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The Transformation from Traditional To Digital: Archiving and Its Impact on Higher Education Institutions (HEI)

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Abstract

The rapid shift from traditional methods to digital platforms has significantly impacted higher education institutions (HEIs). This transformation is not limited to teaching and administrative processes but also extends to how information is stored, accessed, and preserved through digital archiving. Digital transformation involves integrating advanced technologies like AI, cloud computing, and big data analytics into the core functions of HEIs. Digital archiving is crucial in ensuring the longevity and accessibility of educational resources, research outputs, and institutional records. This paper explores the effects of digital transformation and digital archiving on the operational, academic, and administrative dimensions of HEIs.

Keywords: Digital transformation, communication systems, archiving system, cloud computing

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التحول من التقليدي إلى الرقمي: الأرشفة وأثرها على مؤسسات التعليم العالي

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المستخلص

لقد أثر التحول السريع من الأساليب التقليدية إلى المنصات الرقمية بشكل كبير على مؤسسات التعليم العالي. لا يقتصر هذا التحول على العمليات التعليمية والإدارية، بل يمتد أيضًا إلى كيفية تخزين المعلومات والوصول إليها وحفظها من خلال الأرشفة الرقمية. يتضمن التحول الرقمي دمج التقنيات المتقدمة مثل الذكاء الاصطناعي والحوسبة السحابية وتحليلات البيانات الضخمة في الوظائف الأساسية لمؤسسات التعليم العالي. يلعب الأرشفة الرقمية دورًا حاسمًا في ضمان طول عمر الموارد التعليمية ومخرجات البحث والسجلات المؤسسية وإمكانية الوصول إليها. تستكشف هذه الورقة آثار التحول الرقمي والأرشفة الرقمية على الأبعاد التشغيلية والأكاديمية والإدارية لمؤسسات التعليم العالي

الكلمات المفتاحية: التحول الرقمي، أنظمة الاتصالات، نظام الأرشفة، الحوسبة السحابية

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1. Introduction

The term "Informatization of society today" refers to the digital revolution that created a new, global, competitive, internationalized, digital, and socio-technical environment. This transition is characterized by the total integration of technology for communication and information into every social, political, and economic facet. The three areas where educational institutions need to grow

are the creation of instructional e-learning resources, the active integration of these tools into the classroom by teachers, and the usage of the newest ICTs in the classroom A crucial aspect of this transformation is digital archiving, which ensures the systematic storage and accessibility of vast amounts of information, thereby enhancing academic research and operational efficiency within higher education institutions.

The institution must therefore move quickly to make the changes that the digital revolution requires .The research problem of information technology developments in higher education institutions can be shaped by asking the following questions:

1) What is the nature and importance of digital transformation and digital archiving among the IT innovations used in tertiary Higher Education institutions?
2) What are the key components and variables that influence the outcomes of projects focused on digital transformation and digital archiving in Higher Education Institutions?
3) What challenges do Higher Education Institutions encounter in implementing digital transformation and digital archiving strategies?
4) How will the integration of digital transformation and digital archiving mechanisms affect Higher Education Institutions?

2. Objective

This study explores how digital transformation and archiving strategies can be effectively implemented in educational settings. The secondary objectives are understanding the characteristics and importance of digital transformation and digital archiving as IT innovations in higher education. Additionally, it seeks to examine the critical components and factors that determine the success of digital transformation and digital archiving initiatives. Moreover, the study aims to identify the challenges that need to be addressed to successfully implement digital transformation and digital archiving strategies. The research hypothesis is that policies at educational institutions can be positively impacted by the use of digital transformation and digital archiving techniques.

3. Literature review

In the paper “Managing Digital Transformation: A Case Study in a Higher Education Institution” identifies the essential components that can assist in the digital transformation. The writers stress how important it is to apply technological innovations according to particular requirements and convert traditional culture into a digital one. This study highlights the significance of assuring the growth and survival of higher education institutions through digital transformation by identifying the characteristics that drive the transition.[1]

The research paper "Deep Dive into Digital Transformation in Higher Education Institutions" clarifies the challenges faced while attempting to implement digital transformation and the obstacles they must surmount to achieve their objectives. Although mentioned, the difficulties higher education institutions confront in pursuing digital transformation are not fully examined or substantiated by data. The survey makes it abundantly evident that higher education institutions are currently experiencing a digital

revolution that is hastening the adoption of new technologies and altering practices, procedures, and business models. Additionally, developing more advanced and effective policies and practices that support their objectives is a critical part of digital transformation. [2]

This study, "An Institutional Perspective for Evalu ating Digital Transformation in Higher Education f rom an Institutional Perspective: Learnings from th e Chilean Case," provides evidence of the importa nce and impact of digital transformation in higher education institutions, particularly in the context of Latin America, with a focus on the Chilean situati on. The main disruptive technologies are listed, along with an explanation of how institutional models and procedures evolve. Best practices, risks, and possibilities related to digital transformation for Latin American universities are also highlighted. The proposal's components were measured using an instrument developed and verified after conceptual work was completed in the first phase of the study's three-phase research methodology. Then, educational institutions took advantage of this instrument. In the end, the idea was applied to colleges to undertake an overall review of the results. [3]

In “Change of the Higher Education Paradigm in the Context of Digital Transformation: from Resource Management to Access Control,” This study emphasizes upgrading university infrastructure through digital technology to maintain adequate and competitive operation. Efficient management of user access to all university resources is recommended through a digital network platform. These KPIs include but are not limited to the number of investments, scientific and educational solutions that effective employment with competitive pay for students. The article is about developing KPIs that control access to information services and facilities, which in turn should be technological, scientific, and educational. The study proposes an approach based on modeling the university management system, where infrastructure logic is core, and recommendations from the study aim at enhancing university infrastructure through digital technology. [4].

The authors of the paper "Assessing Digital Transformation in Universities" proposed an integrated digital transformation model developed in this research to evaluate the maturity level of digital transformation practices among educational institutions and compare them with those in other industries. The challenges listed include a lack of qualified leadership, changes in culture, a lack of inventiveness, and a lack of resources, which are specific concerns to be considered. It is noted that universities should prioritize digital transformation above all other issues because it is critical. This study's conclusions show that universities lag behind other sectors of the economy, and they should take note, as it should serve as a wake-up call for educational establishments to prioritize efforts towards digitalization. [5] .

4. Methodology

The evolution of digital transformation has been made up of a new step-by-step process that implies introducing the most sophisticated technologies into different spheres of organizations to boost productivity, efficiency, and competitiveness. This strategy is widely suitable for numerous sectors, not excluding education, where the infusion of digital tools and strategy is vital for revamping institutional processes and improving outcomes. Here, we present our approach, which involves developing and

deploying a specialized digital archive system designed specifically for higher education institutions (HEIs). The purpose of this system is to meet peculiar challenges and needs in managing educational materials, research data, and administrative records as identified entities in the age of digitalization.

Our approach is structured around creating a software program to store information electronically, where we adopt C# for programming and SQLite for the database. The developed system aims to ensure the availability of an easy-to-use yet powerful system that can be adopted by Higher Educational Institutions (HEIs) for management and archival purposes. The components found in the system:

- **User Login Interface:** This interface ensures secure access to the system, allowing authorized users to log in with their credentials. It is very important for ensuring that the data is kept safe and secure.
- **Book Management:** It allows users to add, modify, and control book records as they wish, with the possibility of inputting detailed information like the type of book, the number of requests, the date, the entity that issued or received the book, and the status of the book, whether it is issued or received.
- **Conversion Capabilities:** Facilitates the conversion of book records to PDF and Excel formats, providing flexibility for reporting and sharing information.
- **Search Functionality:** Offers efficient retrieval of book information based on various criteria, such as book type, request number, date, and issuing/receiving entity.
- **Cloud Integration:** Ensures data is backed up securely and accessible from any location, enhancing the system's performance and scalability.

Appraise the efficacy of the electronic preservation program, we adopted a thorough assessment methodology that comprises case studies and statistical data evaluation. Through scrutiny of actual cases, we are able to appreciate the pragmatic pros and cons of the archiving system, which in turn helps us fine-tune and improve it so as to ensure better alignment with higher education institutions' (HEIs) digital transformational strategies.

Digital transformation is like an unseen hand touching every corner of Higher Education Institutions, isn't it? Breathing into teaching, learning, research, and administration. The methodology stresses the great value that can be obtained from the use of digital media and technologies, not only to drive operational efficiency but also as a channel through which service delivery can be revolutionized. The Major components of this influence are as follows:

- **Education:** Generation of interactive learning systems is greatly supported by the system, which uses e-learning methodologies such as remote learning, blended learning, virtual reality, and augmented reality technologies. These systems can help bring education to all corners of the world and ensure everyone has access regardless of their geographic location or capabilities — it also promotes student-faculty engagement [6] .
- **Administrative Efficiency goes first**: through automation of administrative work such as enrollment, admission, examinations and assessment. The system improves information flow that supports data management in addition to cutting the cost related to the use of

paper-based systems; this also has an impact on customer service because it provides electronic services to students and parents.

- **Scientific Research is also important:** The system helps in promoting scientific research by allowing access to digital libraries and databases which are essential for resource sharing plus online tools that facilitate collaboration. Dissemination of research findings is done electronically [7].
- **Work Environment Improvement**: The system improves the work environment for faculty and staff by offering tools that increase effectiveness and decrease workload. It fosters transparency plus accountability, which are core components in enhancing decision-making processes [8] .

The methodology fits into broader strategic goals of digital transformation to drive more revenue and higher productivity levels, thus laying down value-added innovations. Higher education institutions must come up with an agile and scalable roadmap for their digital transformation plan, which is capable of supporting their strategic objectives. The integration of digital technologies into institutional processes not only streamlines operations but also positions HEIs for sustained success in a rapidly changing digital environment. The findings of this study affirm that leveraging digital transformation strategies is pivotal for navigating the complexities of modern education and achieving long-term institutional goals.

Universities face a significant issue when it comes to data analysis because of the vast amount of data that they use and view as a source of big data. Universities are not focusing on data and producing new knowledge. Many are lacking in big data capabilities and data scientists to conduct analysis and produce insightful knowledge about their curricula, student populations, and relationships to different courses (behavioral patterns related to education) [9] This situation confirms that colleges need two essential components in their big data strategy: (a) a reliable method that enables them to analyze the data more effectively, and (b) it should yield prompt findings when needed.[10]. Conventional data analysis may not yield empirical insights to investigate prospects, but it does produce accurate results and takes longer to produce sensitive outcomes that can keep up with the quickly evolving demands of competitive education. We stress that using big data approaches is imperative for universities in order to obtain timely, accurate, and relevant findings. Universities would be able to make better, more reliable decisions that reflect student learning and create advantages with the use of real-time data. [11].

Three essential components are needed for the suggested utility of big data to be closely connected with the digital transformation plan. (a) The ability to process huge amounts of data from several volumes; (b) a fast enough rate at which data is received and analyzed; and (c) the utilization of different and distinct data structures (structured, semi-structured, and unstructured). We suggest that a university might gradually contribute to the entrepreneurial digital environment by implementing a big data strategy that is intimately linked to the digital transformation. [6]

These technological advancements have led our research to focus on developing a comprehensive digital archiving program that complements the broader digital transformation strategies in higher education. This archiving program ensures that educational materials, research data, and

administrative records are systematically stored, easily accessible, and securely preserved for long-term use. By integrating advanced audio-visual and software technologies with a robust archiving system, higher education institutions can not only enhance the learning experience but also ensure the sustainability and efficiency of their operations in the digital age.

Improving operational effectiveness, enhancing teaching and learning opportunities, and preparing students for the digital workplace are the main objectives of digital transformation in higher education. in table (1) explain some universities adopts digital transformation .[12] [13]

Table 1: Digital transformation technology in international universities

No.	Name of university	Digital transformation technology
1	Arizona State University	Learning management systems, big data analysis for insights and forecasts, and online courses and programs.
2	Stanford University	Integrated augmented reality, virtual reality, and artificial intelligence into their teaching methods.
3	Massachusetts Institute of Technology	Encompassing social media, websites, eBooks, and other online resources, in addition to cutting-edge instruments like gamification for improved educational experiences.
4	Harvard University	Improved their students' educational experiences by utilizing podcasts, online communities, webinars, and microblogging sites.
5	California University	By integrating cutting-edge technology like cloud computing, virtual reality, and artificial intelligence into their teaching and learning processes, they store student records using blockchain technology.

Explanation of the impediments that may face the digital transformation process in higher education institutions will be clarified in the table 2. It will start from the financial aspects and extend to the cultural and organizational aspects, with a focus on analyzing the impact of each obstacle on the digital transformation process and its influence on the performance of the educational institution**.** [4]

Table 2: The impediments to digital transformation in higher education institutions

NO.	The impediments	Explain the impediments to digital transformation
1	Financial Resource Shortage	Insufficient availability of funds to finance digital transformation projects.
2	Resistance to Change	Resistance from some faculty members and staff who may be unwilling to change their work methods.
3	Digital Skills Gap	The lack of necessary digital skills required

4	Lack of Suitable Digital Infrastructure	The absence of robust communication networks, modern computer hardware, and electronic educational software.
5	Lack of Digital Culture	A scarcity of digital culture that supports the concept of digital transformation
6	Privacy and Security Concerns	Concerns regarding privacy and security when utilizing technology in education.

Numerous companies are taking a while to adopt digital transformation, even if there are clear advantages for higher education. Currently, just 13% of universities are working on a digital transformation project. Numerous educational institutions have encountered obstacles that have caused them to halt their digital transformation efforts. Table (3) provides an explanation of some of the obstacles that can be solved in various ways. [14]

Table 3: Type of Challenges and How to Overcome

No.	Type of challenges	explain	Overcome methods
1	Cultural Shift	One of the largest obstacles will be getting staff members to adjust their behaviors, which frequently encounters opposition.	Establishing clear goals, keeping lines of communication open with staff, and carefully scheduling the rollout of workflow automation are all important for firms. [15]
2	Lack of Strategy	Ignorance of the consequences can arise when it comes time to put the tools into practice.	Careful planning can help organizations stay clear of this problem. Establish the criteria used to assess the project's progress, its key goals, and its digital transformation to meet those objectives. A well-thought-out plan will help to stay on course and accomplish objectives.
3	Outdated Technology Infrastructure	It might be challenging to merge antiquated, cumbersome technology with modern IT infrastructures in many higher education institutions.	The best workflow automation software solutions are created with this difficulty in mind. The software is simple to integrate, regardless of whether the organization is using more antiquated legacy systems or contemporary cloud software.

5. Discussion

The rapid shift from traditional methods to digital platforms has significantly impacted higher education institutions, offering both advantages and disadvantages. One major benefit is improved adaptability to the business world. Educational institutions that use digital resources can quickly adapt to a dynamic and diverse business environment. Digital transformation in higher education also removes geographical constraints, enabling universities to reach and educate students globally, thus promoting international education. In addition, digital transformation promotes openness within institutions. Clear roles, duties, and goals are defined, which enhances integrity and transparency. It also encourages the emergence of new modes of thinking. By

leveraging contemporary technologies, educational institutions support innovative ways of communicating and interacting. Moreover, digital transformation can lead to cost savings. While initial investments in digital infrastructure may be high, long-term savings are realized through efficient and adaptable service delivery.

However, there are notable disadvantages. One major issue is the technology gap. The process of going digital is not a walk in the park; it needs significant injections into software development and infrastructure, a situation that can squeeze financial and administrative resources out of an organization. Waving these costs against these benefits demands a keen eye be kept on them. Higher learning institutions should see to it that they make good use of what the digital transformation offers, while at the same time taming the challenges to ensure a successful transition takes place. In any metamorphosis taking place, be it within the system or outside, digital archiving has a great role to play. It sees through the preservation of educational resources, research outputs, plus institutional records.

Bringing AI onboard would mean infusing such advanced technology (AI), cloud computing and big data analytics into high education institution's core functions which will not only ensure that this information remains available but also make sure that it serves its purpose long enough.

In essence, when we talk about digital transformation, operational dimensions! Academic dimensions! Administrative dimensions! These are all affected as much by this wave as anything else with regards to stakes held by higher education institutions...

This, therefore, necessitates handling such a change with thoughtfulness. And strategic approaches, simply because you cannot afford to miss any spot since every corner matters in this journey towards total digitization, where you are looking forward to addressing all issues surrounding accessibility, including information security, data management, among many others, once you have them under control.

The process of digital transformation demands investments in software development plus infrastructure, where pressure is placed on financial and administrative resources, but indeed, trying to strike a balance between these advantages and disadvantages is very important. Higher education must take full advantage of the benefits brought by the digital transformation, and at the same time, overcome challenges that stand in their way; only then can the transition be successful. In this journey towards transformation, digital archiving surfaces as an important component that ensures preservation of educational resources, research outputs, and institutional records. It is thus prudent to integrate high-level technologies like artificial intelligence, cloud computing, and big data analytics into information core functions in higher learning institutions so that information is not only kept safe but also made available when needed, which greatly contributes to resource sustainability.

In general: digital transformation plus digital archiving affect almost all dimensions (operational, academic, administrative) within higher education institutions; therefore, such effects must be carefully addressed with this transformational issue requiring a strategic thought on how it should be dealt with in future.

6. Design System and Implementation

The system of digital archiving was developed using C# as the primary programming language

language and SQLite as the management system of the database to create a strong but friendly application for managing and archiving books. Features included user login, book management, plus easy conversion into PDF or Excel format: in addition, with its implementation of quick search functions and integration to cloud storage, which greatly improves performance and accessibility.

6.1 System Architecture

The architecture of the system is divided into three major parts:

6.1.1 User Interface (UI): The UI is created using Windows Forms in C# to provide an interactive user interface for the system. Users should be able to understand it easily. Major components are:

- User login interface.
- Operations available for managing books (adding, editing, deleting).
- Fields through which book details can be entered, including the kind of book, the number of requests, the date of transaction, the organization that issued or received the book, and the type of transaction.
- Buttons for converting books to PDF and Excel formats.
- Search functionality for quickly locating issued or received books.

6.1.2 The choice of SQLite is a wise one due to its lightweight and effective management of databases. The database schema consists of two main tables that make sure user data and book details are kept in such a way that they can be easily accessed without compromising the integrity of data:

- **Users table**, which stores user credentials and roles
- **Book table, which stores different information related to books like type, request number, date, issuing/receiving entity,** along with the type (whether it was issued or received). Cloud integration

The system has cloud storage integration to provide quick access to data and guarantee that the data is safely backed up. It allows the end users to keep their data and take it from any place, which in turn improves the scalability and dependability of the system.

In Figure (1) shows that the overall structure and layout of Digital archiving system. A schematic diagram can be considered as consisting of three main layers: the display interface (UI), search layer, sorting layer.

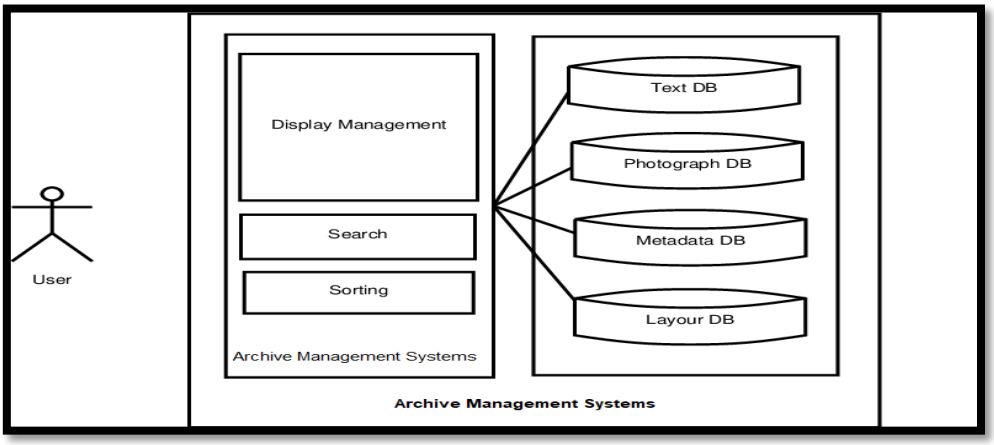

Figure (1) Architecture and Design of the Archive System

6.2 Key Features

- **User Login:** An interface that is safe, where users who are authorized only can have access. The SQLite database stores user credential information; authentication will be handled securely.
- **Book Management:** Adding new books can be done by users with details such as the book type and request number, date and issuing/receiving entity along with the type (issued/received). Editing and removing existing book records are also possible on the system.
- **PDF and Excel Conversion**: Among the features of the system is an easy transformation for book records into PDF and Excel. This can be useful for reporting purposes.
- **Search Functionality:** Different criteria such as type, request number, date, and issuing/receiving entity can be used by users to search books easily. It helps to find specific records in a big dataset.
- **Cloud Storage:** Combining the system with cloud storage guarantees the safety of all data, which means there is no chance of losing it. In addition to this, through this feature users can reach the system and its information from any place on Earth.
- **High Performance:** The development approach used in creating the system makes it very high speed so that data can be handled quickly. This is realized through proper database query optimization and well-written code.

6.3 Implementation Details

6.3.1 The Implementation of User Interface:

- Developed using Windows Forms in C#.
- Implements a Model-View-Controller (MVC) pattern for better separation of these issues, which are concerns and maintainability.

6.3.2 Database Implementation:

- SQLite database with tables for users and books.
- SQL queries are optimized for fast data retrieval and manipulation.

6.3.3 Cloud Integration:

- Utilizes cloud storage services (e.g., Azure, AWS) for storing data.
- Ensures data synchronization between local and cloud storage.

6.3.4 PDF and Excel Conversion:

A method used to manage conversions is third-party libraries (e.g., iTextSharp for PDF, EPPlus for Excel). The method also ensures that the output files are well structured with all the necessary information included. Through the incorporation of such functionalities and adherence to industry standards in software engineering, the digital book archiving system can be considered a complete and effective solution for use in the educational sphere for the proper management and archiving of books.

In figure (2) shows that the digital archiving system's login form. It is designed as a secure point of entry for the system users.

Figure (2) Login form

In figure (3) the heart of users once they have successfully logged in is the Dashboard Form. It presents a summary of primary tasks and enables users to easily steer their way through activity management.

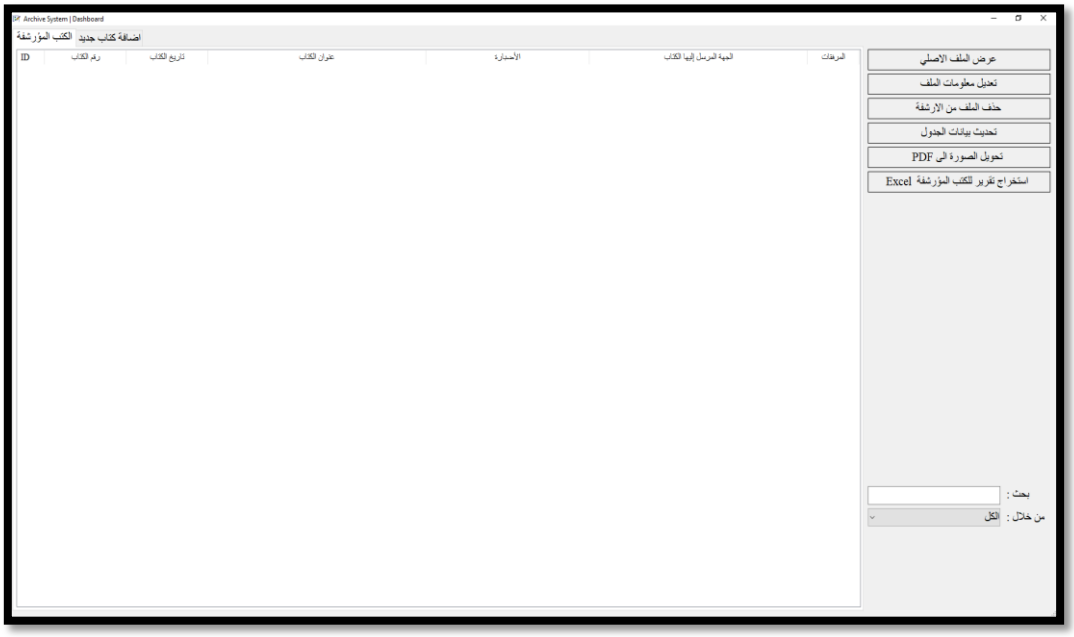

Figure (3) Form Archive System Dashboard

In Figure (4) depiction showing how the user interface for inserting a new book into the digital storage system looks. This form has been developed with the aim of simplifying procedures used during entry of new book records into the archive.

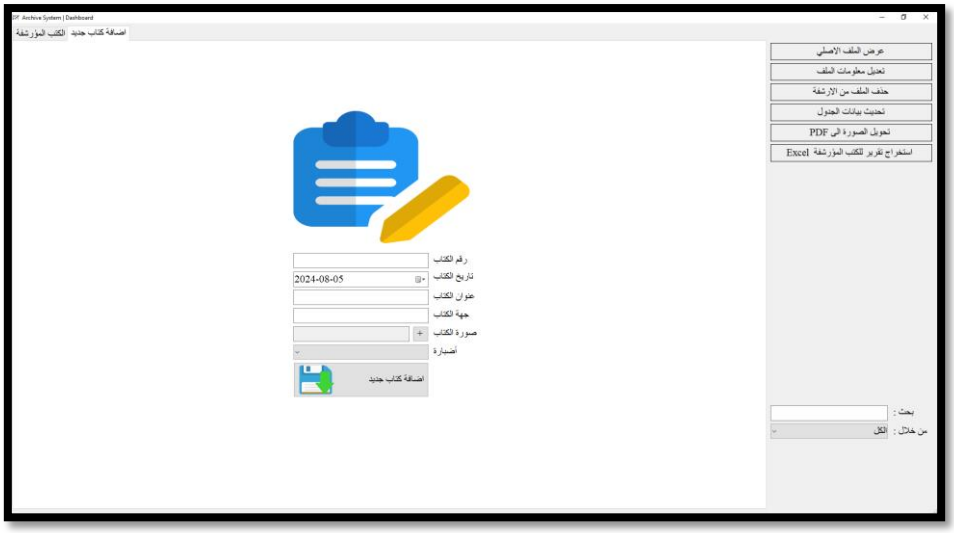

Figure (4) Expanding the library collection by one more volume.

7. CONCLUSION

The efforts of supporting the digital transformation of educational institutions involve the following major actions: addressing resistance to change by promoting an innovative and continuously improved culture; benefits that can be gotten from digital transformation, and support plus resource provision to aid individual adaptation to technology changes. But it plays a key role. The success and sustainability of these efforts is achieved through regular monitoring and evaluation of the initiatives in digital transformation which must be done with data collection, analysis, and necessary adjustments that can be relied upon. For successful future development, educational organizations must understand the significance of providing their employees with the required digital abilities to use and apply technology in turn. They organize learning activities, workshops, and provide tools that help with digital literacy and skillfulness. Through such collaborations with technology firms as well as professionals from different industries, institutions receive knowledge about digital change and understand the latest tendencies and approaches resource-wise; in addition to getting help during implementation.

8. Future work

Connecting institutions, the technology providers, and industry experts can hasten the transformation of processes from paper-based to digital, as well as resource utilization for continuous improvement. In conclusion, delving into unique pedagogical strategies such as flipped classrooms and virtual reality can lead to better involvement with students in their education, plus effective results.

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