disagreed
4.	Digital content creation and marketing.	2.78%	19.44%	69.44%	8.33%	2.17	0.67	Disagreed
5.	Paid information literacy/digital literacy training.	2.78%	58.33%	33.33%	5.56%	2.58*	0.67	Agreed
6.	Online information services.	11.11%	41.67%	38.89%	8.33%	2.56*	0.67	Agreed
7.	Database development or management services.	8.33%	22.22%	55.56%	13.88%	2.25	0.67	Disagreed
8.	Data analysis or data-related services.	5.56%	25.00%	53%	16.67%	2.19	0.67	Disagreed
9.	Knowledge management consultancy.	5.56%	52.78%	36.11%	5.56%	2.58*	0.67	Disagreed
10.	Production and sale of information products.	5.56%	19.44%	58.33%	16.66%	2.14	0.67	Disagreed
11.	Digital publishing/e-book production.	8.33%	27.78%	50.00%	13.89%	2.31	0.67	Disagreed
12.	Freelance research and documentation services.	-	25.00%	61.11%	13.89%	2.11	0.67	Disagreed
13.	Social media information services.	8.33%	41.67%	47.22%	2.78%	2.56*	0.67	Agreed
14.	Digital information systems consultancy	2.78%	19.44%	69.44%	8.33%	2.16	0.67	Disagreed

Table 3.

Table 3 presents the responses from Library and Information Professionals (LIPs) regarding the extent to which they have adopted infopreneurship as an income diversification strategy in Nigeria. The mean responses across the 14 evaluated items ranged from 2.08 to 2.83, while the standard deviation was uniform across all items at 0.67. Out of the 14 statements, 6 items recorded mean scores at or above the 2.50 benchmark threshold, while 8 items fell below the benchmark.

Specifically, respondents indicated adoption to a high extent ($\mu \geq 2.50$) in the following areas:

- Research and information-search services (2.83 ± 0.67)
- Information consultancy services (2.72 ± 0.67)
- Paid information literacy/digital literacy training (2.58 ± 0.67)
- Knowledge management consultancy (2.58 ± 0.67)
- Online information services (2.56 ± 0.67)
- Social media information services (2.56 ± 0.67)

Conversely, respondents recorded low adoption levels ($\mu < 2.50$) across technical, data-driven, and commercialized information ventures:

- Digital publishing/e-book production (2.31 ± 0.67)
- Database development or management services (2.25 ± 0.67)
- Data analysis or data-related services (2.19 ± 0.67)
- Digital content creation and marketing (2.17 ± 0.67)
- Digital information systems consultancy (2.16 ± 0.67)
- Production and sale of information products (2.14 ± 0.67)
- Freelance research and documentation services (2.11 ± 0.67)
- Information brokerage services (2.08 ± 0.67)

The data reveals a clear structural difference on how LIPs approach infopreneurship as an income diversification strategy. Professionals readily adopt services mainly focused in traditional library competencies such as literature searching, research support, information consultancy, knowledge management, and user training where existing academic training provides immediate confidence. However, there is a pronounced hesitation toward high-value, and product-based commercial ventures like data analytics, database development, digital publishing, content marketing, and information brokerage. This pattern indicates that while Nigerian LIPs actively recognize infopreneurship as a supplementary income channel, their practice remains largely confined to traditional service extensions rather than fully commercialized, tech-driven information enterprises. Unlocking the full empowerment potential of infopreneurship will therefore require bridging technical skill gaps in data management, digital product design, and business commercialization.

Sustainability of Infopreneural Ventures

Table 4: Level of sustainability of infopreneurial ventures operated by Library and Information Professionals (LIPs) in terms of business survival rate and income stability

S/N	Statement (n=36)	4 (VHE)	3 (HE)	2 (LE)	1 (VLE)	μ	σ	Decision
	Survival Rate							
1.	My infopreneurial venture can continue operating despite challenges such as lack of funds, among others.	8.33%	38.89%	38.89%	13.89%	2.42	0.67	Disagreed
2.	My infopreneurial venture has remained operational despite changes in technology and information markets.	11.11%	36.11%	41.67%	11.11%	2.47	0.67	Disagreed
3.	I have been able to maintain infopreneurial activities consistently in last three years	5.56%	30.56%	55.56%	8.33%	2.33	0.67	Disagreed
4.	My infopreneurial venture has a high likelihood of surviving in the long term.	8.33%	38.89%	44.44%	8.33%	2.47	0.67	Disagreed
	Income Stability							
6.	Infopreneurship generates income consistently.	11.11%	52.78%	27.78%	8.30%	2.67*	0.67	Agreed
7.	Income from my infopreneurship has increased over time.	8.33%	38.89%	38.89%	13.89%	2.42	0.67	Disagreed
8.	Income from infopreneurial ventures is sufficient to cover its operating costs.	5.56%	41.67%	44%	8.33%	2.44	0.67	Disagreed
9.	Re-investing part of the income generated from infopreneurship into the venture for growth and development.	5.56%	41.67%	44%	8.33%	2.44	0.67	Disagreed
10.	Infopreneurship provides a reliable source of additional income.	11.11%	77.78%	8.33%	2.78%	2.97*	0.67	Agreed

Table 4.

Table 4 presents the responses from Library and Information Professionals (LIPs) regarding the level of sustainability of infopreneurial ventures operated by Library and Information Professionals (LIPs) in terms of business survival rate and income stability indicators. The mean responses from 10 items discussed ranged between 2.33 to 2.97 while the standard deviation was equal across all items at 0.67. Two statements from the table mean scores above 2.50 while eight statements recorded mean scores below the required benchmark.

Specifically, respondents indicated to a high level that:
Infopreneurship generates income consistently (2.67)
Infopreneurship provides a reliable source of additional income. (2.97)
Furthermore, the respondents also indicated to a low level that:
My infopreneurial venture can continue operating despite challenges such as lack of funds, among others. (2.42)
My infopreneurial venture has remained operational despite changes in technology and information markets (2.47)
I have been able to maintain infopreneurial activities consistently in last three years (2.33)
My infopreneurial venture has a high likelihood of surviving in the long term (2.47)
Income from my infopreneurship has increased over time. (2.42)
Income from infopreneurial ventures is sufficient to cover its operating costs. (2.44)

The findings indicate that infopreneurial ventures carried out by LIPs are more useful as sources of additional income than as highly sustainable long-term businesses. The respondents recognized that infopreneurship can provide consistent and reliable source of income, but the ventures face difficulties in surviving financial and technological challenges, maintaining continuous operations, increasing income, covering operating costs, and reinvesting earnings for growth. Therefore, the sustainability level of the ventures can be described as relatively low, particularly in terms of business survival, while their contribution to supplementary income appears comparatively stronger.

Conclusion

The study concludes that infopreneurship has considerable potential as a sustainable economic empowerment strategy for Library and Information Science professionals in Nigeria. The findings show that LIPs in Nigeria have adopted infopreneurship mainly through services closely related to their traditional professional competencies, such as research and information-search services, information consultancy, information literacy training, online information services, and knowledge management consultancy. However, adoption remains low in more technology-driven and commercial areas such as data analysis, database development, digital publishing, information brokerage, and digital content creation. The study further concludes that while infopreneurship provides a consistent and reliable source of additional income, its long-term sustainability remains relatively low. Challenges relating to business survival, technological changes; continuity of operations, income growth, operating costs, and reinvestment limit the ability of LIPs to develop sustainable ventures. Hence, repositioning infopreneurship requres stronger digital and entrepreneurial competencies, improved access to funding and institutional support, continuous professional development, and greater commercialization of information products and services. Using these measures, infopreneurship can become a stronger pathway for income diversification,

self-employment, professional relevance, and sustainable economic empowerment among LIS professionals in Nigeria.

Recommendations

i. LIS professionals should improve their digital and entrepreneurial competencies to enable them identify and take advantage of infopreneurial opportunities in the digital economy.
ii. Library schools should strengthen entrepreneurship education by incorporating practical infopreneurship and business-related skills into the curriculum.
iii. Professionals should explore emerging technology-based information businesses, particularly data services, database management, digital publishing, and online content development.

References

Adetayo, Adebowale Jeremy and Hamzat, Saheed Abiola (2021). Infopreneurship and Financial Satisfaction among Library Professionals in Tertiary Institutions in Ede, Osun, Nigeria. Library Philosophy and Practice e-journal. 4749. https://digitalcommons.unl.edu/libphilprac/4749.

Akidi, Juliana Obiageri and Udoh, Inemesit U., (2021). Infopreneurship Skills for Sustainable Development: A Focus on Library and Information Science Students of Selected Federal Universities in Nigeria. Library Philosophy and Practice (e-journal). 6420. https://digitalcommons.unl.edu/libphilprac/6420

Amakiri, D. (2025). Infopreneurship: A Catalyst for Knowledge Economy Development in Nigeria. SIAR-Global Journal of Computer, Information & Library Science, Vol. 1 Issue 1 https: DOI: 10.5281/zenodo.17742517

Aregbesola, A., Van der Walt, T., Owolabi, S., Idiegbeyan-Ose, J., Okocha, F. & Eyiolorunshe, T. (2019). Infopreneurship in a developing country: Opportunities and challenges. IOP Conference Series: Materials Science and Engineering, 640. http://doi:10.1088/1757-899X/640/1/012123

Arowosola, Olutayo; Kashim, Musa; Oyizea, Lamidi Blessimg; Joseph, Ochai; and Hussena, Adam, (2022). Awareness and Relevance of Infopreneurship Among Library and Information Sciences (LIS) Prince Abubakar Audu University, Anyigba, Kogi State Nigeria. Library Philosophy and Practice (e-journal). 7087. https://digitalcommons.unl.edu/libphilprac/7087.

Chux-Nyehe, G.C. and Nwinyokugi, P.N (2020). Infopreneurship: Values and Implications on Employment Sustainability of SMEs in Rivers State Nigeria. International Journal of Research and Innovation in Social Science (IJRISS) |Volume IV, Issue III. www.rsisinternational.org.

Jerry, E.F. and Oyinkepreye, S. (2023). Practice of Infopreneurship by Librarians in Public University Libraries in South-South Nigeria. Evidence Based Library and Information Practice 2023, 18.3. https: DOI: 10.18438/eblip30235.

Kazungu, I. (2021). Infopreneurship as a career option among African university students. Southern Africa Journal of Communication and Information Science, 1, 66. https://journals.nust.ac.zw/index.php/sajcis/article/download/18/14

Koweh Musa E. (2026). ICT Utilisation and Infopreneurship in LIS for Sustainable Solutions to Developmental Challenges. Impact International Journals and Publications, Volume 2, Issue 3, pp. 744-752. https://impactinternatiaonaljournals.com

Nwoka, I.B., Ihejirika, I.C. & Obuah, O.B. (2024). Librarians' Digital Skills and Utilisation of Innovative Technologies for Library Service Delivery in Public University Libraries in Rivers State. Information Managers: A Journal of Nigerian Library Association Rivers State Chapter, 7(1), 19 – 35

Ogbonyomi, M.A. (2024). Exploring Entrepreneurial Opportunities Available to Library and Information Science Graduates for Sustainable National Development. Global Review of Library and Information Science (GRELIS), 20(1), 156 – 164.

Ola, O.S. and Adeyeye, S.V. (2026). Career Development in Librarianship in Nigeria: A Conceptual Review of Issues and Challenges. International Journal of Academic Library and Information Science, Vol. 14(3), pp. 144-150, https://doi.org/10.14662/ijalis2026220.

Oladokun, B.D and Olatokun, W.M. (2026). Integrating Emerging Technologies Into LIS Education in Nigeria: An Educators' Perspective and Framework for Curriculum Reform. Education for Information, Vol. 0(0) 1–25. https: DOI: 10.1177/01678329261452517

Owate, C.N. & Chikezie, H.E. (2024). Assessment of information professionals' digital competence in promoting access to electronic information resources in academic libraries in Rivers State, Nigeria. The Catalyst Journal of Library and Information Literacy, 3(2), 52-67.

Shubho, S.S., Alam, S., Chakraborty, S., Aziz, M.B., Hasan, S., Hasan, S. and Rifaya, A. (2025). Economic Empowerment of Women for Sustainable Social Development. International Journal of Social Sciences and Management Review Volume: 08, Issue: 01. https://doi.org/10.37602/IJSSMR.2025.8115