Original Research Paper

Step by Step Implementation of DSRM for Personalization of Reading

Marzita Mansor[1], Wan Adilah Wan Adnan[1], Rohaizah Abdul Wahid[2], Jamilah Hamid[1]

[1] *Universiti Pendidikan Sultan Idris. Perak, Malaysia.*
[2] *Universiti Teknologi MARA. Perak, Malaysia.*

Abstract: This paper aims to discuss step-by-step activities of the implementation of Design Science Research Methodology (DSRM) in the development of Personalization teaching and learning materials for children. DSRM is adapted in the development of personalized teaching and learning materials due to its potential to provide specific guidelines based on specific outcomes. This paper revealed the potential of DSRM as a reliable and comprehensive methodology that leads the developer on step by step processes to perform the development. Apart from that this study provides details description on the development of personalized teaching and learning materials that is successfully developed using the DSRM methodology as guidelines.

Keywords: Children, Interface Design, Personalization, Reading.

1. Introduction

Various research on education is done with the aim of making the teaching & learning process more effective [1] [2] [3] [4] [5] and acceptable to students [6] [7] [8] [9]. One of the areas that is often studied in education is personalization of reading [10] [11] [12]. This research employed design science research methodology (DSRM) as a methodology in the entire research process in order to come out with the personalization of reading for children. Personalization is used as the solution to cater children reading difficulties due to its potential to come out a reliable solution according to each children reading ability.

2. Literature Review

Research methodology is a standardized scientific study that the researcher follows in order to conduct a reliable study on a specific topic of interest. Not only that research methodology serves as an important tool to support research domain but also research methodology and research domain compliment each other to contribute to the body of knowledge [13] [14] [15] [16]. In particular, research domain provide a scientific methods to the complex task of discovering solutions to a particular problems in research domains.

Design science is an outcome based information technology research methodology, which offer specific guidelines for evaluation and iteration within research projects. The methodology of the research also focuses on the development and performance of (designed) artifacts with the explicit intention of improving the functional performance of the artifact. The methodology acts as guidelines for the researchers to conduct their research systematically. In general, there are 6 activities (steps) based in Design Science Research Methodology framework as suggested by Peffers et al. [17].

3. Methodology

The DSRM activities include Problem Identification and Motivation, Define the objectives of the solution, Design and Development, Demonstration, Evaluation and Communication as shown in Figure 1. This build-and-evaluate loop is typically iterated a number of times before the final design artifact is generated.
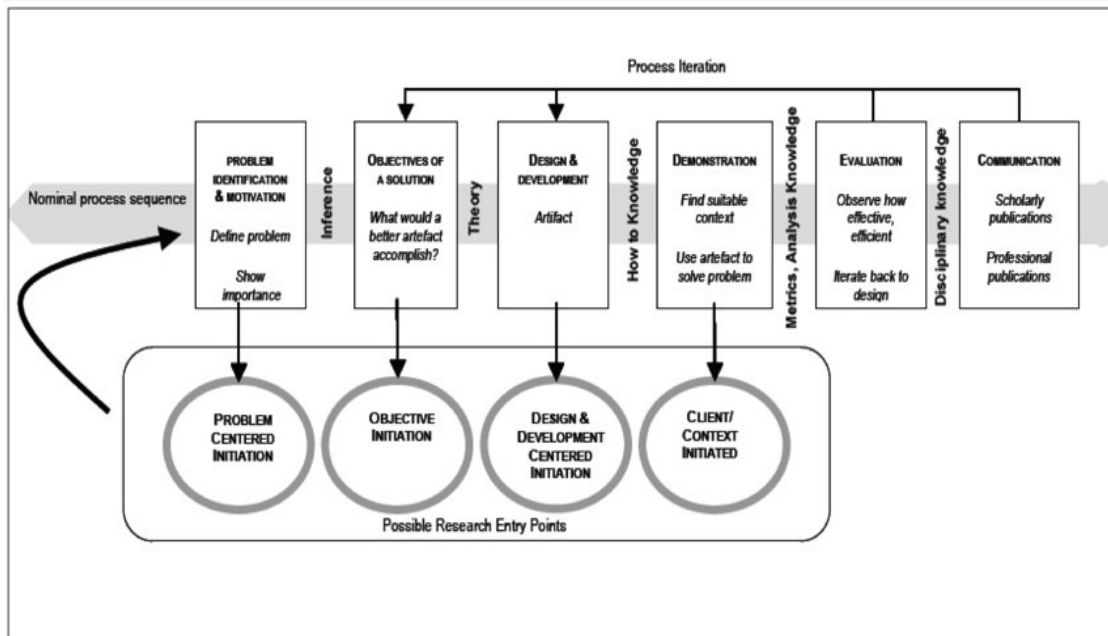

Figure 1. Design Science Research Methodology [17]

Hevner et al. [18] also has stated that the definition of IT artefacts in IS not only refer to instantions, but also includes constructs, model and methods applied in development and use of information systems. The authors also stated that in the design science paradigm, knowledge and

understanding of the problem domain and it solution are achieved in the building and application of the building artifacts.

4. Finding and Discussion

Due to the DSRM potential, this paper provide a brief discussion by providing step by step implementation of the DSRM throughout the scope of the research conducted.

Step One: Problem Identification

The heart of the research is to identify problem and motivation to solve issue arises from the real situation. Suitable with the Design Science Research Methodology (DSRM) ideas for the creation of new knowledge, identified solution of the problem discussed on the problem has arises is used as a foundation in the research for the new knowledge creation. Figure 2 provide several activities involved in the problem identification process.
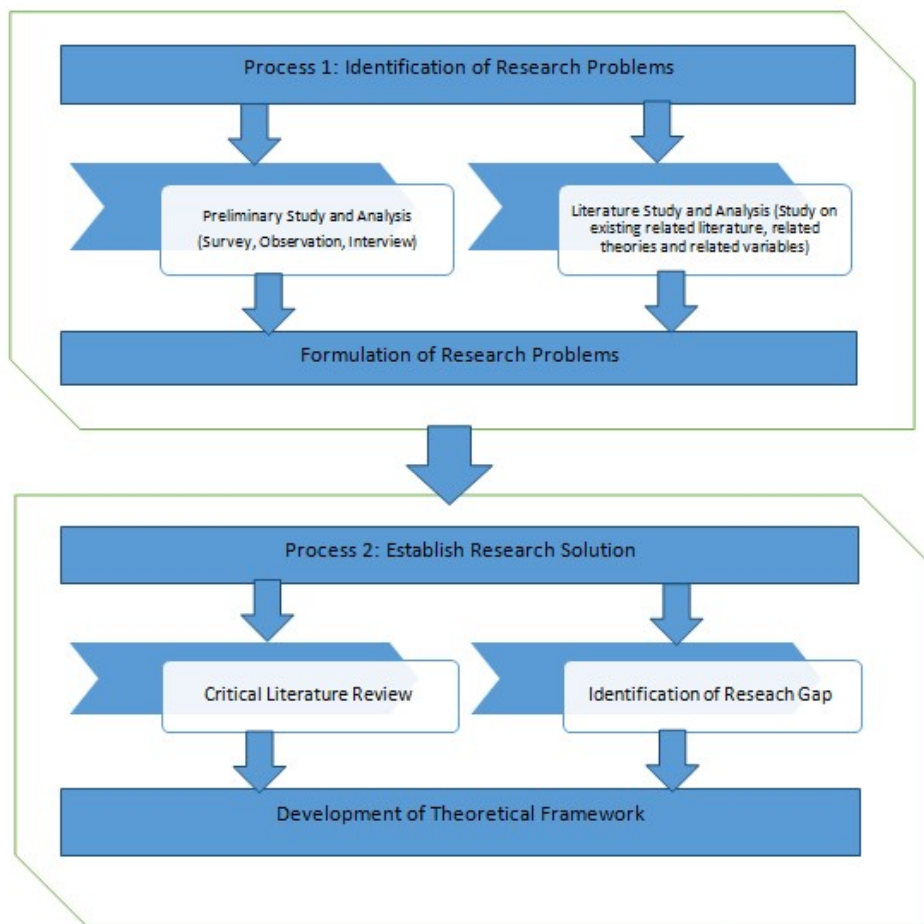

Figure 2. Main Processes in Problem Identification and Motivation Phase

Step 2: Define Objectives and Solution

In this phase, the process involved the defining the objectives and its solution. The following figures shown us the objectives of this study and feasible outcomes of the research.

Table 1. Define Objectives and Solution

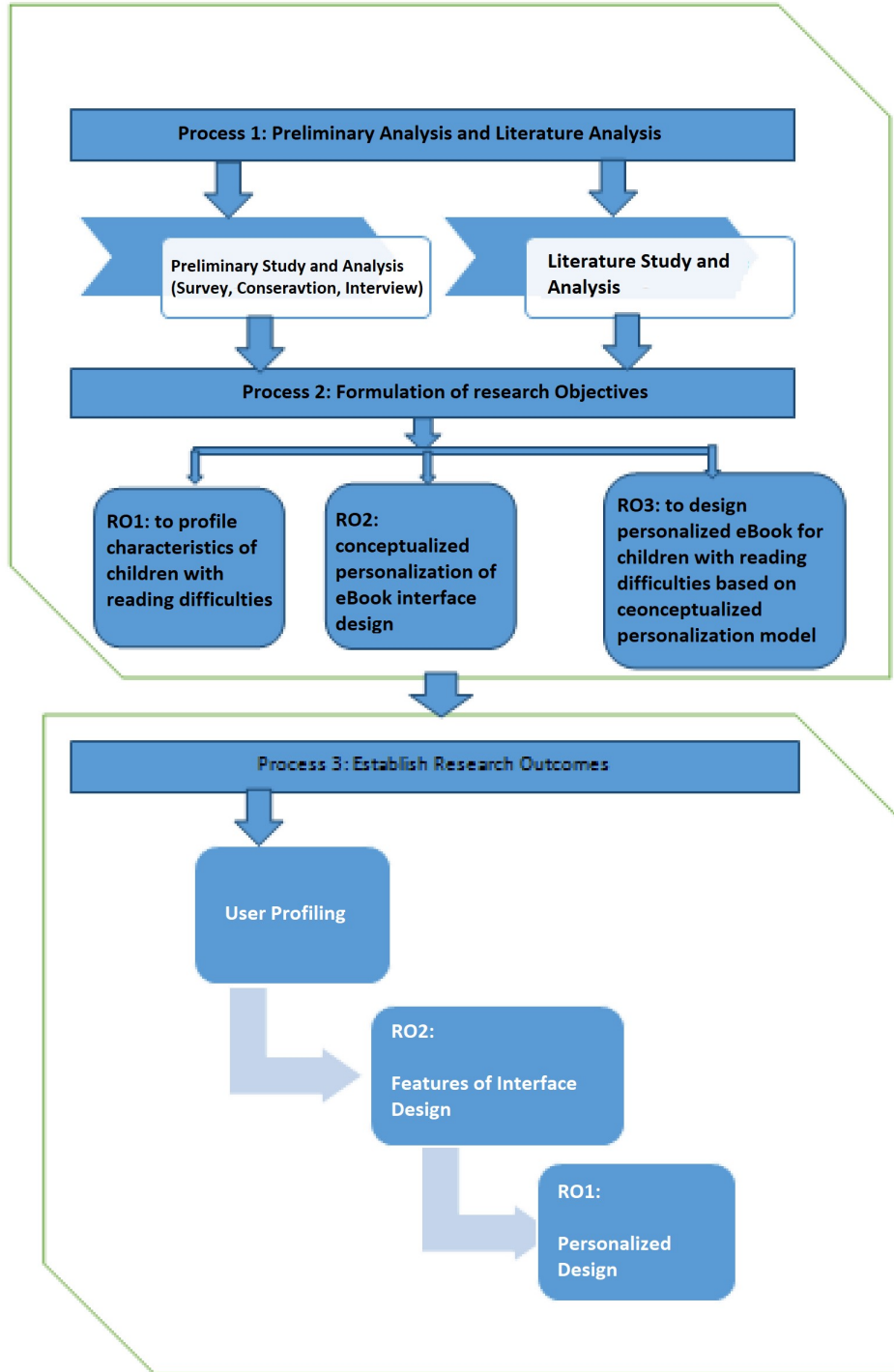| Research Objective	Outcome
To design personalized reading material for children	Personalized Design

Figure 3. Main processes in Define Objectives and Solution Phase

Step Three: Design and Development

Phase 3 involves Design and Development Phase. In this phase, all the analysed data from previous phase, phase 2: Define the objectives phase are analysed further for design purposes.

Activities related to design and development on the Interface Design are conducted in this phase.

All activities involves in the design and development phase are described in the following Figure 4.
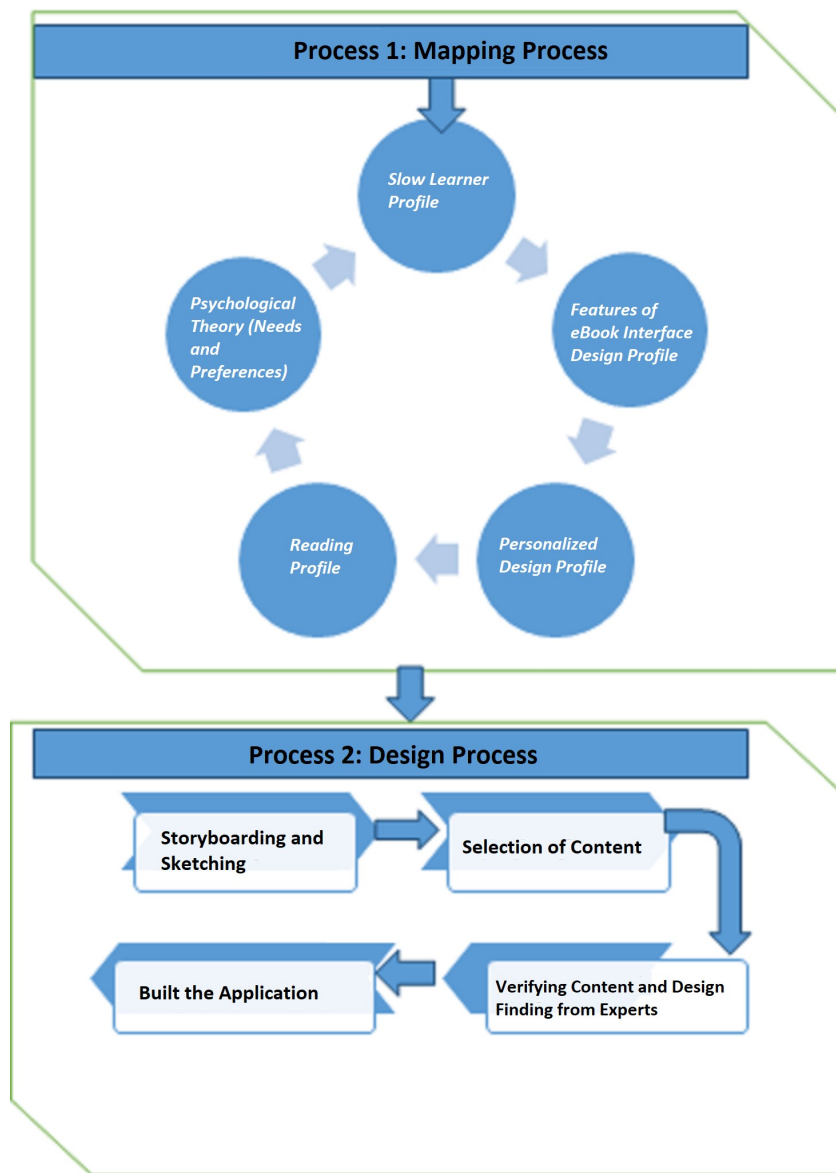
Figure 4. Main Processes in Design and Development Phase

Step Four: Demonstration
At this phase, the use of the artefact was demonstrated to classify the design according to user profile in order to solve the identified problem. In this research, the demonstration phase covered user testing on the proposed personalised interface design. The outcome from user testing to categorize interface design is based on the individualised learning.

Figure 5 shows main processes in demonstration phase.

Step Five: Evaluation
This step provides evaluation of the personalized design through the use of the prototype of personalization of the reading material for the children The processes then are documented as finding in a form of report. Figure 6 shows main processes in evaluation phase.
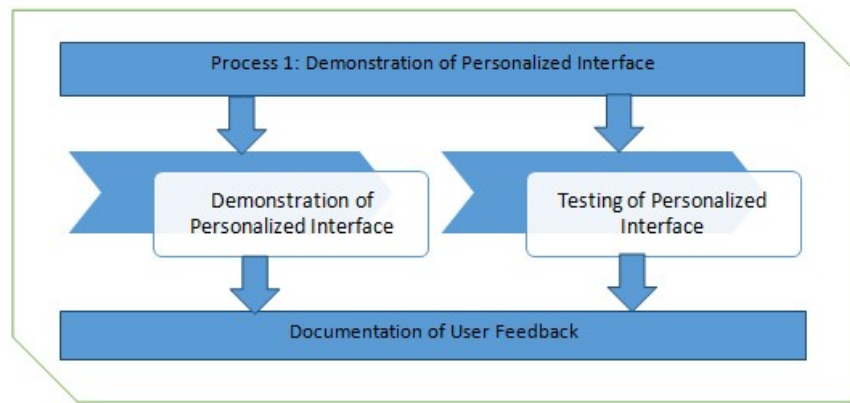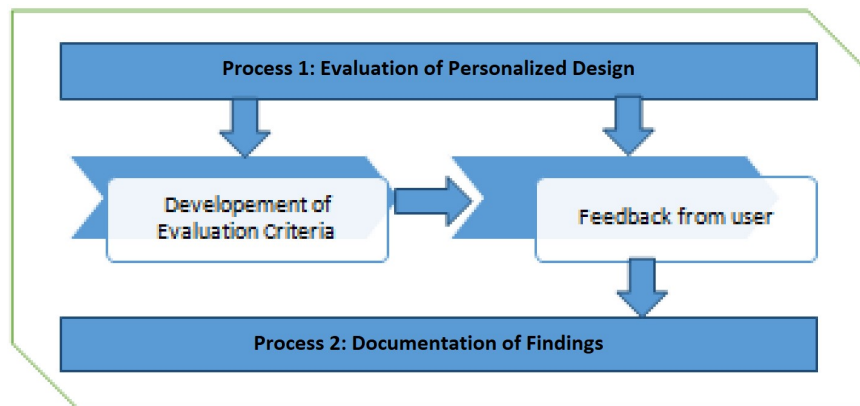
Figure 5. Main processes in Demonstration Phase

Figure 6. Main Processes in Evaluation

5. Conclusion

Developing personalized teaching and learning tools require the researcher to identify specific requirements in detail covering specific personalization approach that require in depth understanding of a user. Apart from that, reading content to offer is on of the important consideration in the development. In order to ensure these two (2) important elements are covered in details, a specific methodology for the development is required. DSRM is chosen in as the methodology to guide the overall research process due to its potential to define a detailed design process to provide support development of the design artefact in this particular study.

Acknowledgement

References

[1]   J. D. Basham, T. E. Hall, R. A. Carter, and W. M. Stahl, "An Operationalized Understanding of Personalized Learning," *Journal of Special Education Technology*, vol. 31, no. 3, pp. 126–136, 2016.

[2] M. R. Husin, I. Y. Panessai, and H. Ahmad, "Interactive Module Development of Teacher's Measurements", *ij-humass*, vol. 1, no. 1, pp. 1-6, May 2019.

[3] A. Atkin, "Peirce's theory of signs," 2013 [Online]. Available: http://plato.stanford.edu/archives/ sum2013/entri es/peirc e-semio tics/. [Accessed: Oct 2020].

[4] S. Bagheri, R. J. Kusters, and J. J. Trienekens, "Eliciting end users requirements of a supportive system for tacit knowledge management processes in value networks: a Delphi study," in: Engineering, technology and innovation (ICE/ITMC). IEEE, pp 1317–1326, 2017.

[5] A. Ismail, N. Z. Mohamed Zain, and H. Mat Zin, "A Simple Survey on Attitude of Computer Science Diploma Students towards STEM", *ij-humass*, vol. 2, no. 2, pp. 76 - 88, Dec. 2019.

[6] I. M. Azpiazu, N. Dragovic, and M. S. Pera, *Finding, Understanding and Learning: Making Information Discovery Tasks Useful for Children and Teachers*. Pisa Italy: Search as Learning (SAL), 2016.

[7] E. Bearne, and D. Reedy, *Teaching Primary English: Subject Knowledge and Classroom Practice*. London: Routledge, 2017.

[8] Nur Syazlina Hanim, "Pelajar Berkecerdasan Tinggi dalam Kalangan Pelajar Kelas Rancangan Khas", *ij-humass*, vol. 2, no. 1, pp. 1 - 13, Jun. 2019.

[9] N. S. Hanim, "Pelajar Berkecerdasan Tinggi dalam Kalangan Pelajar Kelas Rancangan Khas", *ij-humass*, vol. 2, no. 1, pp. 1 - 13, Jun. 2019.

[10] H. Michael, C. K. Kevyn, C. Jamie, E. Maxine, J. Alan, and W. Lois, "Personalization of Reading Passages Improves Vocabulary Acquisition," *International Journal of Artificial Intelligence in Education*, vol. 20, no. 1, pp. 73-98, 2010.

[11] M. Mansor, W. A. Wan Adnan, and N. Abdullah, "A Step-by Step Process in Designing Personalized Reading Content for Slow Learner Children", *ij-humass*, vol. 2, no. 2, pp. 95 - 102, Dec. 2019.

[12] P. C. Brown, H. L. Roediger, and M. A. McDaniel, *Make it stick.* Harvard University Press, 2014.

[13] R. Hashim and M. H. Mohamad Yatim, "Hubungan Antara Motivasi dan Penerimaan Dengan Pencapaian Akademik Pelajar Dalam Pembelajaran Menggunakan M-Pembelajaran di Kolej Vokasional", *ij-humass*, vol. 2, no. 2, pp. 89 - 94, Dec. 2019.

[14] R. Baskerville, and M. D. Myers, "Special issue on design science research in information systems: making IS research relevant to practice: foreword," *MISQ*, vol. 28, pp. 329–335, 2004.

[15] A. Adesuyi, O. Obolo, S. Oloja, and B. Badeji-Ajisafe, "A Framework of Concept Complexity-based Personalized E-learning System. Journal of Education," *Society and Behavioural Science*, vol. 24, no. 4, pp. 1-6, 2018.

[16] N. Laili, S. E. Purwanto, and F. Alyani, "Pengaruh Model Penemuan Terbimbing Berbantu LKPD terhadap Kemampuan Pemahaman Konsep Matematis Siswa SMPN 6 Depok", *ij-humass*, vol. 2, no. 1, pp. 14 - 37, Jun. 2019.

[17] K. Peffers, T. Tuunanen, M. A. Rothenberger, S. Chatterjee, "A Design Science Research Methodology for Information Systems Research," *Journal of Management Information Systems*, vol. 24 no. 3, pp. 45–77, 2008.

[18] A. R. Hevner, S. T. March, J. Park, and S. Ram, "Design Science in Information System Research," *MIS Quarterly*, vol. 28, no. 1, pp. 75–105, 2004.

[12] S. Benhamdi, A. Babouri, and R. Chiky, "Personalized recommender system for e-learning environment," *Education and Information Technologies,* pp. 1-23, 2016.

[19] D. E. G. Avison, *Fitzgerald Information systems development: methodologies, techniques and tools, 4th edn.* Maidenhead: McGraw-Hill Maidenhead, 2006.

[17] Anonymous, "Agile," 2018 [Online]. Available: http://www.agile model ing.com/artif acts/userS tory.htm. [Accessed: Oct 2020].