



Integrating Innovation Labs in Libraries: Fostering Creativity and Entrepreneurship

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Abstract

Libraries are becoming hubs for creativity, innovation, and entrepreneurship as they expand beyond their conventional functions. The development of innovation labs, special areas that offer access to state-of-the-art equipment, collaborative settings, and support for entrepreneurs, within libraries is examined in this paper. By providing tools like digital video creation, coding workstations, 3D printing, and business incubation services, these labs allow users to explore, prototype, and create new ideas. By encouraging interdisciplinary cooperation and granting fair access to innovative resources, libraries are emerging as important catalysts for skill development, economic empowerment, and digital literacy. The effect of library-based innovation labs on community involvement, workforce preparedness, and entrepreneurial activity is explored in this paper through an analysis of best practices and case studies. While offering solutions for successful execution, it also discusses important issues including financing, employee training, sustainability, and technology developments. The paper highlights the transformative potential of innovation labs in positioning libraries as inclusive spaces for knowledge creation and socio-economic development. Hence, integrating these labs into their services, libraries can strengthen their roles as catalysts for lifelong learning and innovation in the digital era.

Keywords

Innovation Labs, Creativity, Entrepreneurship, Libraries

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Introduction

Libraries have long been recognized as centers of knowledge with quiet reading rooms and facilities for community engagement. However, with rapid technological advancement, there is a pressing need for transformation and the establishment of adaptable and long-lasting solutions. In today's digital era, libraries have evolved beyond mere repositories of books to become hubs of creativity, innovation, and entrepreneurship. A key transformation within modern libraries is the emergence of innovative labs - dedicated spaces designed to provide access to advanced technologies and resources that support learning, creativity, and entrepreneurship (Snyder, 2018). These labs offer cutting-edge tools, mentorship

opportunities, and collaborative environments that empower individuals to develop and actualize their ideas. By providing resources that may otherwise be inaccessible, they function as incubators for problem-solving and exploration. In the current global economy, innovation is increasingly critical for organizational sustainability and growth.

Maker spaces, often referred to as innovation labs, are areas within libraries equipped with tools such as 3D printers, laser cutters, coding workstations, and digital media production equipment. These facilities enable users to engage in a wide range of activities including prototyping, digital storytelling, product development, and artistic expression. For instance, the Saint Paul Public Library's

Innovation Lab offers a free creative space with amenities like a recording studio pod and upgraded 3D printers, supporting artists and entrepreneurs (Saint Paul Public Library 2024). The establishment of maker spaces has proven effective in enhancing community engagement, supporting workforce development, and stimulating entrepreneurial ventures. In Nigeria, the Anambra State Maker space, co-located with the Kenneth Dike Library, serves as a model of integrating innovation hubs within traditional libraries to promote research, development, and commercialization of ideas (Agim et al., 2024; UN Development Programme Nigeria, 2024). Academic libraries are also increasingly adopting these innovation-oriented spaces. For example, the University of Kansas Libraries' Maker space supports interdisciplinary projects in engineering, theater, and environmental studies. In South Africa, the introduction of technology-focused maker spaces in academic libraries has provided collaborative environments for students and researchers to work on projects and explore emerging technologies (Masenya, 2023). Assessments of such initiatives indicate that innovation hubs uphold the fundamental mission of libraries by fostering inclusivity, lifelong learning, and community service. These spaces have also shifted public perceptions of libraries, attracted diverse user groups, and expanded the use of library services (Koh et al., 2024).

Conceptualization and Purpose of Innovative Labs within Libraries

A library innovation lab is a space equipped with resources like computers, 3D printers, media editing tools, and crafting supplies, enabling patrons to create both intellectual and physical materials (Dewa, 2020). These labs are defined not only by their tools but by the opportunities they offer for hands-on learning and collaboration. Burk (2015) describes an innovation hub as a library area where users can design, build, and create using various tools and materials. These

spaces, whether dedicated rooms or multipurpose areas, support a wide range of projects from 3D printing and robotics to recycled art. According to Dewa (2020), such hubs encourage students to experiment beyond the classroom, reinforcing course learning through creative exploration.

Innovation labs aim to democratize access to technology and promote lifelong learning. By offering free or low-cost access to advanced tools, they empower users to develop skills, engage in creative projects, and collaboration. These labs act as community incubators for ideas, supporting entrepreneurship, education, and workforce development. For instance, the Innovation Lab at the Anchorage Public Library provides adult learners with access to technology, workshops, and job skill resources in an inclusive environment (Anchorage Public Library, n.d.). Similarly, the Library Living Lab in Barcelona engages users in co-creating and prototyping new tools and services, positioning libraries as drivers of social innovation (Barcelona Library Living Lab, 2018). In academic settings like Utah State University, Innovation Hubs support research and learning with a focus on collaboration, inclusion, and access to emerging technologies (Utah State University Libraries, n.d.). In summary, library innovation labs are essential spaces fostering access to technology, skill-building, and collaborative innovation, reflecting the modern library's evolving role.

Key Technologies and Resources in Library Innovation lab

Library innovation labs are designed to bridge the gap between information access and hands-on creativity. These labs use technology and resources to foster innovation, entrepreneurship, and workforce development.

Digital Video Creation and Multimedia Production

Digital video creation and multimedia production have become vital features of

modern library innovation labs, transforming libraries into dynamic spaces where users can create, communicate, and innovate. In the view of Amanda (2014), digital video creation involves the use of DSLR cameras, smartphones, and camcorders, while multimedia production includes video editing, podcasting, animation, and mixed media. Innovation labs are typically equipped with microphones, green screens, lighting, and professional software like Adobe Premiere Pro, Final Cut Pro, and Audacity, allowing users to produce content for platforms such as YouTube and social media. This integration supports digital literacy, enabling users to learn storyboarding, scripting, and editing, while also fostering entrepreneurship. Startups and freelancers can produce digital ads and portfolios, using library resources to minimize costs. Additionally, educational uses include video essays and multimedia research projects.

In Nigeria, the Herbert Macaulay Library in Yaba, Lagos, revitalized through a GTBank and Co-Creation Hub (CcHub) partnership, offers multimedia tools for creating podcasts and promotional videos, contributing to the local creative economy (TechCabal, 2018). Internationally, the Toronto Public Library's Digital Innovation Hub offers similar resources, democratizing media creation (Toronto Public Library, n.d.). Snyder (2018) emphasizes how such labs empower users by providing access to professional tools. According to Okwoli (2023), digital content creation in libraries promotes communication, self-expression, and entrepreneurship.

Coding Workstations and Software Development Platforms

Coding workstations and development platforms are pivotal in transforming libraries into tech-driven innovation hubs. These setups usually include high-performance computers with robust processors and graphic capabilities, essential for software engineering and computational tasks

(Colegrove, 2013). Libraries often offer IDEs such as Visual Studio Code, PyCharm, Eclipse, and access to platforms like GitHub for collaborative software development (Slatter & Howard, 2013). These resources help build digital competencies in programming languages like Python, Java, and JavaScript (Willett, 2018), and enable exploration of AI, machine learning, and block chain technology. Libraries also support project-based learning, allowing users to create apps, websites, and hardware-software prototypes using tools like Arduino and Raspberry Pi (Bagley & Rudd, 2021). Programs like boot camps and hackathons encourage innovation and collaborative learning. Entrepreneurs can use these resources to build tech startups or freelance, transforming libraries into low-cost incubators (Moorefield-Lang, 2015). The American Corner Lagos Innovation Hub offers coding classes and digital skills training that feed into Nigeria's tech ecosystem (American Spaces Nigeria, 2022). Globally, Chicago Public Library's YOUmedia Lab provides students with coding tools and mentorship in app design and game development (Chicago Public Library, 2021). According to Burke (2014), coding in libraries shifts users from passive consumers to active creators, while Mersand (2020) sees it as a means of empowering communities through problem-solving and innovation.

3D Printing, Prototyping, and Fabrication Tools

3D printing and fabrication tools are transforming libraries into maker spaces that support creativity, problem-solving, and economic development. These tools allow users to turn digital ideas into physical objects, using 3D printers like the Ender 3, Ultimaker S5, and MakerBot Replicator+ (Colegrove, 2017). Computer Aided Design (CAD) software such as Tinkercad, Fusion 360, and SolidWorks enables users to design models for printing with materials like Polylactic Acid (PLA) and Acrylonitrile Butadiene Styrene (ABS). Libraries also offer

laser cutters, computer numerical control (CNC) routers, and vinyl cutters for prototyping, along with hand tools for assembling mechanical and electronic components (Moorefield-Lang, 2015). Fabrication tools, including sewing machines and soldering kits, expand the creative possibilities. These tools support science, technology, engineering and mathematics (STEM) education by enabling practical applications of theoretical concepts, and they encourage entrepreneurship by allowing low-cost prototype development. Community engagement is enhanced as access is often free or low-cost.

In Nigeria, the American Corner Innovation Hub in Lagos provides access to 3D printing and design workshops for youth and entrepreneurs (American Spaces Nigeria, 2022). The Herbert Macaulay Library is also integrating maker tools through CcHub to stimulate innovation. Internationally, the Fayetteville Free Library's Fab Lab provides public access to 3D printing and fabrication, supporting diverse creative and technical projects. Scholars like Blikstein (2018) advocate for "democratized innovation" through accessible fabrication tools in public spaces. Moorefield-Lang (2015) notes that such resources prepare users for careers in design, engineering, and manufacturing. Overall, 3D printing and prototyping empower users to build tangible products, enhance STEM education, and contribute to local economic growth.

Importance of these labs in fostering creativity, entrepreneurship, and workforce development

Innovation labs within libraries play a pivotal role in fostering creativity, entrepreneurship, and workforce development. By offering access to cutting-edge tools and a collaborative environment, these labs empower individuals to explore ideas, develop essential skills, and bring innovative concepts to life. Hands-on learning is at the heart of these spaces, stimulating creativity

and practical problem-solving. Equipped with resources such as 3D printers, digital media production tools, and coding workstations, library innovation labs enable users to prototype and test ideas in real time. Inventionland Education (2024) emphasizes that these labs cultivate an atmosphere of creativity where users can experiment freely with emerging technologies and stretch the boundaries of their imagination.

A prominent example is the American Corner Innovation Hub in Lagos, which provides services such as 3D printing, coding classes, tech boot camps, startup incubation, and digital literacy programs. Thousands of young Nigerians have benefited from these free resources, resulting in the emergence of several tech startups. Such initiatives help participants develop skills in design thinking, critical analysis, and creative expression—all essential ingredients for innovation in the modern world. In addition to creativity, innovation labs serve as vital platforms for entrepreneurship. Nweke, Yakuband and Ayefu (2022) assert that libraries are instrumental in promoting entrepreneurial culture, and in an increasingly globalized world, their importance continues to grow. These labs are not merely physical spaces filled with equipment; they are transformative centers that nurture a culture of innovation and empowerment. Santarsiero, Schiuma and Carlucci (2020) argue that innovation labs act as catalysts for transformation, equipping individuals with the confidence and tools to build solutions and start ventures. Libraries, by offering affordable and often free access to expensive technologies and workspaces, have become central to supporting grassroots entrepreneurship. For instance, the Innovation Lab at the Anchorage Public Library offers tools and training that support aspiring entrepreneurs in turning ideas into viable businesses. The services provided encompass assistance with prototype development, formulation of digital marketing strategies, and comprehensive

business planning, all of which constitute critical components for the growth and sustainability of startups and small enterprises (Anchorage Public Library n.d). These labs also host workshops and networking events that connect entrepreneurs with mentors and collaborators, strengthening local innovation ecosystems.

In Nigeria, the Yaba Library Maker space, in collaboration with CcHub, illustrates the impact of public-private partnerships in fostering tech innovation. Their programs include coding for kids, digital skills training for adults, and community innovation events. The Maker space has significantly contributed to the development of “Yabacon Valley,” a thriving tech community that nurtures young entrepreneurs and supports the digital economy. Workforce development is another area where innovation labs are making a profound impact. These labs provide hands-on training in high-demand areas such as digital literacy, coding, 3D design, and media production, equipping users for 21st-century careers. The Barcelona Library Living Lab (2018) exemplifies this approach by helping users gain practical experience with advanced technologies in real-world settings. By providing these opportunities in accessible public spaces, libraries help bridge the skills gap and ensure that people of all ages can adapt to an evolving job market. The Library Innovation Hub at Kenneth Dike Library, University of Ibadan, also stands out in this regard. Focused on academic and technological innovation, it supports students through research assistance, coding tutorials, and business ideation workshops. The goal is to close the gap between academic research and industry needs, enabling students to convert academic insights into solutions that support workforce development and entrepreneurship. In summary, innovation labs within libraries are more than just tech-equipped spaces; they are dynamic, inclusive hubs of transformation. By fostering creativity, supporting entrepreneurship, and

preparing individuals for the future of work, these labs position libraries as essential contributors to community development and economic resilience.

Challenges of Innovation Labs in libraries

Innovation labs in libraries have unlocked new opportunities for creativity, learning, and entrepreneurship. However, their sustainability, effectiveness, and accessibility are hindered by technical and institutional challenges. Addressing these issues is crucial for scaling these initiatives. One of the primary obstacles is the high cost of acquiring and maintaining advanced equipment such as 3D printers, laser cutters, and CNC machines. These tools are expensive not only to purchase but also to repair, calibrate, and maintain (Ford, 2018). Given that libraries often operate on limited budgets, allocating resources for these technologies can be difficult, especially when core services like book lending are still a priority.

Another major issue is the need for specialized staff skills. Innovation labs demand staff that is proficient in digital fabrication, coding, electronics, and project-based learning, in addition to traditional library expertise. Finding and retaining such hybrid professionals can be a challenge, and continuous professional development is often necessary to keep pace with rapid technological advancements (Moonasar 2021). Furthermore, user training and accessibility are crucial. Many library patrons may lack prior experience with technologies like CAD software, 3D printers, or soldering stations. Without structured training programs or mentoring, users may feel intimidated or misuse the equipment. This digital divide also means that those with prior technical exposure or higher education backgrounds are more likely to benefit from the labs (Moorefield-Lang, 2015).

Safety and equipment misuse are additional concerns. Maker space tools, if not properly handled, can be hazardous. For instance, laser

cutters pose fire risks, and soldering irons can cause burns. Libraries must create detailed usage policies, conduct mandatory safety orientations, and secure liability protections, which can be both time-consuming and legally complex (Britton, 2012). There are also concerns regarding the alignment of innovation labs with the library's traditional mission. Some stakeholders question whether activities such as coding workshops or product prototyping align with libraries' roles as custodians of knowledge and literacy (Larson, 2019). Balancing the core mission of information access with new technological roles requires strategic vision and community engagement. Sustainability remains a significant challenge. Libraries often rely on grants or special funding to launch innovation labs, but maintaining operations beyond the initial funding period is difficult without steady revenue models or new funding sources (Bagley & Rudd, 2021). This creates a gap between the initial enthusiasm for such programs and their long-term viability. In conclusion, while innovation labs present exciting opportunities, they face considerable challenges related to funding, staffing, safety, accessibility, and sustainability. Addressing these obstacles requires careful planning, community involvement, strategic partnerships, and a long-term commitment to evolving libraries' roles in society.

Way Forward

The establishment of innovative laboratories within university libraries requires a structured, collaborative approach involving multiple stakeholders. These labs, which serve as hubs for digital creativity, research support, information technology skills, and interdisciplinary innovation, must be carefully planned and sustainably developed. The following step-by-step process on how innovative labs can be systematically implemented in university libraries, specifying the roles of government, universities, library authorities, and users can serve as guides for implementation.

Policy and Strategic Direction (Government's Role)

This first step involves national policy formulation and funding provision. The government, through relevant agencies such as the Tertiary Education Trust Fund (TETFund), the National Universities Commission (NUC), and ministries of education and science and technology, must create a policy framework that prioritizes digital innovation in university libraries. This includes: allocating dedicated grants for library innovation projects, issuing guidelines for library digitization, research support services, and emerging technologies (e.g., AI, VR, 3D printing), and partnering with international bodies to enhance infrastructure and capacity building.

Institutional Commitment and Infrastructure Planning (Universities' Role)

Universities must demonstrate institutional will by integrating library innovation labs into their academic and strategic development plans. Their responsibilities include: approving physical space within library buildings or nearby ICT hubs, committing budgetary support to supplement government grants and encouraging faculties and research centres to use the labs for interdisciplinary collaboration and student engagement.

Library Leadership and Project Design (University Libraries' Role)

University libraries play a central role in designing and implementing the lab. As knowledge centers, libraries are well-positioned to provide a technology-rich, user-focused environment. Their responsibilities include: developing a detailed proposal that outlines the lab's objectives, equipment, staffing needs, and service offerings, identifying priority areas such as multimedia content creation, makerspaces, digital archiving, data visualization, or research support, procuring necessary tools, such as computers, digital recording equipment, 3D

printers, coding platforms, and collaborative software and establishing clear operational models, usage policies, and evaluation metrics.

Stakeholder Training and Capacity Building (Users' Role: Staff and Students)

The success of an innovation lab relies on active participation by its users - academic staff, students, and librarians themselves. Their roles include: participating in digital literacy and technology skill-building workshops organized by the library or external partners, using the lab for project-based learning, academic support, and digital scholarship, engaging in peer-to-peer learning activities, hackathons, and research showcases that encourage knowledge exchange.

To achieve this, university libraries should offer tiered training programs on emerging digital tools, facilitate certification opportunities, and collaborate with faculties to embed lab use in the curriculum. Academic staff must also be reskilled to utilize these labs for instructional design, online content development, and research productivity.

Pilot Implementation and Evaluation

Once funding, design, and training are in place, the library can launch a pilot version of the lab. This pilot phase allows for: testing of tools and services with a select group of users, gathering feedback for improvement, establishing key performance indicators such as number of users, types of projects completed, digital resources created, and academic impact and regular monitoring and transparent reporting are crucial to ensure the lab's relevance and scalability.

Sustainability and Scaling Up

To maintain long-term relevance, libraries must adopt sustainability models such as: offering fee-based professional development courses, hosting innovation competitions and research grants, partnering with alumni and industry to support innovation fellowships and equipment upgrades. Over time,

successful models can be scaled across other faculties or replicated in other institutions.

Interestingly, this step-by-step framework contributes significantly to knowledge generation by providing a holistic model for the development of innovative labs within university libraries, an area often underexplored in the context of African higher education. By outlining the distinct responsibilities of each stakeholder, this approach bridges policy, infrastructure, pedagogy, and practice. It emphasizes that innovation in university libraries is not solely a technical or architectural endeavor, but a multi-layered process involving governance, institutional alignment, community engagement, and human capital development. This contribution thus provides a replicable model for universities seeking to transform their libraries into 21st-century learning and innovation ecosystems.

Conclusion

Conclusively, while the road to fully realizing the potential of innovative labs in libraries is challenging, it is far from impossible. Through strategic funding, staff development, community engagement, collaborative partnerships, and evidence-based evaluation, libraries can reinvent themselves as dynamic spaces for innovation and empowerment. The examples and insights emerging from current research make it clear that libraries that embrace these approaches will be better equipped to meet the evolving needs of their communities and thrive in a rapidly changing world.

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