Enhancing the quality of interior design education through improved data management processes

Trang Tran Ngoc Thanh

Abstract

In the shift towards integrating information technology in higher education, this study focuses on enhancing interior design education through a novel data management model that supports both in-person and online learning. By tackling the inefficiencies of traditional data handling and leveraging advanced technologies, we've crafted a solution that merges a Learning Management System (LMS) with cloud storage, aiming to streamline the access, storage, and sharing of educational content. Tested in interior design courses at a Hanoi architecture university, the model demonstrated notable improvements in data management, fostering greater collaboration and interaction among students and teachers, and thereby, elevating educational quality. The findings suggest that this model not only addresses current educational challenges but also opens avenues for the broader application of IT in interior design education, indicating a promising direction for future enhancements in educational data management.

Key words: education quality, interior design, data management, education administration, technology, Learning Management System

M.A. Trang Tran Ngoc Thanh
Department of Interior Design
Hanoi Architectural University
Email: thanhtrang167@gmail.com
Tel: 0988426090

Date of receipt: 8/4/2024
Editing date: 22/4/2024
Post approval date: 04/11/2024

1. Introduction

In the modern educational landscape, the incorporation of information technology into data management and organization has become an essential element, particularly in the field of interior design education, where there is a high demand for creativity and interaction between teachers and students [1].However, data management in the university education environment, especially within interior design project courses, often faces numerous challenges, including the complexity of the data, as well as issues related to data access and security[2].

The Department of Interior Design at Hanoi University of Architecture is currently responsible for teaching various project courses including interior design, garden design, furniture design, architectural design, comprehensive projects, and graduation projects (a total of 11 projects). In the training process of interior design, documents and materials play the main role, which includes not only printed documents but also electronic ones. For online or blended training formats at Hanoi Architectural University, the exchange of these materials often occurs manually and statically, through making copies every time they are shared via email, messages, or social media applications like Facebook, Zalo, etc., leading to significant waste of storage resources and difficulty in managing different data versions after each modification or addition. The current data management system is not yet linked to task management and user rights, creating risks for information security when electronic documents are exchanged online, such as unauthorized access, eavesdropping, copying, or transfer to unauthorized individuals. Moreover, the current working environment has not been able to create uniformity during the compilation of lectures and training programs, making the exchange and discussion among lecturers, not only within the same workshop, department but also across the entire faculty, difficult. The lack of a common reference data repository, with the ability to control access and easy sharing, is also a prominent issue, limiting the process of searching and using materials by members of the educational community. This becomes even more urgent when most lecturers and students are not fully aware of the online training management system (LMS) and synchronous online communication methods, which are mainly conducted through software like Microsoft Teams, while Zoom is only used as a supplement in certain cases. In addition, asynchronous communication methods and data exchange are primarily done through Zalo and Facebook Messenger, and even the review of projects is performed through these channels, showing the necessity for an optimized and improved solution in data management and communication in the online training environment. The organization of data storage through Google Drive - not part of the same system as MSTeam - also reflects the essential need for a more integrated and efficient solution. Furthermore, in the context of the global pandemic and the development of online education, the application of cloud technology and Learning Management System (LMS) to manage project data has become more crucial than ever. These solutions not only improve data management and organization but also facilitate easy access and collaboration on projects for students and teachers, regardless of space and time [3].

In direct training methods, traditional data management practices in education are often not flexible enough to meet the increasing demands for collaboration and information sharing during the design and implementation of projects. Some disadvantages of the traditional method of collecting and storing project assignments can be listed as:

Costly and not environmentally friendly: Printing documents requires the use of paper, ink, and energy, resulting in unnecessary expenses and negative environmental impacts.

Limitations in storage and organization: Printed documents require physical storage space and can easily be damaged, lost, or destroyed. Managing and organizing a large volume of printed materials also becomes challenging, especially when specific information needs to be retrieved from a large collection of submitted assignments.

Difficulties in grading and feedback: Teachers spend a lot of time reviewing each printed assignment and writing feedback by hand, which is not only time-consuming but can also lead to inconsistencies in evaluation.

Limitations in presentation: Printed assignments do not allow the use of multimedia means such as sound, video, or interactive links, limiting students' presentation and expression capabilities.

Challenges in collaboration: The traditional method of submitting assignments is challenging for collaboration among students because each person has to work on their own copy of the document, reducing the ability to discuss and edit together.

Difficulties in accessing submitted work: Students do not have an electronic copy of their submitted assignments, limiting their ability to review their work and learn from feedback.

Limited flexibility: The method of submitting printed assignments requires students and teachers to be present at a specific location, reducing flexibility and convenience, especially in situations like pandemics or distance learning.

Longer feedback time: The process of grading and providing feedback on printed copies can take longer than using electronic tools, delaying the time students receive and learn from feedback[4, 5, 6].

These shortcomings highlight the necessity of transitioning to modern technological methods for assignment collection and project management, such as online learning management systems, to enhance the effectiveness and quality of the training and educational process. Moreover, deploying and integrating new technologies into the educational process requires a deep understanding of both fields: information technology and interior design education. This raises several important questions: How can we develop an effective data management model that also ensures flexibility, ease of use, and security? How can this solution be broadly applied in the university education environment? And how can it promote interaction and collaboration between students and teachers, thereby enhancing the quality of interior design training? This paper will focus on answering these questions through the proposal and testing of a new data management model, aiming to improve the educational and training processes.

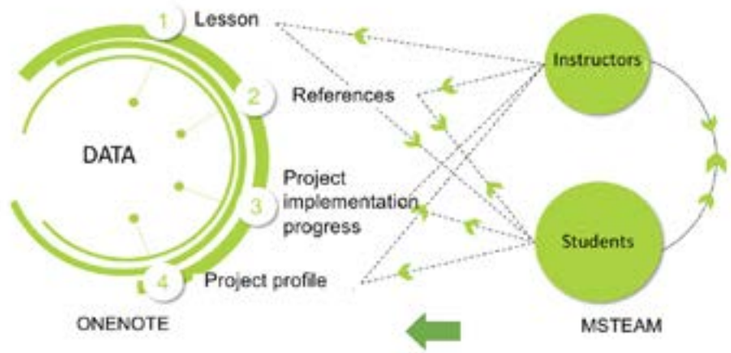

Figure 1. Diagram of data content and user relationships on the LMS system of a project module

Table 1: Organization of data storage content of a class project on Classnote Book.

HANDBOOK	***DATA***
TEACHER'S HANDBOOK Space is reserved for full-time instructors only..	Course outline; Learning and teaching plan; Lesson; References; Projects of previous courses
CONTENT LIBRARY The space is for everyone to read, but only full-time instructors can edit and set up content.	Project profile; References; Reference project; Implementation progress plan; General regulations...
PUBLIC SPACE Space where everyone can view and collaborate on editing on the same data copy (suitable for group work organizations)	Group 1 data; Group 2 data; Group 3 data; ... Or Session 1 data; Session 2 data; Session 3 data; ...
STUDENT HANDBOOK Data storage space for the entire project making process of each student. Teachers can view and edit. Students can only see and edit their own storage space, not other students'	Current profile; Analyze and develop design tasks; Research and reference; Drawings of space organization and furniture arrangement; Outline design ideas and direction; Perspective of design space; Technical implementation drawings; Technical implementation drawings; Final completed drawing documents...

2. Methods

Phase 1: Through document research methods and expert consultation, the author proposes a data management model that includes recommendations for storage software, organization of storage, and data search capabilities.

Phase 2: This study employs experimental research methods to assess the effectiveness of the data management solution for the Interior Design Project course on the Learning Management System (LMS). The subjects of this research include students participating in Interior Design Project classes that utilize the LMS.

Observation: The research team observes the practical use of the solution in the classroom environment and records changes in learning effectiveness and student-teacher interaction.

Survey: Developing and distributing questionnaires to students and teachers to assess satisfaction and perceptions of the solution compared to traditional methods.

Interviews: Conducting in-depth interviews with a selection of students and teachers to gather detailed data on their experience using the solution, as well as to record suggestions for improvement.

The collected data is analyzed using content analysis methods to identify trends and patterns in the use of the solution, as well as statistical analysis to evaluate the differences in effectiveness and satisfaction before and after testing the solution.

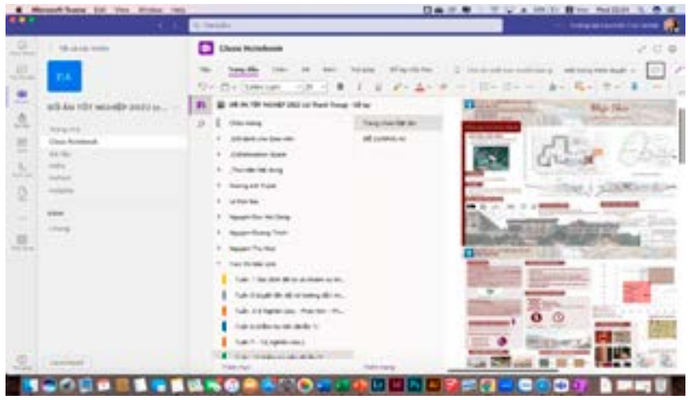

Figure 2. Interface of a classnotebook for data management of a project class (graduation) for a lecturer's account on MSTeam

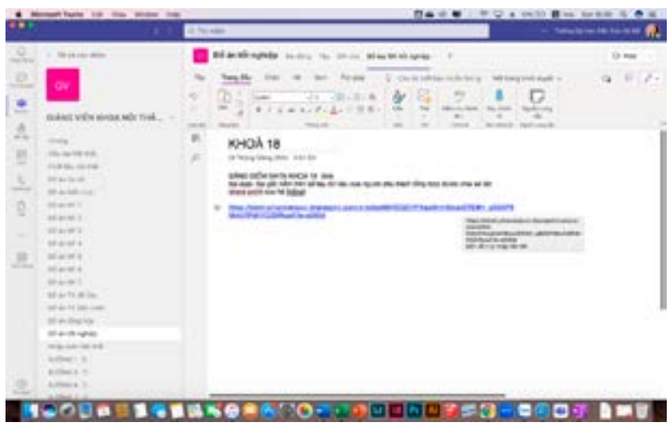

Figure 3. Interface for organizing data management of all subjects at the Faculty level on Onenote

3. Results

3.1.The proposed data management solution

Criteria

The data stored on the system comprises both structured and unstructured data. The content of "data" on the LMS must be managed in accordance with the essence of the term "metadata," which includes all information about the fundamental characteristics of the data [7].Within the scope of this topic, data management for the Interior Design Project course includes the task of organizing storage and sharing at the level of individual project classes and the entire project system at the departmental level. The data for the project course includes: lectures by instructors (PowerPoint, video, Word, PDF), reference materials (books, drawings, related research...), all student data during the project (reference materials, reference images, drawings...) and the complete project portfolio of the student.

Data management is not merely activities of storage, replacement, and distribution; it is the management of the entire lifecycle of data throughout the educational process and must ensure the following criteria:

Availability and Collaborative Capability: This refers to the readiness of information for valid retrieval needs, more specifically, the ability to access data anytime, anywhere[8].

Usability: Includes five criteria: Accuracy: For data to be usable, it must be accurate. Issues such as outdated data, incomplete data, and simple errors can reduce the accessibility of the data; Connectivity: Data needs to flow between sources. If two data sources cannot connect and accurately identify each other, usability will be affected for both; Standardization: Developing a common language and data format; Metadata: Since metadata is an extremely important tool, providing purpose and structure to the data; Logical Distribution: Ensuring that data is classified and arranged in a logical, easily searchable location.

Consistency: The consistency of data is demonstrated through its accuracy, uniformity, and timeliness across the database system, even with multiple users accessing the database or even in the event of an incident (hardware or software).

Data Integrity: Refers to the ability of data to remain accurate and maintained through policies and management throughout its entire lifecycle.

Storage method

Cloud Storage, a service offered for storing, managing, sharing, and backing up data (images, videos, files, etc.) remotely, facilitates convenient data

management and entry from anywhere, provided there is an internet-connected device like a smartphone or computer. The ability to concurrently access and collaborate on cloud data helps overcome the limitations of static data sharing models, ensuring data integrity and shortening the time required for data compilation. This concurrent access facilitates the development of shared digital repositories for editorial teams. Cloud storage services come with information management features such as permission settings, member administration, internal data sharing, personal data management, etc., ensuring security requirements are met. Another advantage of cloud storage solutions is the stable backup capability and easy data recovery with large storage capacities. Some popular cloud storage services include AWS, Google Drive, Dropbox, OneDrive, and more. However, it is advisable to choose a storage service that is part of the same ecosystem as online collaboration tools and other online work support tools to facilitate data synchronization and sharing.

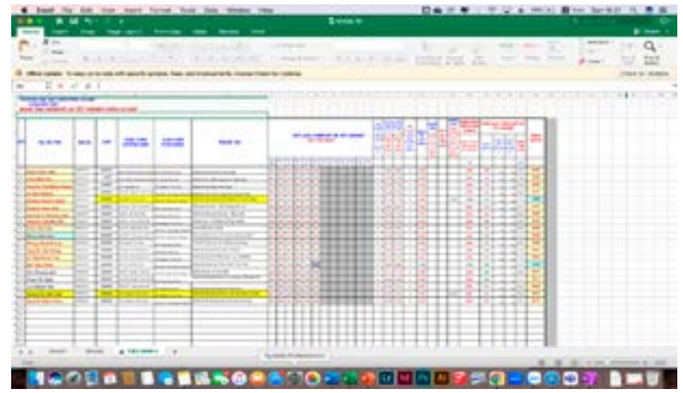

Figure 4. List of excel files managing data addresses for interior design project course 18

Storage organization

Organizing data management using Class Notebook/ OneNote: For the LMS currently deployed at Hanoi University of Architecture, which is MSTeams, the Class Notebook is an integrated storage tool. Each class group comes with its linked OneNote Class Notebook. Your Class Notebook is a digital notebook for the whole class to store text, images, handwritten notes, attachments, links, voice, video, and more. The OneNote Class Notebook includes three internal notebooks with different viewing and collaborative permissions: Student Notebook (A private space shared between the educator and each student. Teachers can access every student's notebook, while students can only view their own); Content Library (A read-only space where teachers can share handouts with students); Collaboration Space (A space where everyone in your class can share, organize, and collaborate). Here is the proposed organization of content storage for the interior design course in Class Notebook:

The notebooks of all students must have a uniform data structure, based on the project workflow, with contents equivalent to a design portfolio. Each "channel" (managed by individual supervising teachers) can also set up separate notebooks with "OneNote" and include the notebooks of the students in that channel for easier management by the supervising teachers. All data, including the class notebooks and notebooks on the "channel," are stored on SharePoint.

Organizing data management using URLs combined with Excel represents a practical and straightforward approach to handle and access various types of educational content stored in the cloud (such as on SharePoint). In this model, each document, image, video, PDF file, notebook, etc., stored in the cloud is assigned a unique URL (Uniform Resource Locator) for identification and access. Managing cloud-stored data files can be simplified by maintaining a list of these URLs. For project courses, this method can leverage Excel to organize lists of data URLs for each student's project along with information like the supervising teacher, scores, topics, etc. This setup enablesthe use of Excel functions to display data according to search objectives, such as:Sorting by Scores (Using Excel's sorting functions to organize the list from highest to lowest scores or vice versa); Alphabetical Listing (Sorting the data URLs by student names or project titles in alphabetical order to quickly locate specific entries); Classifying by Class or Group (Organizing projects according to class or group facilitates easier access to projects within specific academic cohorts); Display by Supervising Teacher (Sorting or filtering projects based on the supervising teacher allows for a quick review of projects under specific guidance)(Firgue 4).

This approach not only streamlines the management of educational resources but also enhances accessibility and efficiency in data retrieval and usage. By effectively utilizing Excel's capabilities in conjunction with cloud storage solutions like SharePoint, educators and students can benefit from a more organized, searchable, and manageable digital learning environment. This system can be particularly useful in remote learning settings or in managing large volumes of project submissions, providing a structured and easy-to-navigate repository of educational resources and student submissions.

Data searchmethod

Before determining the data search method, it is crucial to identify who will be conducting the search and the purpose of the search. For example, students may be searching for reference materials, lectures, example projects provided by instructors, or instructors may be looking for specific data in students' project processes. The purpose after finding the data could vary: to reference, download for adjustments, directly edit, or just to transfer data. Accordingly, specific access rights for each type of data should be established. Here are some data search methods on the MSTeam system:Using the Search Tool (This requires establishing a common naming rule for different types of data and should ideally be done on SharePoint, where all organizational data on MSTeam is stored); Data Structure Logic (The way data is organized on the system interface can also serve as a data search method. For a class group, instructors can easily find all data of a student throughout the project process thanks to the organizational structure of data in the Class Notebook, where each student's personal notebook is linked to the class's collective notebook based on the class list).

With the data management organizationusing URLs

combined with Excel, searchers can easily look up all project data for each student by name/class list, or by score from high to low, or by project title (Figure 4). For more complex data search purposes, involving specific data characteristics (e.g., file size, last access time, most interactions, etc.) or for statistical and analytical purposes, a sophisticated management solution for databases is required. This involves using SQL (Structured Query Language) - simply understood as a "filter" capable of collecting information from multiple tables in a database system and setting criteria for the appropriate database management system to follow.

Data sharing methods

To share these document files, creating copies as in the static sharing model currently applied is not necessary; instead, one only needs to send the URLs (links) of those files to the recipient (through any digital communication tool, within or outside the system). To ensure security in sharing URLs, it's advisable to utilize the access management features provided by cloud computing services. This approach not only simplifies the process of sharing but also enhances security by controlling who has access to the data.

3.2. Evaluation Results of Satisfaction Levels After Implementing the Solution.

The goal of the scale is to assess the satisfaction levels of students regarding the use of digital data management systems in an educational environment, including aspects such as features, user interface, accessibility, technical support, and cost-effectiveness. The specifics of the scale are as follows:

User Interface: Ease of use and intuitive; Aesthetic appeal of the interface.

Features and Performance: Richness of features; Processing speed and system response time; Stability and reliability of the system.

Flexible Access and Lookup: Availability of user guides, reference materials; Students and teachers can access records and projects from anywhere with an internet connection, enhancing flexibility in teaching and learning processes.

Management and Storage Efficiency: Easy and quick information classification and search; Providing almost unlimited storage space.

Enhanced Collaboration: Students and teachers can work together on a project, discuss, and share ideas in real-time; Teachers can provide direct comments and edits on student submissions, helping the evaluation and improvement process to be conducted quickly and effectively.

Safety and Security: The level of personal and work data security; Security of the information exchange process.

Cost Savings: How much cost is saved compared to traditional methods; Improvement in work efficiency through the use of the system.

Each evaluation criterion is designed as a question in the survey with a scale ranging from 1 (very dissatisfied) to 5 (very satisfied). Participants may add notes or specific suggestions for each item. The survey is designed to collect information from 120 students about their experiences before and after using the integrated online data management system with the LMS system. The survey results are as follows:

The shift from traditional data management to cloud storage methods has been positively received, with satisfaction levels rising from 0% to 85%. This indicates that the user interface of cloud systems offers advantages in usability and aesthetics. Similarly, there has been a significant improvement in features and performance, with 88% of students satisfied with the cloud system compared to 0% with traditional methods. An average score of 4.5 demonstrates that cloud systems provide many useful features and strong performance. Flexible access and ease of search have also improved significantly, with the average score increasing from 2.3 to 3.8, and satisfaction levels rising from 15% to 75%. The most notable improvement has been in the efficiency of management and storage, with the average score increasing from 2.8 to 4.7, and satisfaction levels rising from 27% to 93%. Compatibility and interoperability between systems have also improved, with satisfaction levels increasing from 18% to 80%. Safety and data security have seen significant improvements, with satisfaction levels rising from 7% to 78%, indicating that students feel more secure with cloud system security. Cost savings are another highlight of the cloud system, with the average score increasing from 1.5 to 4.6, and satisfaction levels rising from 5% to 91%. This shows that cloud systems not only enhance work efficiency but also significantly save costs for students.

From the data above, it is clear that adopting cloud storage methods for data management has brought significant improvements across the board compared to traditional data management. Cloud systems not only provide a good user interface and many powerful features but also enhance safety, security, and cost savings for users. This also reflects the general trend in modern education, where cloud technology is becoming a key tool in improving the quality of education and data management.

Table 2. Student satisfaction assessment results with traditional data management methods and cloud data management methods

Evaluation criteria	Traditional data management		Data management using cloud storage method	
	Average Score	Satisfaction Percentage	Average Score	Satisfaction Percentage
User interface	0	0%	4.3	85%
Features and Performance	0	0%	4.5	88%
Flexible access and lookup	2.3	15%	3.8	75%
Efficient management and storage	2.8	27%	4.7	93%
Interoperability	3.1	18%	4.0	80%
Safety and Security	1.8	7%	3.9	78%
Cost savings	1.5	5%	4.6	91%

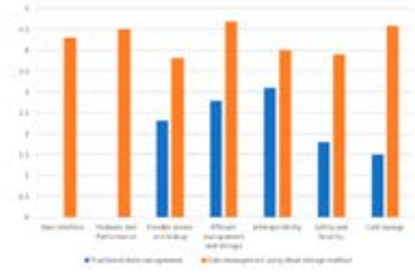

Figure 5. Bar chart comparing student satisfaction results between traditional data management methods and online data management methods.

4. Discussion

We have deployed this solution in a number of trial classes and observed that it significantly improves the data management process and facilitates effective collaboration and interaction between teachers and students. Students can easily access documents, lectures, and project-related data quickly from anywhere, as well as submit work and receive feedback online. Teachers can manage, monitor progress, and assess the quality of students' work more easily. However, attention must be paid to challenges such as issues of privacy and data security, as well as training users to effectively use new technological tools. To address these issues, we recommend developing clear data security policies and organizing training sessions for both teachers and students.

At the departmental level, with "metadata" management, a data management system can be built using SharePoint combined with Power Apps for more complex management features. Managing metadata requires linking with human resource management, managing an entire online training program system, and a digital platform-based training strategy to achieve both automation and personalization. Therefore, the method and organization of metadata management at the departmental level can be developed and constructed in subsequent studies.This approach necessitates a comprehensive system that can handle not just the data itself but also the relationships between data, processes, and people involved in the educational ecosystem. Incorporating SharePoint and Power Apps allows for the creation of a highly customizable and scalable platform that can cater to the specific needs of the department, including:Dynamic Data Structures (Designing data models that reflect the complexity of educational data, including courses, student performances, and resources); Workflow Automation (Automating routine tasks such as enrollment processes, assignment submissions, and feedback mechanisms to improve efficiency); Personalized Learning Paths (Utilizing metadata to offer personalized course recommendations, adaptive learning experiences, and individualized support); Integration Capabilities (Seamlessly integrating with other systems, such as Learning Management Systems (LMS), for a unified educational platform); Access Control and Security (Implementing robust access controls and security measures to protect sensitive information while ensuring that data is accessible to authorized users).

By focusing on metadata management, the department can enhance the organization, accessibility, and effectiveness of its digital educational resources. This strategic approach to data management promises to support the evolution ofonline and digital education, making it more responsive, personalized, and effective for students and faculty alike. Further research and development in this area can lead to innovative solutions that leverage the full potential of digital technologies in higher education.

5. Conclusion

The data management solution for the Interior Design Project course on the LMS system that we proposed has shown numerous benefits, including improved accessibility and management of data, enhanced collaboration and interaction between teachers and students, and increased effectiveness of the teaching and learning process. In the future, we aim to expand this solution beyond the initial trial scope, as well as to integrate new technologies such as artificial intelligence and big data analytics to optimize the management and analysis of educational data.

From the initial results, we believe that the application of information technology in educational data management, especially in the field of interior design, will open up new opportunities to improve the quality of education and facilitate students' comprehensive development of professional skills as well as teamwork and problem-solving skills in the real world./.

References

1. *Yuan, Gao. (2023). Application of Information Technologies in Pedagogy. International journal of education and humanities, doi: 10.54097/ijeh.v8i2.7779.*
2. *Xiaojun, Li. (2022). Innovation and Development of University Education Management Informationization in the Big Data Environment. Scientific Programming, doi: 10.1155/2022/7542067*
3. *Trang T.N.T., Vu N.M. (2023).. Application of online training management system for interior design project modules.*
4. *Katarzyna, Biernacka., Kerstin, Helbig., Petra, Buchholz. (2021). Adaptable Methods for Training in Research Data Management. Data Science Journal, doi: 10.5334/DSJ-2021-014.*
5. *Lucas, Matheus, do, Prado, Gomes. (2023). Design and Implementation of Graduate Education Data Management System Based on B/S Structure. doi: 10.1007/978-981-99-1428-9_114.*
6. *Quan, Guan. (2022). Data Governance Framework as Initiative for Higher Educational Organisation. doi: 10.1109/ectidamtncon53731.2022.9720396.*
7. *Jane, Greenberg., Mingfang, Wu., Wei, Liu., Fenghong, Liu. (2023). Metadata as Data Intelligence. Data intelligence, doi: 10.1162/dint_e_00212*
8. *Rosie, Higman., Marta, Teperek., Danny, Kingsley. (2018). Creating a Community of Data Champions. International Journal of Digital Curation, doi: 10.2218/IJDC.V12I2.562*