

Technovation Access Tools and Information Resources Accessibility in Libraries

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ARTICLE INFO	ABSTRACT
Received: 26 Sept 2025	This study examined the role of technovation access tools in information resources accessibility in libraries. The 21st century has ushered in a drastic shift in information resources accessibility, driven largely by the deployment of technovation access tools. This study discussed types of technovation access tools like digital learning platforms, Internet of Things (IoT), and Mixed Reality Tools. The study further outlined the roles of technovation access tools in enhancing information resources accessibility to include improving efficiency and accuracy, fostering collaborations through digital platforms and Natural Language Processing (NLP) for discovering insights, among many others. Enhanced search/retrieval capabilities, personalized information retrieval and strategic utilization of each of these tools through automation and knowledge management were highlighted as the advancements in information accessibility. The challenges of technovation access tools noted in the study include digital divide and accessibility inequality, privacy and security concerns, among others. Some of the ways to mitigate these challenges of was the recommendation amongst others that Government and library administrators should invest in information literacy training programmes to enhance access to information, particularly in underserved regions. The study concluded that technovation access tools have revolutionized information in the 21st century, transforming how information resources are accessed, analyzed, and utilized as well as the simplification of complex data retrieval processes, thereby driving advancements in the Library and Information Science field. Keywords: Technovation Access Tools, Information Resources Accessibility, Libraries, Internet of Things
Revised: 01 Nov 2025	
Accepted: 10 Nov 2025	

Introduction

“Technovation” is a phrase coined from the term “technology innovation,” which refers to the use of innovative technologies. Technovation access tools are blended technology solutions that provide enhanced access to systems, environments, or services in an intelligent, efficient, and user-centric ways. This term may often refer to tools or systems that leverage cutting-edge technologies to improve how users gain access to resources by integrating innovation, security, and usability, whether digitally, physically, or both. Innovation technology access tools refer to platforms, systems, or methodologies that facilitate the efficient and equitable access to advanced technologies, breaking down barriers such as cost, geography and expertise.

These access tools are designed to democratize technology usage, providing users, especially from marginalised or underserved communities with the resources they need to leverage new technological advancements in the Library and Information Science field. By integrating emerging technologies like AI, cloud computing, and IoT, innovative technology access tools foster innovation, collaboration, and sustainable development in libraries when equitably accessed. Technovation access

tools can be understood as a system, platform, or tool that integrates innovative technologies to enhance access to information resources. Libraries are therefore providing access to web-based Online Public Access Catalogue (OPAC) interfaces to enhance and make it easier for users to access and use information resources.

Technovation access tools focus on utilizing advanced technologies to improve access to digital resources, services, and information, especially for marginalised or underserved populations (Prasastiningtyas *et al.*, 2024). These access tools integrate innovative solutions to address barriers such as physical disabilities, lack of infrastructure, and digital illiteracy. By leveraging modern technologies in libraries, such tools aim to make information and services accessible to all users, regardless of their geographic location, socio-economic status, or physical impairments.

Technovation access tools are mechanisms or platforms designed to enhance the accessibility and integration of innovative technologies across various sectors. As quoted by Hussain (2019), innovative technology access tools are designed to improve user access to information resources and services through a combination of cutting-edge technologies, adaptable user interfaces, and affordable access solutions. These tools can target various user groups, from individuals with disabilities to vulnerable populations, ensuring a more inclusive digital library system. It can be noted that in the field of Library and Information Science (LIS), students most often do not seem to gain much experience in utilizing these tools as taught them by para-professional librarians whom they see often. Therefore, without guidance in the use of these access tools from professionals, their hopes are dashed as they know their career as well as professional development will be shattered (Obot, 2021).

These tools, which include advanced search engines, AI-powered platforms, big data analytics, and mobile applications, have become essential for navigating the vast expanse of information resources available in the digital age. According to Bassey, Umoh & Umofia (2024), in the 21st century, technological advancements have significantly transformed various sectors. The convergence of technology and innovation in the creation of these tools has not only enhanced information accessibility but has also reshaped how we learn, make decisions, and engage globally (Parveen & Ramzan, 2024). As the need for real-time and accurate information intensifies, technovation access tools are at the forefront, revolutionizing how information is sought, processed, and utilized (Umoh & Umanah, 2024).

The key benefit of these tools are their ability to simplify the retrieval of complex data. By utilising AI algorithms, machine learning, and predictive analytics, these tools can filter, categorise, and prioritise information, providing library users with precise results in seconds (Ejjama, 2021). This is particularly crucial in fields like healthcare, education, and business, where timely access to critical data can significantly impact outcomes. For example, tools like PubMed in the healthcare sector and Google Scholar in academia have drastically reduced the time it takes for professionals and researchers to find credible information as technovation access tools have facilitated the accessibility of such information resources.

Despite their promising potential, the use of technovation access tools in information resources accessibility is not without challenges. Issues such as digital inequality, concerns over data privacy, lack of technological literacy, disability accessibility, data privacy and security, culture and language barrier, lack of technological infrastructure, ethical concerns, maintenance and regular updates, sustainability of technovation efforts and the prevalence of misinformation have emerged as significant obstacles to their full potential. However, the effectiveness of these tools is often reliant on users' digital literacy and access to the necessary infrastructure (Sanders & Scanlon, 2021). As a result, regions with limited access to advanced technologies or insufficient educational support remain underserved, thereby widening the digital divide.

Technovation access tools have played a pivotal role in facilitating global collaboration and knowledge sharing. These tools have enabled researchers, businesses, and policymakers to share insights, foster innovation, and address complex challenges on an unprecedented scale. Platforms like ResearchGate and Academia.edu have amplified collaborative research efforts, while tools like Tableau and Power BI have revolutionised data visualisation and decision-making. Such collaborative power highlights the essential role of these tools in driving innovation and solving societal issues.

However, these advancements must be approached with caution to mitigate associated risks. Over-reliance on algorithm-driven tools can perpetuate biases embedded in data, and the commercialization strategies of many platforms may undermine user trust. Tackling these challenges requires robust policy frameworks, ethical considerations, and ongoing innovation to ensure that technovation access tools remain inclusive and transparent in information resources access (Al-kfairy *et al.*, 2024). Thus, a balanced approach between innovation and regulation is very crucial to fully unlock the potential of these access tools.

Technovation access tools are a double-edged sword in the realm of information accessibility. Their potential is vast, from improving accessibility to fostering global collaboration. However, the challenges they present require proactive solutions to avoid exacerbating inequalities and compromising data integrity. This paper critically explores the roles, challenges and advancements in technovation access tools for increased information resources accessibility, offering in-depth analysis of their impact and future possibilities.

Concept of Information Resources Accessibility

Information resources accessibility refers to the extent to which resources can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (Olise, 2018). In other words, accessibility is the ability to access the functionality and potential benefit of the library system. According to Akwang, Udoh and Obot (2024), every library user has the right to access information regardless of age, time and location. Therefore the onus lies on librarians to enhance timely accessibility of information resources for every library user through technovation access tools.

According to Phiri (2024), information discovery involves extracting meaningful patterns, trends, and insights. This process enables informed decision-making and fosters innovation across various domains, including Library and Information Science. Computer proficiency is required to enable the requisite skills to perform various tasks thereby accessing relevant, current and timely information online. This includes the ability to navigate online environment and retrieve relevant information which is the hallmark of electronic information resources (Umoh, 2018).

Sweeney (2020) stated that information accessibility refers to the process of identifying datasets. This process encompasses various techniques and technologies that enable users or systems to explore and analyse data to uncover hidden patterns, relationships, and insights that are essential for decision-making. Retrieving and extracting valuable, relevant, and actionable information from vast and diverse knowledge accessibility encompasses a comprehensive process and approach involving the creation, discovery, capture, organisation, refinement, presentation, and provision of data, information, and knowledge with a specific goal in mind. E-resources are those information materials in the library that can only be accessed electronically, with the use of technovation access tools.

Information accessibility follows the religious application of technovation access tools for extracting valuable, actionable knowledge from large datasets using techniques from data mining, machine learning, and artificial intelligence (AI) which involves identifying hidden patterns, trends, and correlations within both structured and unstructured data. Advancements in AI, particularly deep learning and natural language processing (NLP), have significantly enhanced the ability to process and interpret complex data, such as text, images, and videos. Information accessibility is a process through which users retrieve valuable knowledge from large and complex data sets using various data analysis and exploration techniques.

Types of Technovation Access Tools and their Strategic Use for Information Accessibility

Innovative technology access tools enable users to bridge gaps in education, healthcare, industry, communication and the library. As highlighted by Aduba, Obot, & Baro (2022) Information literacy (e.g innovative technology tools) allows us to cope by giving us the skills to know when we need

information and where to locate it effectively and efficiently. These tools, leverage advancements in ICT, AI, blockchain, IoT, and mixed reality, provide efficient, secure, and inclusive solutions. In-depth exploration of various types of innovative technology access tools and how they aid accessibility are discussed below.

Digital Learning Platforms: Digital learning platforms like Google Classroom, Moodle, and Edmodo have transformed education, enabling institutions to deliver online and hybrid learning experiences. These tools provide features such as real-time assessments, interactive discussions, and multimedia integration, which cater to diverse learners. Studies by Olufunke (2020) reveal that platforms like Google Classroom, particularly in low-resource settings, have helped bridge access gaps in tertiary education. Additionally, these platforms support collaborative learning environments by integrating tools like video conferencing, automated grading systems, and personalised learning paths.

Digital Learning Platforms (DLPs) have become pivotal as innovative technology access tools, enabling efficient information accessibility in the library. These platforms leverage advanced technologies, such as artificial intelligence and adaptive learning, to personalize content delivery and cater to diverse learner needs. By offering vast repositories of digital resources, interactive assessments, and collaborative tools, DLPs enhance engagement and knowledge acquisition. Moreover, their accessibility via mobile devices and cloud computing bridges geographical and socio-economic gaps, fostering inclusivity. The strategic use of DLPs not only facilitates lifelong learning but also empowers users with skills for the digital age. According to Xu and Yang (2020), such platforms drive innovation in education, making information accessibility, more dynamic and contextually relevant.

Internet of Things (IoT) Applications: IoT tools connect devices to streamline industrial operations, healthcare monitoring, and smart home and library systems. IoT sensors in libraries track machinery performance, enabling predictive maintenance. IoT's potential in real-time library user decisions, enable precision information resources location which in turn facilitate accessibility. Similarly, IoT-enabled smart libraries automate energy use, security, and lighting, providing user convenience and reducing operational costs, making it indispensable in automation and healthcare. Information technologies change rapidly with evolving technological innovations and the variety and abundance of information resources that is becoming available and should be made accessible to information users (Obot and Umoh, 2021).

The Internet of Things (IoT) has revolutionized multiple industries by enabling interconnected devices to collect, share, and analyze data seamlessly. IoT applications enhance efficiency, innovation, and decision-making by library users. These systems utilize sensors, cloud computing, and artificial intelligence to deliver real-time insights, optimize information resources usage, and predict future trends in libraries. Strategically, IoT fosters automation, reducing human intervention while increasing precision and scalability. Therefore, Jayaraman and Al-Turjman (2020), IoT applications are critical to the digital transformation journey, driving smarter solutions and fostering sustainable practices globally.

Mixed Reality (MR) Tools: Mixed reality combines Augmented Reality (AR) and Virtual Reality (VR) to create immersive experiences in library user education to facilitate information resources accessibility. Therefore Bassey, & Owushi (2023) are of the view that a wide range of human talents, including reasoning, reading, speaking, grasping, remembering, making judgements, and taking part in interactive learning which in turn enhance accessibility, can be improved by access to viable technology innovation tools. MR tools redefine access to virtual environments, blending the physical and digital worlds seamlessly.

Mixed Reality (MR) tools, blending physical and virtual environments, are revolutionizing how users interact with digital content. These tools leverage technologies like Augmented Reality (AR) and Virtual reality (VR) to create immersive experiences for education, healthcare, entertainment, and

industry. MR enable users to visualize complex data, simulate scenarios, and enhance collaboration in ways traditional methods cannot achieve. By providing real-time, interactive feedback, MR tools drive engagement and innovation. According to El Sayed *et al.*, (2021), MR applications are pivotal in fostering experiential learning and enhancing decision-making for information resources accessibility, making them indispensable in modern day libraries.

Technovation Access Tools in Information Resources Accessibility

The rapid growth of digital technologies and innovative access tools in the 21st century has transformed how individuals and organizations access information resources. Technovation access tools such as big data analytics, artificial intelligence (AI), machine learning (ML), digital platforms, and social media analytics have revolutionized information discovery, making it more efficient, scalable, and impactful. Below is an extensive discussion of their roles in information resources accessibility.

Improving Efficiency and Accuracy in Information Resources Accessibility: Technovation tools, particularly AI and ML algorithms, improve the efficiency and accuracy of information resources accessibility. Algorithms are capable of processing vast datasets, recognizing patterns, and delivering tailored insights in real time. For instance, big data tools and Natural Language Processing (NLP) enable researchers to extract relevant data points quickly, reducing manual search and eliminating human error. Geissinger *et al.* (2023) emphasize that tools like social big data analytics can transcend traditional boundaries in data discovery, offering creative and meaningful ways to process and extract value from large datasets.

Enhancing Collaboration through Digital Platforms: Technovation access tools facilitate collaborative platforms where researchers, organisations and stakeholders can collectively contribute and access valuable information. Platforms like cloud computing, blockchain and crowdsourcing technologies act as enablers for information sharing and co-creation of knowledge. For instance, Bonazzi *et al.* (2024) explore how tools like crowdsourcing could be employed in libraries to help efficiently mine, identify and access strategic insights by leveraging collective intelligence.

Natural Language Processing (NLP) for Accessibility: NLP-based access tools allow libraries to analyse and process human language data and unlocking valuable insights. These tools automate the categorization of large textual datasets, improving the speed of discovery for research and decision-making purposes. Just (2024) explains how NLP is used as a strategic innovation access tool to search, analyse, and access information resources.

Enabling Predictive Analytics and Innovation Management: Predictive analytics, supported by AI and ML algorithms, allows for better trend identification, forecasting, and resource allocation for timely accessibility in libraries. These tools empower libraries to stay ahead of competitors in other information providing agencies by uncovering new opportunities and predicting changes. According to Mortati *et al.* (2023), data-driven tools provide librarians with insights that blend big and "thick" data, enabling innovative solutions that foster informed decision-making for information resources accessibility.

Accelerated Information Resources Accessibility through AI: Artificial intelligence and automation tools are pivotal for accelerating information resources accessibility because AI-driven systems analyze complex relationships within large datasets, identify hidden trends, and offer evidence-based insights. Ren & Zhao (2021) stated that knowledge networks, powered by AI, enable library users construct, evaluate, and search for new technological opportunities efficiently.

Advancements in Technovation Access Tools for Information Resources Accessibility

Enhanced Search and Retrieval Capabilities: One of the most significant advancements driven by technovation access tools is the improvement of search and retrieval systems as traditional search engines often rely heavily on keyword matching, which can limit the relevance of search results. Modern systems, powered by AI and NLP, go beyond simple keyword-based search, allowing for more nuanced and contextual retrieval of information. For example, tools like Google Search and Microsoft Bing use AI algorithms to understand the intent behind user queries and return results that are contextually relevant, even when the exact query terms are not matched.

Personalized Information Accessibility: The growing use of AI and ML in information retrieval has led to a significant increase in the personalization of search results. Tools such as recommendation systems used by platforms like Netflix, YouTube, and Amazon rely on algorithms that analyse user behaviour, preferences, and past interactions to tailor information and content. In the context of information resources accessibility, these tools help individuals and libraries find relevant data based on their unique needs and interests. This personalisation is particularly important in medical libraries where referrals could be given for personalised medicine and treatments which rely on relevant and timely information (Rogowski *et al*, 2015).

Automation of Data Organisation and Knowledge Management:

Technovation access tools are also transforming how information is organised and managed. With the ever-growing volumes of data being generated across industries, managing and extracting value from this data has become a key challenge. AI-driven tools, such as IBM Watson and Google Cloud AI, enable the automation of data classification, tagging, and summarization. These tools help organise vast repositories of unstructured data into manageable formats, improving both searchability and accessibility.

Integration across Platforms and Sources:

The integration of data across multiple platforms and sources is another area where technovation access tools show significant promise. Tools like federated search systems enable users to search across a variety of databases and information systems simultaneously, delivering a more comprehensive set of results (Hyland, 2024). For example, platforms like Elsevier's Scopus or Google Scholar offer integrated search functionality that pulls data from a broad range of academic journals, articles, and research papers, thus enhancing accessibility for patrons. These access tools help users access information resources.

Data Mining and Visualization Tools:

The role of data mining techniques have enhanced information resources accessibility, particularly in handling vast amounts of unstructured data, such as texts, images, and videos. Visual analytics tools enable better interaction with the data, allowing users to identify trends, patterns, and insights more effectively.

Challenges associated with using Technovation Access Tools

Digital Divide and Accessibility Inequality: A primary challenge is the persistent digital divide which affects access to innovative technologies. Many individuals, particularly in developing countries or rural areas, lack the infrastructure or resources (such as high-speed internet and modern devices) to benefit from technovation access tools. This inequality is particularly evident in educational, healthcare, and employment contexts, where technology-mediated services often fail to reach marginalized communities (Bandyopadhyay & Kundu, 2022).

Privacy and Security Concerns:

According to Miao & Wu (2023) the integration of AI and digital technologies in access tools raises significant concerns regarding the privacy and security of users' personal data. With increasing data breaches and misuse of sensitive information, users remain apprehensive about adopting tools that require personal data, such as health records or financial details. Technovation access tools often fail to meet the rigorous privacy standards necessary to assure users that their information is secure.

Interoperability Issues: Interoperability, or the ability of different systems and devices to work together seamlessly, remains a significant challenge in the utilization of these technovation access tools. This issue is especially critical in the library, where access tools need to integrate with systems. Therefore, lack of standardization and synchronization between various platforms leads to inefficiency and frustration for both users and librarians who are the service providers (Thompson & Green, 2021).

Lack of User-Centric Design:

Gomez & Padilla (2020) stated that many technovation access tools are not designed with the end user in mind, resulting in poor accessibility and usability. Particularly, individuals with disabilities or those from non-technical backgrounds may find these tools difficult to navigate. User-centric design, which takes into account the diverse needs of the user base, is often overlooked in the development process.

High Cost of Implementation:

The cost of implementing technovation access tools is another barrier, particularly in libraries in third world countries. The development, deployment, and maintenance of advanced technologies such as AI and machine learning tools often require significant financial investment, making them difficult for many libraries to afford (Singh & Zhang, 2022).

Ethical Issues and Algorithmic Biases: As AI-driven access tools become more prevalent, concerns about algorithmic biases and unethical decision-making have surfaced. These tools often reflect the biases inherent in their training data, which can lead to discriminatory outcomes, especially for vulnerable groups. For instance, AI tools used in recruitment or healthcare might favor certain demographics over others, exacerbating existing inequalities (Khan & Sharma, 2024).

How to Mitigate the Challenges of Technovation Access Tools

Government should play a pivotal role in addressing the digital divide. Public policies that promote digital equity through subsidies, tax incentives for digital libraries, and public-private partnerships can create a library ambience that supports equitable access to technology. International collaboration for global digital library access programs can help in reducing disparities between developed and developing countries (Singh & Ghosh 2024).

Government and regulatory bodies play a key role in mitigating privacy and security concerns by enacting comprehensive data protection laws (Lin & Zhang 2021). These laws should mandate transparency regarding data collection, processing, and sharing practices, and should enforce strict penalties for non-compliance. Enforcing and implementing such laws will help ensure that user data is protected and relevant and accurate accessibility of information resources across borders is assured.

Collaboration between organizations, industries, and stakeholders is essential for mitigating interoperability challenges. Through industry consortia, alliances, and collaborative efforts, libraries can work together to set common standards, resolve compatibility issues, and drive innovation in ways that benefit users (Morris & Clark, 2023).

Incorporating user feedback into the design process is the foundation of user-centric design to ensure active and continuous feedback from the target users throughout the development process (Cooper & Turner, 2021). Engaging users early and often, through methods like surveys, usability testing and user interviews, ensures that technology is aligned with user needs and preferences. Interactive design cycles that incorporate user input help refine tools to meet user expectations to ensure information resources accessibility.

Open-source software is a cost-effective alternative to proprietary solutions, enabling libraries to utilize high-quality access tools without the associated licensing fees to enhance information resources accessibility. Open-source communities often provide robust support, and libraries can modify the software to meet their specific needs. By adopting open-source technologies, organizations can significantly reduce initial and ongoing costs (Patel & Johnson 2022).

One of the primary sources of algorithmic bias is unrepresentative or biased data. To mitigate this, libraries should prioritize the use of diverse and inclusive datasets that reflect the real-world variety of users. This includes ensuring that data is representative of different genders, ethnicities, socioeconomic backgrounds, and other critical demographic factors. Training algorithms on such balanced datasets reduces the risk of biased predictions or outcomes or biased interpretations of the information resources accessed through (Binns & Williams 2021). Policymakers must therefore develop and enforce robust data privacy laws and ethical guidelines to address concerns surrounding user data and algorithmic bias. This will promote trust and transparency in the use of technovation access tools for information resources accessibility in libraries.

Government and library administrators should invest in training programs to improve digital literacy and access to technological infrastructure. This will help bridge the digital divide and ensure equitable use of technovation access tools for information resources accessibility.

Stakeholders in academia, libraries, and technology should collaborate to design technovation access tools that are user-friendly, inclusive, and tailored to specific user needs. Encouraging innovation through funding and research will expand the capabilities of these tools for more effective information resources accessibility.

Conclusion

Technovation access tools have revolutionized information resources accessibility in the 21st century libraries, transforming how knowledge is accessed, analysed, and utilised. These tools simplify complex data retrieval, driving significant advancements in the Library and Information Science field. However, challenges like digital inequality, misinformation, and data privacy concerns persist. Despite these obstacles, technovation access tools foster global collaboration and innovation, offering immense potential to address societal challenges. Striking a balance between innovation and regulation is essential to ensure inclusivity and transparency in libraries. Ultimately, these tools represent a transformative force in information resources accessibility, with the power to redefine global connectivity.

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