

DEVELOPMENT AND EFFECTIVENESS OF DIGITAL APPLICATION AS THE NEW SYSTEM TO ORGANIZE PRACTICUM MATERIALS AT SCHOOL OF PROSTHETICS ORTHOTICS IN POLYTECHNIC HEALTH SCIENCES JAKARTA I

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Abstract

Introduction: The Prosthetic Orthotics (PO) School at Health Polytechnic Jakarta I relies on practical skills and various materials in its labs/workshops for device fabrication. To enhance logistics management, this study proposes a new digital application leveraging digital technology's efficiency. The aim is to improve the organization of logistics at the PO school, given the diversity and volume of practicum materials. The study involves developing and evaluating the effectiveness of the new digital application. **Method:** Using a mixed methods approach, the study employed a focus group discussion (FGD) to gather insights from managerial-level participants and student users. FGD participants discussed the expected design, features, and functions of the new digital management system, as they are actively involved in logistic management. The study also evaluated the new system by comparing it with the old manual system. **Results and Conclusion:** Participants expressed expectations for a digital application with user-friendly features, easy gadget access, access authorization, automation of stock tracking, and a warning system for stock shortages. The developed digital management system aligned with these expectations and demonstrated superior effectiveness when compared to the manual system in managing a diverse range of practicum materials at the PO School of Health Polytechnic Jakarta I. Time constraints during the COVID-19 lockdown limited the elaboration of additional key features, suggesting a need for future studies to explore other aspects based on the school's evolving needs.



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Introduction

Prosthesis and Orthosis is an assistive device that could help to enhance physical function thus improving mobility and quality of life of people with disabilities (Ramstrand et al., 2021). These devices could be prefabricated or customized by a Prosthetist Orthotist Professional, the latter provides the best fit and satisfaction but need a wide variety of materials and components to make it (Wang et al., 2020). Becoming a Prosthetist Orthotist professional requires a formal education minimum of three years studying prosthetics and orthotics (PO) sciences and their application. This education could be vocational/ applied sciences or a Bachelor's. In Indonesia, PO education is still emerging and only two PO schools all over the country namely Health Polytechnic Jakarta I and Health Polytechnic Surakarta are under the Ministry of Health Republic of Indonesia. Both PO schools provide vocational/ applied sciences in PO sciences.

Prosthetics Orthotics (PO) schools including the PO Department at Health Polytechnic Jakarta I provide training for students that involve practical skills at the laboratories which requires a wide range of materials and components available to support students' learning experience in fabricating prostheses/orthoses. Effective teaching and learning in vocational education (i.e. PO education) relies on many factors including excellent facilities provision such as materials and components availability (Audu et al., 2013). Therefore, assurance of materials availability for teaching-learning purposes is important to be considered by the management level of the PO vocational school where this may be achieved through good management of materials storage. Furthermore, well organization of consumable materials and components in PO schools is not only for quality education purposes but also to manage the overestimate or underestimate cost to buy all materials (Peine et al., 2019). If all practicum materials were not well recorded and documented, the management would not be able to accurately identify unit cost materials and their usage which may lead to underbuying which may jeopardize students' hand skills, or overbuying which is not cost-effective (Peine et al., 2019). It is important to ensure that the practicum materials used in PO vocational education are well-managed using an efficient and effective system.

Therefore, the management level holds the key role in good managerial of workshops, labs, and materials by establishing an efficient and effective management system (Osuntuyi, 2020).

A preliminary survey of the managerial level of the PO department at Health Polytechnic Jakarta I revealed that the management of materials was performed manually (i.e., excel sheets and forms) which may compromise its efficiency and efficacy considering the large number of practicum materials that is used at the PO school. This manual system involves management level (i.e., school top management) and users (i.e., students and technicians) in its daily operations. From the preliminary survey, it is reported that complaints from both the managerial level and users with this manual recording system such as time-consuming recapitulation of material usage periodically and in and outflow of material out the storage were slowly moved. Coordinator Nowadays, revolution industry 4.0 and digitization are believed to an effective and efficient emerging technologies that may apply in multiple aspects including in the education (Ghobakhloo, 2020; Haleem et al., 2022). Several studies have reported the efficacy and efficiency of using digital automation technology in managing and recording the supply system including in the vocational education (Efimova & Tsenzharic, 2008; Mukred & Yusof, 2015; Sutirman et al., 2022). The success of digital technology in supply chain management may be as effective if applied to PO school's practicum materials organization because they both have similar characteristics. Therefore, there is a need to develop a new management system to replace the old system (i.e., manual record) at PO Schools, Health Polytechnic Jakarta I.

The purpose of this study was to develop a new digital application that is expected to serve as a tool to manage a wide variety and many practicum materials used at PO Schools of Health Polytechnic Jakarta I, and further evaluate its effectiveness. Therefore, the primary objective of this study was to develop and design a new management system that leverages digital technology. The development of this new system considered and accommodated the needs of both the managerial level and users as parties involved in its operations. The secondary objective of this study was to evaluate the effectiveness of this digital system record and



compare it with the old system. We hypothesized that the digital application management system was found to be more effective and efficient than the current practicum material management system (i.e., manual record).

Methods

This research utilized a descriptive mixed methods study design. A qualitative study design by means of Focus Group Discussion (FGD) was used to answer the primary objective. Likert in Bishop & Herron, (2015) explained that a Likert-type questionnaire can be used to quantify people's perceptions of issues or matters. Thus, the quantitative approach was used to measure the secondary objective of this study which was to evaluate the effectiveness of the new digital system using the Likert Items.

a. Primary Objective (Design and Development of Digital Application of Practicum Material Management System)

The digital application was developed and designed according to the data that were collected and transcribed through exploration in the FGD session with the participants. The FGD served as a medium to identify the key features of the newly developed practicum materials management system that emerged from participants. In this FGD, both the managerial level and users were involved as participants (N=8). We chose four (4) relevant participants to represent managerial group and four (4) participant to represent users group. The small number of participants was due to the constraints of lockdown period during COVID-19. These groups of participants were selected because they all have knowledge about the functions and are involved in the loops of daily operations of the current logistic management systems at the PO Department, Health Polytechnic Jakarta I. Therefore, it was reasonable to include these selection of participants in the development of the new management systems. The managers at Health Polytechnic Jakarta I PO Schools were defined as the head of the department, secretary of the department, coordinator of academic affairs, and coordinator of lab and workshops. These people are the ones who are responsible and in charge of making budget plans for procurement, monitoring, and evaluating the practicum materials that are needed in the teaching-learning process at PO School of Health Polytechnic Jakarta I. The users

were defined as students and technicians. The FGD was conducted in separate homogenous groups to minimize bias and limited expression of superiority and inferiority between users and the management level. Both users and management levels received similar structured questions that were used as guidance for the discussion's flow. The list of questions was constructed as an open-ended question to allow participants to express and explore their own experiences, opinions, and input related to the practicum material management system. The FGD was conducted on 29 April 2020 during the COVID-19 lockdown and before it, all participants received and signed the informed consent. During this FGD, all key features that were wished to have in the new management systems were discussed thoroughly among participants. The FGD was recorded for transcription purposes. Through data transcription from FGD, a design and the key features of the new system were identified and used as a reference to develop the digital application for the practicum material management system. The application data developer was involved to develop and design the digital application accordingly. It took approximately two months to register all practicum materials and integrated all key features into the digital application systems. The newly developed management system was completed and ready to use in the end of June 2020. This digital application then was introduced and disseminated to the users and managers. The familiarization and training to the new system took place approximately around one month. Furthermore, the new system was implemented in the daily operation to manage the practicum materials and components usage in the store and workshop at PO School of Health Polytechnic Jakarta I.

b. Secondary Objective (Effectiveness of Digital Application of Practicum Material Management)

A quantitative study design was used to answer the secondary research objective which was to evaluate the effectiveness of new and old management systems, a structured questionnaire was utilized. It was a challenge to find a suitable questionnaire that accommodated the needs of practicum material for PO school. Therefore, the question was structured accordingly and validated only through experts due to time restrictions during



COVID-19 in 2020. The same participants (N=8) involved in the FGD were asked to fill the questionnaire. The participants filled this structured questionnaire to evaluate the effectiveness of the old and new systems. There were five questions used in the questionnaire that measure the following indicators to describe the effectiveness of a system; 1) The management of consumables materials can meet the desired objectives/results/outcomes; 2) the management system/management of consumables materials has all the expected objectives/outcomes related to BHP governance; 3) all objectives/outcomes expected from the management system of consumables materials successfully achieved following a predetermined time; 4) the management systems of consumables materials has had and developed a work plan to assist in achieving any results/goals/outcomes expected to be produced by it. 5) the management system has a predetermined indicator for each of the goals/outcomes/outcomes expected by it so that the process of achieving the desired outcomes/results/objectives can be monitored continuously. This questionnaire used Likert items with integration of radio button on each question namely strongly agree, agree, neutral, disagree and strongly disagree. The participants were asked to rate each item of the question accordingly in order to measure the effectiveness of the newly developed systems of logistics management (i.e., digital application) and the old one (i.e., manual). All participants were asked to fill out the questionnaire and rate their perceived effectiveness when using the manual system to organize practicum materials. This first session of filling questionnaire serve as the pretest. This pretest was conducted on 30th April 2020, one day after the FGD. After the new system (i.e., digital application) was developed and implemented, the participants again were asked to answer the same questionnaire as the pretest and this time was to measure the effectiveness of the newly developed digital management system. This second questionnaire's completion served as a posttest. It was conducted on 30th September 2020, one month after the digital management system was implemented and used as a daily operation to manage practicum materials at PO School of Health Polytechnic Jakarta I. After having the results of the pretest and post-test, further statistical analysis was performed to measure the effectiveness of the new digital application when

compared with the old manual management systems. Because of the small number of participants, the normality test was run by using the Shapiro-Wilk method which was reported to be the most sensitive to analyze data normality of a small sample size (Nor Aishah Ahad et al., 2011). Because the data was not normally distributed, the t-test analysis was performed by using a non-parametric tool named the Wilcoxon Signed ranked Test (MacFarland & Yates, 2016).

Results

Participants (N=8) in this study were involved to answer the primary and secondary objectives of this study. Participants' characteristics and demographics are described in Table 1 below.

Table 1. Participants' Characteristics and Demographics

No	Participants	f	Percentage (%)
Gender			
1	Male	3	37.5
2	Female	5	62.5
Total		8	100.0
Age			
1	13 - 19 year old	1	12.5
2	20 - 29 year old	3	37.5
3	30 – 39 year old	2	25
4	> 40 year old	2	25
Total		8	100.0

The data in frequency and percentage (%)

a. Result of The Primary Objective (Design and Development of Digital Application of Practicum Material Management System)

One of the aims of this study was to design and develop a new management system that could serve as an effective tool by leveraging digital technology for its application. The key features of the new management system were collected and identified through FGD with the participants. The results of data transcriptions of



FGD extracted from the participants are as follows; i) participants wished to have a digital application system that is accessible through gadgets; ii) limited access only to the authorized person; iii) integrated with the automation system to track the supply/consumption; iv) has stocks shortage warning system; v) has automatic periodic usage summary report and recapitulation to identify unit cost and consumption rates.

The summary of key features of the new digital application was developed in collaboration with the application developer. The transcribed data of FGD about the key aspects of the new digital systems to manage the practicum material were featured into this new system. The system was on a web browser basis and made to be accessible by different gadgets and computers (i.e. desktop and laptop). To accommodate the access limit only for the authorized, the landing page to the system requires a username and password to enter the system as shown in Figure 1 below:



Figure 1. Authorization Access on the Landing Page of the Digital System

The new system also integrated supply/consumption that was automatically recorded and documented by the new system as shown in Figure 2.

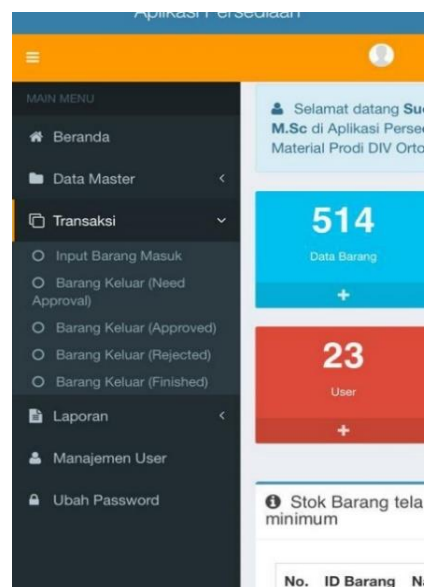


Figure 2. Supply and Consumption Track Feature of Digital System

Moreover, the stock shortage warning system was also incorporated into this digital application to ensure materials availability for the teaching-learning process as seen below in Figure 3.

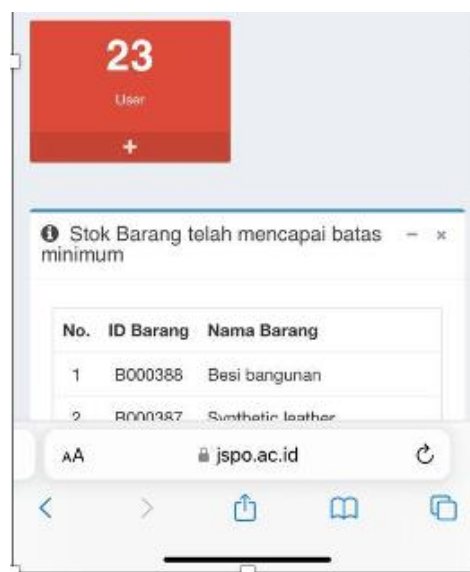


Figure 3. Warning System of Supply Shortage

Finally, the automatic recapitulation and usage report was also made possible with this new system (Figure 4) and has report printing feature.



Figure 4. Periodic Recapitulation and Usage Report

b. Result of The Secondary Objective (Effectiveness of Digital Application of Practicum Material Management)

The result of our secondary objective is shown in Table 2 below:

Table 2. Comparative Between Manual and Digital Application Management Systems

Variable	f	Mean	SD	P-Value
Manual Management System	8	9.63	1.302	0.011
Digital Application Management System	8	16.13	1.727	

The table above shows that the digital application was significantly more effective than the manual one with a p-value of 0.011. The mean score effectiveness of the digital system was also much greater than the manual system according to the participants.

Discussion

The purpose of this study was to design and develop a new system to manage practicum material by proposing a digital application that was reported as an effective and efficient system by several studies to manage storage in the vocational education (Efimova & Tsenzharic, 2008; Mukred & Yusof, 2015; Sutirman et al., 2022). Furthermore, the effectiveness of the digital application management system and the manual management system were evaluated.

The Development of Digital Application for Practicum Materials Management System

In this study, the development and key features of the digital management system were constructed and designed by following the FGD transcription results collected from participants that consist of the managers and users at the PO Department, Health Polytechnic Jakarta I. From the FGD, there were five important features that were expressed by the participants. First, participants wished to have a digital system that is accessible by different gadgets. The purpose of this is so that the authorized person can remotely monitor the stock flow and approve practicum materials requests by the users from anywhere without a signature requirement from the request form like the old system had. One participant stated that "... allows easy access like through cellphone so that I can monitor the supply flow from anywhere because I have my phone with me most of the time". Another managerial-level participant also expressed that "... the application system can assist with remote approval." Second, the participants pointed out that the system should only be accessed by the authorized person for easy control and coordination. These results are construed by another study that reported easy and controlled access protocol found to be more effective in electronic medical records thus providing more efficient healthcare for patients (Dubovitskaya et al., 2020; Fan et al., 2018). Third, for easier identification of supply availability and



usage, participants expected the new system would integrate the automation of supply/consumption tracks. As expressed by the managerial level participant "...supply and usage records are made in real-time feedback". Fourth, in addition, the system should have a warning system for shortage of materials. According to participants, these features will help them to efficiently plan the procurement according to their needs thus ensuring practicum material availability for learning purposes so that students can effectively achieve their learning outcomes. This notion was supported by the study that outlined the importance of proper supply control in order to avoid oversupply (i.e. cost inefficiency) and undersupply that may compromise the operation that needs particular material ready for use (Peine et al., 2019). Finally, the management level anticipated the new system could help in performing supply consumption recapitulation every semester where the record could be printed for preparing periodic reports. Furthermore, this report may help to identify the unit cost of each practicum material and plan the procurement according to the report. As quoted from the statement of one participant at the top management level "...related to monitoring and evaluation for procurement of goods which need to continuously and periodically performed".

The FGD transcriptions showed that at the managerial level of the PO School of Health Polytechnic Jakarta I have a good understanding of what is needed to perform good governance and management of practicum material to ensure good quality of vocational education, particularly in PO sciences and technical skills. This statement is well aligned with another study that expressed a good management is where the authorized person at the managerial level understands their task and performs it with efficient and effective (Osuntuyi, 2020).

The Effectiveness of Digital Application of Practicum Material Management System

The results above reported that the digital management system was found to be significantly more efficient and effective than the manual record management system. This result is well supported by

the study of Brundin-Mather et al. (2018) which revealed manual records prone to error whereas digital systems provide more reliable and high-quality data. The digital application provides more accurate data due to it using a computerized system. In the medical field, digital scanning was reported to have a more accurate scan of the intraoral area (Ender & Mehl, 2013). System manual registration and management of practicum material may consume longer time than a digital system where the recapitulation was performed with an automation system. The automation provides real-time feedback whereas the manual may take time to show feedback only after the supply registration has been accomplished. Accessibility from anywhere holds superiority in granting access to a material request by the user, meanwhile, the manual request form needs the authorized person's signature to give permission for supply outflow. When the authority was not present, this may slow the learning process because the material was held in storage until the request form was approved by signature. Moreover, the feature of supply consumption and shortage warning helps to ensure the availability of materials and easy planning of procurement timing for the management level. In addition, the automation recapitulation may be helpful to prepare periodic reports for the superior about the unit cost and is useful for budget planning of practicum material procurement. These features that are integrated into the new system were developed and designed according to the expectations of the participants. Therefore, the efficiency and efficacy of digital applications were prominently felt because they translated the needs of the management level and enabled them to plan, monitor, and evaluate through this digital application.

Conclusions and Recommendations

This study developed and designed a digital application to manage practicum materials at PO Department Polytechnic Health Jakarta I to address the possible errors that may occur with a manual system. This new digital system fills the gaps of



manual registration of supply in the storage such as longer time to make reports and recapitulation. Furthermore, all participants wished to have a digital system to manage materials and components that have easy access, secured, and have many automation features for in and out/usage flows of the materials including periodical report support.

Both groups, users and managerial level agreed that the digital management system is more effective and efficient when compared to the manual one and this result is well aligned with several studies such as.

The limitation of this study was the small number of participants due to FGD being conducted during the lockdown period of the pandemic Covid-19. Therefore more aspects and features in the digital system were not elaborated further because of the lockdown constraints. In future studies, it is suggested to investigate and elaborate further on other key aspects and features of the digital management systems following the dynamic of needs at PO School of Health Polytechnic Jakarta I. For example, the feature of return material tracking in case of overestimated requests from the users. In addition, the development of a standard operation procedure (SOP) to control this digital system is also needed in further study.

References

- Audu, R., Umar, I. Y., & Idris, A. M. (2013). *Facilities Provision and Maintenance: Necessity for Effective Teaching and Learning in Technical Vocational Education*. <http://repository.futminna.edu.ng:8080/jspui/handle/123456789/2815>
- Bishop, P. A., & Herron, R. L. (2015). Use and Misuse of the Likert Item Responses and Other Ordinal Measures. *International Journal of Exercise Science*, 8(3), 297–302.
- Brundin-Mather, R., Soo, A., Zuege, D. J., Niven, D. J., Fiest, K., Doig, C. J., Zygun, D., Boyd, J. M., Parsons Leigh, J., Bagshaw, S. M., & Stelfox, H. T. (2018). Secondary EMR data for quality improvement and research: A comparison of manual and electronic data collection from an integrated critical care electronic medical record system. *Journal of Critical Care*, 47, 295–301. <https://doi.org/10.1016/j.jcrc.2018.07.021>
- Dubovitskaya, A., Baig, F., Xu, Z., Shukla, R., Zambani, P. S., Swaminathan, A., Jahangir, M. M., Chowdhry, K., Lachhani, R., Idnani, N., Schumacher, M., Aberer, K., Stoller, S. D., Ryu, S., & Wang, F. (2020). ACTION-EHR: Patient-Centric Blockchain-Based Electronic Health Record Data Management for Cancer Care. *Journal of Medical Internet Research*, 22(8), e13598. <https://doi.org/10.2196/13598>
- Efimova, E. G., & Tsenzharic, M. K. (2008). *Electronic logistics services in Russia: The bridge to United Europe*. <https://www.elibrary.ru/item.asp?id=25390846>
- Ender, A., & Mehl, A. (2013). Influence of scanning strategies on the accuracy of digital intraoral scanning systems. *International Journal of Computerized Dentistry*, 16(1), 11–21.
- Fan, K., Wang, S., Ren, Y., Li, H., & Yang, Y. (2018). MedBlock: Efficient and Secure Medical Data Sharing Via Blockchain. *Journal of Medical Systems*, 42(8), 136. <https://doi.org/10.1007/s10916-018-0993-7>
- Ghobakhloo, M. (2020). Industry 4.0, digitization, and opportunities for sustainability. *Journal of Cleaner Production*, 252, 119869. <https://doi.org/10.1016/j.jclepro.2019.119869>
- Haleem, A., Javaid, M., Qadri, M. A., & Suman, R. (2022). Understanding the role of digital technologies in education: A review. *Sustainable Operations and Computers*, 3, 275–285. <https://doi.org/10.1016/j.susoc.2022.05.004>
- MacFarland, T. W., & Yates, J. M. (2016). Wilcoxon Matched-Pairs Signed-Ranks Test. In T. W. MacFarland & J. M. Yates (Eds.), *Introduction to Nonparametric Statistics for the Biological Sciences Using R* (pp. 133–175). Springer International Publishing. https://doi.org/10.1007/978-3-319-30634-6_5



- Mukred, M., & Yusof, Z. (2015). The Role of Electronic Records Management (ERM) for supporting Decision making Process in Yemeni Higher Professional Education (HPE): A Preliminary Review. *Jurnal Teknologi*, 73. <https://doi.org/10.11113/jt.v73.4202>
- Nor Aishah Ahad, Teh Sin Yin, Abdul Rahman Othman, & Che Rohani Yaacob. (2011). Sensitivity of normality tests to non-normal data. *Sains Malaysiana*, 40(6), Article 6.
- Osuntuyi, E. O. (n.d.). *Effective Workshop Organisation and Management in Vocational and Technical Education*. 7(1).
- Peine, A., Hallawa, A., Schöffski, O., Dartmann, G., Fazlic, L. B., Schmeink, A., Marx, G., & Martin, L. (2019). A Deep Learning Approach for Managing Medical Consumable Materials in Intensive Care Units via Convolutional Neural Networks: Technical Proof-of-Concept Study. *JMIR Medical Informatics*, 7(4), e14806. <https://doi.org/10.2196/14806>
- Ramstrand, N., Maddock, A., Johansson, M., & Felixon, L. (2021). The lived experience of people who require prostheses or orthoses in the Kingdom of Cambodia: A qualitative study. *Disability and Health Journal*, 14(3), 101071. <https://doi.org/10.1016/j.dhjo.2021.101071>
- Sutirman, Yuliansah, & Muslikhah, R. I. (2022). *The Effectiveness of Electronic Record Information System for Education (ERISE) on Improving Electronic Filing Skills in the New Normal Era*. 131–138. https://doi.org/10.2991/978-2-494069-67-1_15
- Wang, Y., Tan, Q., Pu, F., Boone, D., & Zhang, M. (2020). A Review of the Application of Additive Manufacturing in Prosthetic and Orthotic Clinics from a Biomechanical Perspective. *Engineering*, 6(11), 1258–1266. <https://doi.org/10.1016/j.eng.2020.07.019>

