

PAPER • OPEN ACCESS

Implementing DSDM and OO Method to Develop Billing in Mental Hospital

To cite this article: S Rohajawati *et al* 2020 *J. Phys.: Conf. Ser.* **1566** 012059

View the [article online](#) for updates and enhancements.

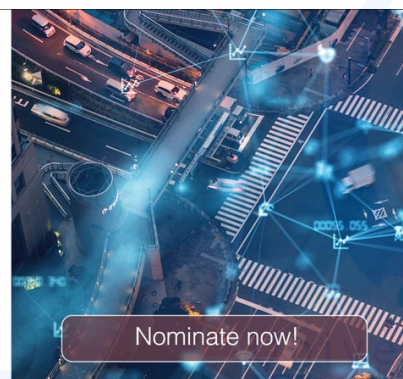


The Electrochemical Society
Advancing solid state & electrochemical science & technology

The ECS is seeking candidates to serve as the
Founding Editor-in-Chief (EIC) of ECS Sensors Plus,
a journal in the process of being launched in 2021

The goal of ECS Sensors Plus, as a one-stop shop journal for sensors, is to advance the fundamental science and understanding of sensors and detection technologies for efficient monitoring and control of industrial processes and the environment, and improving quality of life and human health.

Nomination submission begins: May 18, 2021



Implementing DSDM and OO Method to Develop Billing in Mental Hospital

S Rohajawati^{1*}, P Rahayu², H Akbar³, S Indria⁴ and D I Sensuse⁵

¹ Information System, Universitas Bakrie, Jalan Rasuna Said, Jakarta 12920, Indonesia

² Information System, Institut Perbanas, Jalan Perbanas Karet Kuningan, Jakarta 12940, Indonesia

³ Information System, Universitas Esa Unggul, Jalan Arjuna Utara, Jakarta 11510, Indonesia

⁴ Information System, Bogor Agricultural University, Jalan Kumbang, Bogor 16128, Indonesia

⁵ Computer Science Faculty, Universitas Indonesia, Depok 16424, Indonesia

*Email: siti.rohajawati@bakrie.ac.id

Abstract. At present, there are many Information Systems Development methodologies. However, we have to select the suitable one related to the problems. This paper presents an implementation of the Dynamic Systems Development Methodology (DSDM) and Object-Oriented (OO) as two combine methods to develop an application of billing in a mental hospital (study case in Indonesia). The application allows the management of the mental hospitals to control and evaluate patient services, and it supports decision-makers for improving the organization. Based on literature studies, we obtained the suitable two methods for DSDM adjusted to the resources, the time frame, the goals, and the required functionality. Meanwhile OO is a highly iterative approach. Data results of the interviews, questionnaires, observations, and artifacts were analyzed according to the user requirement process. The study can be concluded that DSDM and OO method is effective in developing an application. The paper depicted problems in facts finding.

1. Introduction

For many years, Information System Development Methodology (ISDM) has developed an unabating interest, particularly surrounding the failure of the Information System (IS) project. This failure happened due to several factors, including the expense of investment in Information Technology (IT) and the high risks of the project itself. Since the 1960s, researching IS failure is an increasingly trending topic [1]. According to [1], IS failure concerns technological and engineering problems where the system did not deliver the requirements and/or had hardware and software deficiencies.

In the next decade, new problems originated, caused by lack of user involvement, user resistance, lack of managerial oversight, and organizational issues. Ten years later, IS began debating the appearance of model key success factors, which is contradictive of interpretivism, constructionist, and critical research. These contradictions are caused by methods of research (quantitative and qualitative). Finally, IS success or failure depends on the individual perspective of the system's dominance in 'perceptions of a system's success or failure'.

In 1992, De Lone and McLean denoted six-factor of IS success: system quality, information quality, uses, user satisfaction, individual impact, and organizational impact [2]. IS success or failure is indicated depending on the process of developing an IS, which is known as IS methodology. More than a hundred IS methodologies are available, consisting of process development, perspective, philosophies, orientation, technique, tools, etc. Some of the best-known methods are Extreme Programming (XP),



Scrum, Feature-Driven Development (FDD), Dynamic System Development Method (DSDM), Adaptive Software Development (ASD), Object Oriented, Crystal, and Lean Software Development (LSD) [3] [4] [5]. The purpose of this research is to describe how the methods (DSDM and OO) are used to solve the problem of billing patients with mental disorders in mental hospitals.

2. Research methodology

This paper adopted DSDM and OO method [3]. The study found that uncertainty is an inherent characteristic of many methods. Thus, it needs to apply and implement the methods to develop the application, to ensure the nine principles of the DSDM method (Appendix 1). The components of the conceptual research framework are (Figure 1) :

- Literature review on ISDM is conducted, published, and cited in an international journal, and referred to as a benchmarking method in previous research;
- Feasibility study uses PIECES (performance, information, economic, control, efficiency, and services) technique [6];
- Business Study conducted for identification of users and their desired functional requirement of process transactional, through the recognition of system architecture, and supports the integration and realization of these unit activities;
- Functional Model Iteration conducted to depict the model of transactional process within user participation;
- Design Model Iteration conducted to analyze and design the architectural classes/objects via interaction between users and make them understand their needs. This method uses Unified Modelling Language notations;
- Finally, the applications are tested by the user.

Each stage results are confirmed using JAD (joint application development) and UAT (user acceptance testing). The research unfolded considers a single case study. It is supported by the previous research conducted in gaining an in-depth and holistic understanding of the organization’s mental hospital [7]. This research is based on the case study in Dr. Soerojo Mental Hospital, Magelang, Indonesia.

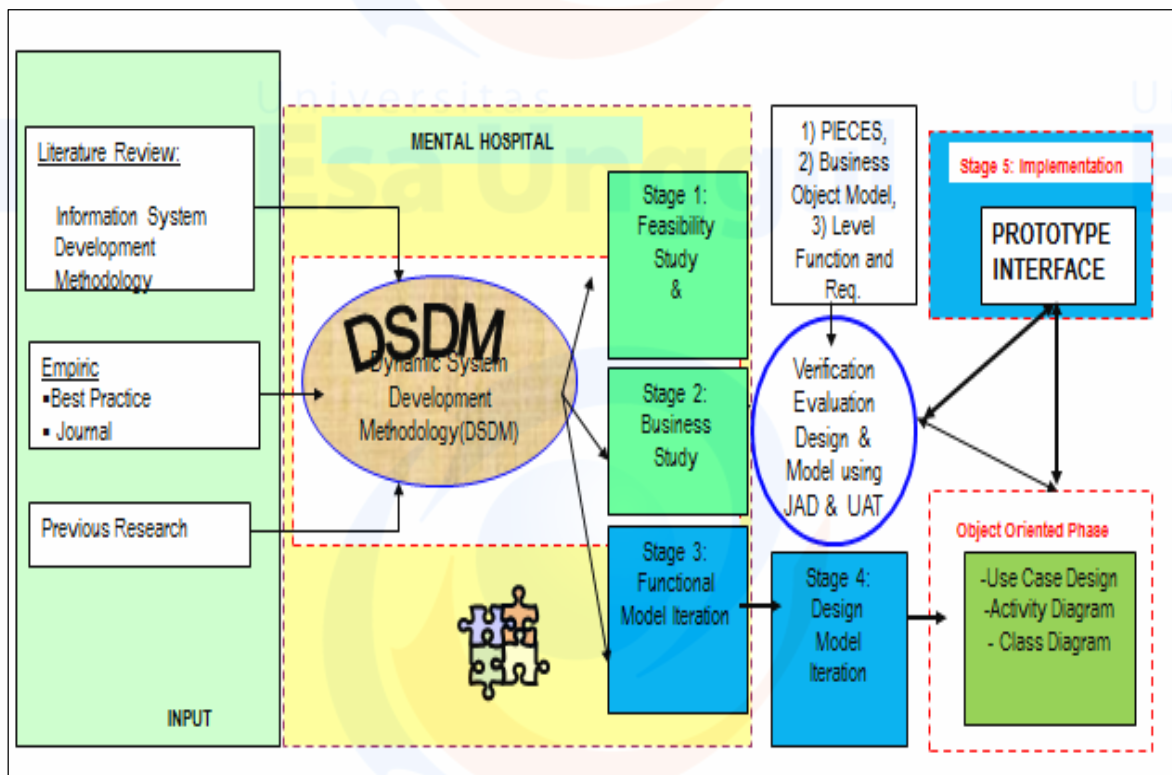


Figure 1. The Conceptual Research Framework.

3. Results and discussion

The application is linked to three domain areas: patient, financial, and medical records. We ensure the hybrid methods are appropriate and reasonable to apply in this case. The reasons for choosing of both methods are flexibility of organizational situation and condition; rapid process of development; incremental fulfillment of user requirement; efficient and effective project management and teamwork; cooperative stakeholder and business partners; active user involvement; response to changing business process; clear depiction of data and information flow; developer understanding and user involvement; revise product as a process maintenance; product delivers quickly with high quality; and ease of conducting change management practice as an agreement of JAD results [7] [8].

The five steps that dominate during processes are: (1) feasibility study, (2) business studies, (3) functional model iteration, (4) design and build iteration, and (5) implementation. In the steps feasibility study, the PIECES framework depicted in Table 1 (performance, information, economy, control, efficiency, and services) technique [6].

Table 1. PIECES framework, criteria, and fact-finding.

PIECES	Criteria	Facts Finding	
Performance	Transaction Throughput	Registry patient More than 70% is the old patient that will need heavy search processing	
	Response time	Slowly process input and output data	
	Anticipated growth	Should be anticipating incremental patient at least 30%	
	Problem Caused	Decreasing process data store and retrieval Lack of capacity data, store, input error by the user	
	Effect	A crash system and only administrator will fix	
	Opportunity	The increasing capacity data store, skill and competencies of users, and maintainability infrastructure	
	Benefit	Stabilization of data and system	
	Constraint	The standard operating procedure is not implemented well	
	Information and Data	Possible improvement	User encourages goodwill SOP implementation
		Information overload	Mostly reported based on client processing and no standardization reporting
Information accuracy		Lack of updating information regarding the patient, price list items, drugs, credit, etc.	
Information timelines		Inaccurate price list of drugs, incomplete medical records information, etc.	
Information format		The data file is in various formats	
Information redundancy		Each of the units can produce similar invoice at the same times	
Lack of information		Incomplete information on prescriptions, mixed content of drugs, expired date, drug inventory, drug warehouse, etc.	
Economic	Datastore, incremental growth	The server is limited by capacity and soon facing lifetime.	
	Financial	Lack of finances to buy the commercial and brands application	
Control and	Budgeting	Should be appropriate with government policies	
	Problem	Undisciplined user login and authorities without a	

Security	Cause	permit Lack of controlling user login and irresponsible of mental user
	Effect	Not tracking user input and process the system
	Opportunity	Encourages users responsible with limited access and enforces the rule of access system
	Benefit	Self-confidentially, reducing data failure, and inaccurate
	Constraint Possible improvement	organisational structure (hierarchical) and culture User should enforce the rule and SOP, rewards and punishment enacted
Efficiency	Problem	Lack of paperless concept
	Cause	Lack of control reporting printed
	Opportunity	Optimally operational database by users
	Benefit	Supporting decision maker
	Constraint Possible improvement	Lack of human resources with IT quality Enforcing reward and punishment for all users
Service	Processing and data accuracy	Double-entry data (manual and computer)
	Reliability	Inconsistency updating data
	Recoverability	Lack of backup data periodically
	Maintainability	Lack of documentation of system development
	Ease of use	Unavailability of guidance and tutorial system
	Flexibility	Uncovered transformation data to other systems
	Coordination Customer and/or employee	Lack of coordination among users Lack of knowledge about computer literacy

The next step is to deliver a feasibility report and project charter which covered schedule, budget, 'work breakdown structure' (WBS), the structure of teams. The business study was conducted using interviews, questionnaires, observations, artifacts. The extent of the feasibility report was to examine the Business Area Definition the stakeholders needed [9].

All business object modeling was verified and confirmed using workshop mode and involved all user units being linked by workshop and JAD meeting. There are twelve modules of functional requirements using the MoSCoW approach. The MoSCoW stands for the 'Must have', 'Should have', 'Could have', and 'Would have'. The 'must-have' requirements are needed to meet the business requirements and are critical to the success of the project. The 'should have' requirements are those that would be great to have if possible, but the success of the project does not depend on them being addressed. The 'could have' requirements are those that would be nice to have met, and the "would have" are those requirements that can be put off until later; these may be undertaken during future developmental iterations [9].

The analysis of functional systems is benchmarked to existing systems. It splits into four columns (existing, system general, ideal, and additional option). The requirement is represented by color code. If the situation and resources are available, then the lists of the function are matched. Thus, the color will be changed into black; but if not matched, the color keeps in red. Timeboxing is mostly used to develop the application module. In time boxing, the application is divided into modules with each having its fixed budget, dates, or milestones for deliverables.

The design process and iteration are focused on integrating functional components and identifying the non-functional requirement. Those are needed for the testing process because the end-users should process safely daily. The design phase aims to translate the business models into design models using UML diagrams [6] [10].

The system consists of four actors: Register, Cashier, Pharmacy, and Operator. It is also grouped into eight packages: Registration, Emergency, Outpatient, Inpatient Cashier, Inpatient Billing, Electro Medic, Laboratory, and Pharmacy. Each package is detailed in a specific use case. The registration (patient registered), inpatient billing (the whole processed entry items of patients such as clinical

treatment, using medical supports, etc.), and the inpatient cashier module are modeled. The cashier module is the central processing of data transaction billing.

Finally, UAT is used to test and examine the application. Each unit delegated staff to test and respond to feedback against to improve the features. The testing activities iterated involving users and staff circularly. Therefore, training users were undertaken after each module ready to deploy. The research finished all stages of DSDM and OO in sixth months, and continued maintenance services for three months.

4. Conclusion

ISDM concepts and theories grew up related to the dynamic of the business environment in the world. They created a new or mixed methodology as a framework and become a guide for practitioners in applying this method. This study is using the existence of ISDM and applied DSDM and OO to solve the IS application in mental hospitals.

We realized that our study needs to be improved and continued to ensure the success of the implementation of ISDM. We suggest the appropriate methodologies needed to achieve the goal of the organization. There can be started from the concept, theories, and fundamentals such as philosophy, orientation, methods, approach, technique, tools, etc. The practice can be enriched by popular techniques (PIECES, the MoSCoW, and Prototype).

The success of applying are: 1) fit with the organizational situation and condition; 2) always encourage user awareness; 3) enforce commitment of top-level management; 4) a way of changing management and using a user-centered approach and 5) cover requirement of a business process. Furthermore, the application allows management to control and evaluate patient services, and it supports management in improving and developing the right level of skills and competencies in the healthcare organization to meet desired service level targets.

Acknowledgment

This research was funded by PTUPT Research Scheme of Ministry of Research Technology, and Higher Education of Indonesia. The greatest thanks are given to JAD team and participants at RSJ Magelang. This opportunity has increased our knowledge and practice on ISDM.

References

- [1] E. Bartis and N. Mitev, "A multiple narrative approaches to information systems failure: A successful system that failed," *Eur. J. Inf. Syst.*, vol. 17, no. 2, pp. 112–124, 2008.
- [2] S. Petter, W. DeLone, and E. McLean, "Measuring information systems success: Models, dimensions, measures, and interrelationships," *Eur. J. Inf. Syst.*, vol. 17, no. 3, pp. 236–263, 2008.
- [3] D. Avison and G. Fitzgerald, *Information System Development: methodologies, techniques & tools*, 4th ed. McGraw-Hill, 2006.
- [4] R. S. Pressman, "Agile Development," in *Software Engineering: A Practitioner's Approach*, 7/e, McGraw-Hill, 2009, pp. 1–21.
- [5] F. Loforte Ribeiro and M. Timóteo Fernandes, "Exploring agile methods in construction small and medium enterprises: a case study," *J. Enterp. Inf. Manag.*, vol. 23, no. 2, pp. 161–180, 2010.
- [6] L. D. Whitten, J. L., & Bentley, *System Analysis and Design Methods - 7th Edition Papers*. McGraw-Hill., 2007.
- [7] S. Rohajawati, "Using Joint Application Development (JAD) to Create Billing Information System Patient (BISP)," in *International Conference on Informatics for Development*, 2011.
- [8] G. Konstantinidis, G. C. Anastassopoulos, A. S. Karakos, E. Anagnostou, and V. Danielides, "A user-centered, object-oriented methodology for developing health information systems: A clinical information system (CIS) example," *J. Med. Syst.*, vol. 36, no. 2, pp. 437–450, 2012.
- [9] B. Roberts, "Dynamic Systems Development Method, The Standard for Rapid Application Development," in *Software Quality*, M. Wieczorek, Ed. Springer-Verlag Berlin Heidelberg, 2001.

- [10] S. Candra and I. K. Putrama, "Applied healthcare knowledge management for hospital in clinical aspect," *Telkomnika (Telecommunication Comput. Electron. Control.*, vol. 16, no. 4, pp. 1760–1770, 2018.

Appendix 1. Fulfillment of nine principles DSDM correlated to the mental health organization.

Principles	Fulfillment
1	Mostly, the process is not fulfillment because users changing positions related to peak and heavy tasks in their job. Fortunately, the representative users are actively following the development process of the application using workshops and JAD meetings.
2	The study appointed by the directors directly into a formal assignment. We got full authority-trust and professional--to collect data which represented of needed organization. It is used in all resources (users and equipment). The study got information and confirmed the meeting. The activities were reported periodically.
3	The organization is categorized as a dynamic environment in the complexity of the business process. Therefore, the process started from a base unit such as a registration unit (operator), afterward moving to heads of units (manager), finally to directors of units, and similarly processing in other units.
4	The problems anticipated using workshop mode. The application prioritized using MosCow technique. If the resources were not enough then the application focused on the important daily transaction processes. The application should quickly process with a limited error.
5	OO methods represent business object modeling. It is depicted in information flow. The prototype is demonstrated in the workshop mode. All functional requirement was adopted responsively and it changed the features. If the features ready to run then it tested by a team developer and examined by a user team.
6	The JAD meeting will be conducted if the requirement is changed to the business rule.
7	The JAD is the key point for solving the critical problem, such as important activities to commit or decline the level scope of the project within all units.
8	The 'quarantine' process is conducted if the subsystem needed revision. Then, the subsystem integrated throughout the testing process in the laboratory.
9	Communication is an important component of nine principles. It should implement and commit by the JAD members. Each of the members should understand their tasks and responsibility.