

PSU-DOST 1 Food Innovation Center Management System

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Abstract- The PSU-DOST 1 Food Innovation Center (FIC) at Pangasinan State University - Bayambang Campus relied on paper-based and manually assisted processes for research and development documentation, project monitoring, inventory recording, and information retrieval. This study designed and developed a web-based management system intended to improve the organization, accessibility, and monitoring of these records and processes. A descriptive research design was used, supported by unstructured interviews with FIC personnel and purposive selection of three system testers composed of one secretary and two researchers. Rapid Application Development (RAD) guided the requirements planning, user design, rapid construction, and cutover stages. The system was developed using HTML, CSS, Bootstrap, JavaScript, PHP, and MySQL and incorporated modules for user, sponsor and client information, contracts, research and development files, project monitoring, inventory, and report generation. Usability was evaluated through an adapted Software Usability Measurement Inventory (SUMI) covering efficiency, affect, helpfulness, control, and learnability. Results showed weighted means of 4.03, 3.90, 3.87, 3.83, and 3.77, respectively, with an overall mean of 3.88, interpreted as usable. The developed system addressed the major problems identified in the existing process, particularly document organization, data retrieval, project progress tracking, inventory management, and report preparation. The findings support the use of the system as a computerized alternative to the Center's previous paper-based procedures, while continued software updating is recommended to respond to future user requirements.

Keywords- Food Innovation Center, management information system, project monitoring, inventory management, Rapid Application Development, SUMI, usability

INTRODUCTION

Automation and computerized information systems have become important tools for organizations that need to manage growing volumes of information and improve the efficiency of routine work. Beier et al. (2018) discussed the expanding role of digital technologies in industry, while Chahal and Patel (2022) noted that traditional methods are increasingly challenged by technological development and the growth of digital materials. Innovation centers within universities likewise depend on organized processes and information to support their missions, and innovation itself may be understood as an outcome, a process, and a mindset (Kahn, 2018).

The value of innovation is closely connected with practical problem solving and the improvement of existing processes. Phan (2019) associated organizational innovation with performance, while

Muthoni (2021) emphasized the importance of technological innovation in business growth. In information-intensive environments, however, innovation can be constrained when records, project files, and inventories are handled through fragmented manual procedures.

The PSU-DOST 1 Food Innovation Center at Pangasinan State University - Bayambang Campus previously relied heavily on paper-based records in the Research and Development Unit and the Database, Documentation, and Project Monitoring Unit. The original manuscript described substantial paperwork, limited personnel, fragmented project records, slow retrieval of information, and difficulty monitoring project progress. These conditions were consistent with literature describing the drawbacks of paper-based

systems, including time consumption, document duplication, storage problems, and the risk of human error in inventory and record management (Owan & Bassey, 2018; Touray, 2021; Wynn, 2021).

Computerized systems can centralize records, speed up retrieval, and support more systematic monitoring. Requirements gathering and user participation are important in developing such systems because the resulting features must reflect the work users actually perform (Jeong & Kim, 2021; Sofyan et al., 2020). Usability evaluation is equally important for determining whether a completed system is understandable, efficient, and acceptable to intended users (Geisen & Bergstrom, 2017; Aiyegbusi, 2019).

Against this background, the study developed a web-based management system for the PSU-DOST 1 Food Innovation Center. The system was intended to support research and development documentation, project monitoring, stakeholder information, contracts, inventory management, and report generation while reducing dependence on manual documentation.

OBJECTIVE OF THE STUDY

The main objective of the study was to create a management system for the PSU-DOST 1 Food Innovation Center that would facilitate the efficient maintenance of vital records, progress monitoring, and quick retrieval of relevant information.

1. Describe the existing process of the paper-based system.
2. Determine the issues experienced with the current system.
3. Identify the features that should be incorporated to maximize the system's functionality.
4. Evaluate the usability of the developed system in terms of efficiency, affect, helpfulness, control, and learnability.

MATERIALS AND METHODS

Research Design

The study used a descriptive research design to document the existing process, identify problems,

determine system requirements, and evaluate the completed system. The original project described, recorded, analyzed, and interpreted the conditions observed at the Food Innovation Center. This approach was consistent with the descriptive research framework discussed by McCombes (2021).

Study Locale and Participants

The study was conducted at the DOST 1 Food Innovation Center located at Pangasinan State University - Bayambang Campus, Bayambang, Pangasinan. Personnel from the Research and Development Unit and the Database, Documentation, and Progress Monitoring Unit were involved in the requirements-gathering activities. For usability testing, purposive sampling was used to select three intended users of the system: one secretary and two researchers. Purposive sampling was selected because the participants had direct knowledge and experience of the Center's procedures, consistent with the sampling description cited from Sharma (2020).

Data-Gathering Instruments

Unstructured interviews were used for Objectives 1 and 2 to document the paper-based process and identify the problems encountered by employees. For Objective 3, system prototypes were used to present and refine the proposed interfaces and functionality. For Objective 4, the study adapted a printed SUMI-based questionnaire from Veenendaal (2019), focusing on efficiency, affect, helpfulness, control, and learnability.

Table 1. Likert Scale for Usability Testing

Numerical Equivalent	Weighted Value	Descriptive Equivalent	Descriptive Interpretation
5	4.21 - 5.0	Excellent	Usable
4	3.41 - 4.20	Good	Usable
3	2.61 - 3.40	Fair	Usable
2	1.81 - 2.60	Poor	Not Usable
1	1.00 - 1.80	Very Poor	Not Usable

Responses with weighted values from 2.61 to 5.00 were interpreted as usable, whereas responses from 1.00 to 2.60 were interpreted as not usable. Average weighted means were computed for each usability dimension and for the overall system.

System Development Procedure

Rapid Application Development (RAD) was used as the system development model. The four stages applied were Requirements Planning, User Design, Rapid Construction, and Cutover. During requirements planning, the proponents interviewed stakeholders and identified the information and operational needs of the Center. User Design translated the gathered requirements into interface, database, and workflow designs. Rapid Construction involved iterative prototyping and system coding, while Cutover covered final refinement, testing, and preparation for use.

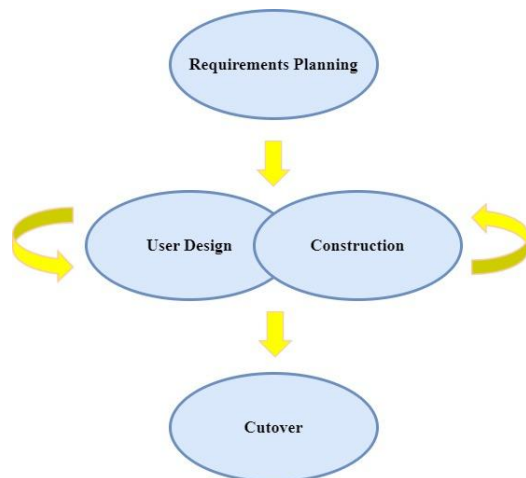


Figure 1. Rapid Application Development model used in the project.

Development Tools and Technical Requirements

The system was implemented as a web-based application. The source manuscript reports the use of HTML, CSS, Bootstrap, JavaScript, PHP, and MySQL. Sublime Text was used as the code editor, InVision supported interface prototyping, and LucidChart was used to create the system diagrams. A web server was required to host and deliver the system to intended users.

Table 2. Software Requirements for System Development

Software	Specification
Operating System	Windows 10
User Interface Design	CSS, Bootstrap, InVision
Text Editor	Sublime Text
Programming Language	PHP, JavaScript
Database	MySQL

Table 3. Hardware Requirements for System Development

Hardware Component	Specification
Processor	Intel i5 11th Gen
RAM	8 GB
Storage	256 GB SSD
GPU	Intel Iris Xe Graphics

Table 4. Software Requirements for System Deployment

Software	Specification
Operating System	Windows 10
Web Browser	Google Chrome, MS Edge

Table 5. Hardware Requirements for System Deployment

Hardware Component	Specification
Processor	Intel i5 11th Gen
Memory	8 GB of RAM
Storage	200 GB SSD
Peripheral Device	Mouse

Data Analysis

Interview data were translated into a Data Flow Diagram to represent the existing process. An Ishikawa diagram was used to organize and analyze problems associated with the manual process. An Entity Relationship Diagram and proposed Data Flow Diagrams were used to define the database structure and system workflow. Usability responses were summarized through average weighted means using the study's five-point interpretation scale.

RESULTS AND DISCUSSION

Existing Process and Problems in the Paper-Based System

The existing process involved multiple units exchanging research and development information, records, inquiry details, sponsor and client information, contracts, and operational information. Because the process relied on paper files and manually maintained records, information handling depended heavily on employee effort and physical document storage.

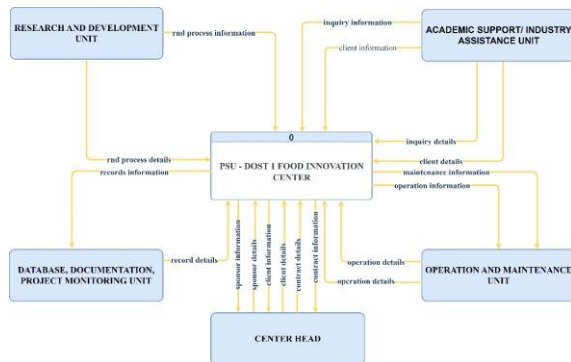


Figure 2. Level 0 Data Flow Diagram of the existing PSU-DOST 1 Food Innovation Center process.

The analysis identified document storage, project progress monitoring, staffing limitations, workspace consumption, duplicated or dispersed information, and paper-based methods as major contributors to poor manual documentation. These concerns are consistent with literature reporting that manual systems may require more time, create redundant records, and increase the risk of errors in inventory and document management (Touray, 2021; Wynn, 2021).

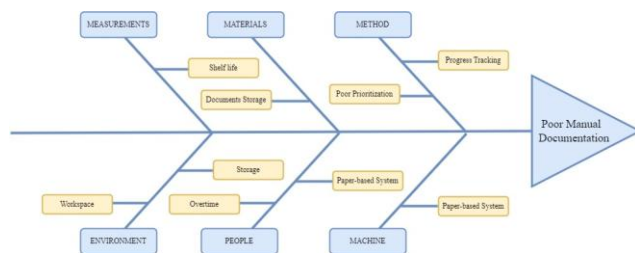


Figure 3. Ishikawa diagram of problems encountered in the existing system.

Features and Structure of the Developed System

The developed system introduced role-based access for an Administrator and Researchers. It stores users, sponsors, clients, contracts, projects, and inventory information in a centralized database. The Administrator can manage records, stock inventory, project information, and reports, while Researchers can access the research and development process and project-related functions according to their privileges.

The Research and Development modules cover Project Proposal, Budget Proposal, Experiment, Sensory Evaluation, Terminal Report, Package of Technology, Intellectual Property Application, and Technology Transfer. Users can upload, download, and print project files, while project phases and sub-phases can be monitored through completion percentages. Inventory functions cover equipment, auxiliaries, supplies, and ingredients, and the system supports report generation for stocks and projects.

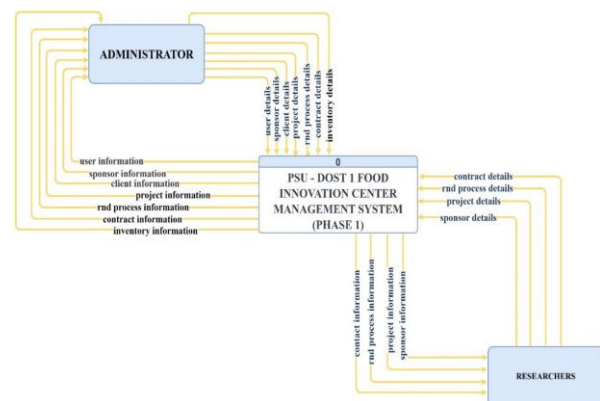


Figure 4. Level 0 Data Flow Diagram of the proposed PSU-DOST 1 Food Innovation Center Management System.



of the time when I use this software.		
It is relatively easy to move from one part of a task to another.	4.33	Usable
Average	4.03	Usable
Weighted Mean		

Efficiency obtained an average weighted mean of 4.03, interpreted as usable. This was the highest among the five dimensions, indicating that respondents generally regarded the system as responsive, helpful to their work, and relatively easy to move through. The source manuscript compared this finding with Thoyyibah et al. (2020), whose SUMI-based evaluation likewise reported above-average efficiency.

Table 8. Usability Assessment in Terms of Affect

Questions	Mean Score	Descriptive Interpretation
I know that I am using the right function.	3.67	Usable
Working with this software is satisfying.	4.00	Usable
The way that system information is presented is clear and understandable.	4.33	Usable
I feel safe using all the functions.	3.33	Usable
The software documentation is very informative.	4.00	Usable
This software does not disrupt the way I normally like to arrange my work.	4.33	Usable
Working with this software is	3.67	Usable

Questions	Mean Score	Descriptive Interpretation
mentally stimulating.		
There is enough information on the screen when it's needed.	4.33	Usable
I feel in command of this software when I am using it.	3.33	Usable
I prefer to stick to the functions that I know best.	4.00	Usable
Average Weighted Mean	3.90	Usable

Affect received a weighted mean of 3.90 and was interpreted as usable. Respondents generally indicated satisfaction with the software and clarity of presented information. The manuscript related this result to the usability findings of Alotaibi (2020).

Table 9. Usability Assessment in Terms of Helpfulness

Questions	Mean Score	Descriptive Interpretation
I think this software is consistent.	4.00	Usable
I would like to use this software every day.	4.00	Usable
I can understand and act on the information provided by this software.	3.33	Usable
This software is not awkward when I want to do something which is not standard.	4.00	Usable
There is enough to read before you	3.67	Usable

can use the software.		
Tasks can be performed in a straightforward manner using this software.	4.33	Usable
Using this software is not frustrating.	3.67	Usable
The software has helped me overcome any problems I have had in using it.	3.33	Usable
The speed of this software is fast enough.	4.33	Usable
I do not have to keep looking back at the guides.	4.00	Usable
Average	3.87	Usable
Weighted Mean		

Helpfulness obtained a weighted mean of 3.87 and was interpreted as usable. The results indicate that the users generally found tasks straightforward and the system sufficiently supportive in performing intended activities. The manuscript discussed this alongside the SUMI findings reported by Lu et al. (2020).

Table 10. Usability Assessment in Terms of Control

Questions	Mean Score	Descriptive Interpretation
It is obvious that user needs have been fully taken into consideration.	3.67	Usable
There are no instances when I have felt quite tense in using this software	4.00	Usable
The organization of the menus	3.67	Usable

Questions	Mean Score	Descriptive Interpretation
seems quite logical.		
The software allows the user to be economical with keystrokes.	4.00	Usable
Learning how to use new functions is easy.	4.33	Usable
There are a few steps required to get something to work.	3.33	Usable
I think this software does not give me a headache.	3.67	Usable
Error messages are adequate.	4.00	Usable
It is easy to make the software do exactly what you want.	4.33	Usable
I can learn to use all that is offered in this software.	3.33	Usable
Average	3.83	Usable
Weighted Mean		

Control obtained a weighted mean of 3.83, also interpreted as usable. The responses suggest that users generally felt able to direct system actions and understood the menu structure and available functions. This was discussed in the source study in relation to the usability results of Thoyyibah (2020).

Table 11. Usability Assessment in Terms of Learnability

Questions	Mean Score	Descriptive Interpretation
The software has always done	3.33	Usable

what I was expecting.		
The software presents itself in a very attractive way.	4.33	Usable
Either the amount or quality of the help information varies across the system.	3.33	Usable
It is relatively easy to move from one part of a task to another.	4.33	Usable
It is not easy to forget how to do things with this software.	3.33	Usable
This software does not occasionally behave in a way that can't be understood.	4.00	Usable
This software is not awkward.	3.67	Usable
It is easy to see briefly what the options are at each stage.	4.00	Usable
Getting data files in and out of the system is easy.	3.33	Usable
I no longer must look for assistance most time when I use this software.	4.00	Usable
Average Weighted Mean	3.77	Usable

Learnability obtained a weighted mean of 3.77 and remained within the usable range. Although it was the lowest of the five category means, users still reported that movement between tasks and learning system functions were generally manageable. The manuscript contrasted this finding with the lower learnability result reported by Jeddi et al. (2020).

Table 12. Overall Usability Assessment

Category	Weighted Mean	Interpretation
Efficiency	4.03	Usable
Affect	3.90	Usable
Helpfulness	3.87	Usable
Control	3.83	Usable
Learnability	3.77	Usable
Overall Mean	3.88	Usable

The overall weighted mean was 3.88, interpreted as usable. All five categories met the study's usability criterion, with efficiency scoring highest and learnability scoring lowest. The overall finding was consistent with the positive usability evaluations cited in the source manuscript, including Nik Ahmad et al. (2021) and Khairunisa et al. (2020). Taken together, the results indicate that the developed system satisfied the intended users' basic expectations for the evaluated usability dimensions.

Discussion of the Study Objectives

For the first objective, the study documented a largely manual workflow involving research and development files, inventories, employee and stakeholder information, contracts, and project records. For the second objective, the identified problems centered on record keeping, data retrieval, project progress tracking, document organization, and paper-based inventory management. For the third objective, these problems were translated into modules for centralized information management, R&D file handling, project monitoring, inventory, and report generation. For the fourth objective, the usability assessment produced an overall mean of 3.88, placing the system within the study's usable range.

CONCLUSION AND RECOMMENDATIONS

CONCLUSION

The study developed a web-based management system that provides the PSU-DOST 1 Food Innovation Center with a more organized means of handling user, sponsor, client, contract, research and development, project, inventory, and report information than the previous paper-based process.

The findings show that the system directly addressed the major operational problems identified during requirements gathering, particularly disorganized document preservation, time-consuming data retrieval, manual project progress monitoring, paper-based inventory handling, and report generation.

The functionality incorporated into the system reflected the Center's documented requirements. The completed system was rated usable across all five evaluated dimensions, with an overall weighted mean of 3.88.

RECOMMENDATIONS

1. Use the PSU-DOST 1 Food Innovation Center Management System to support the Center's transition from paper-based procedures to computerized record, project, and inventory management.
2. Update and maintain the software as user requirements and operational needs change.
3. Use the RAD approach for future systems of a similar nature when rapid prototyping and continuous user feedback are appropriate.
4. Continue usability evaluation after deployment, particularly when major features or workflows are revised.

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