Analysis of Requirements in the Context of Multi-Platform Dropshipping Application Using Activity Theory

Nur Atiqa Basaruddin
Universiti Kuala Lumpur
Malaysian Institute of Information Technology
Kuala Lumpur, Malaysia
natiqabasaruddin@s.unikl.edu.my

Nik Azlina Nik Ahmad
Universiti Kuala Lumpur
Malaysian Institute of Information Technology
Kuala Lumpur, Malaysia
nikazlina@unikl.edu.my

***Abstract*—Today, Internet plays a major role in business growth. A change has taken place in organizations that have significantly transformed the conduct of business, both on established and start-up companies, and this include dropshipping business. However, in order to support the business operations, a proper system or application is needed. Therefore, appropriate requirements analysis is necessary in order to build a system capable of supporting dropship business process. This paper proposes a method that uses activity theory to analyze the requirements of multi-platform system applications. It then explores a case study of a dropshipping sales management application, presenting the findings utilising activity theory by breaking down the activities into actions and operations as part of the requirements analysis process.**

Keywords—activity theory; dropshipping; mobile requirements; requirements analysis

I. INTRODUCTION

Requirements analysis is an important phase in requirements engineering as it allows the development team to catch the problems early and minimize the impact with respect to costs and time [1]. One of the methods that can be used to analyze the requirements is by using Activity Theory. AT includes the full activity of the work as the analytical unit, where the activity is divided into the tools, objects, division of labour, community, rules and subject. Activity theory is a method that focuses on human interaction and the use of tools within a social system [2]. The scope of work produced by organizational individuals can only be understood in a framework unit known by activity. It also provides a faster theoretical contribution by providing a list of experiences obtained from the cases analyzed that may be useful in future flow technique implementations [3]. Activity can be broken down into actions that can be done by means of operations [4]. To improve operational agility and competitiveness, organizations today need a strong, Web-enabled, scalable information access infrastructure. The definition viewed by Chaffey [5] on mobile commerce is portable devices such as laptops, tablet devices and cell phones, electronic communications and electronic transactions are normally performed using various forms of wireless connections. E-commerce sales are also useful for entrepreneurs who can reduce the cost of doing business and attract a larger number of customers.

This paper aims to study about the activity theory in the dropshipping management in multi-platform application named. This application was developed for small business owner like dropship agent and stockist. The multi-platform was proposed in order to ease the administrative task as multi-platform application is able to support the uniformity across all platforms [6]. With this application system, human error can be minimized when calculating their sales revenue. In addition, this system would provide them with a platform to safely store and manage the customer database as it is very important to the business. It would also make it easier for the targeted user to follow up on after-sales activity with their customer. The system was developed based on proper elicitation technique [7] since the previous dropshipping applications has several pitfalls.

II. RELATED WORKS

A. Dropshipping

The method of supply chain management in which the supplier does not hold the products in stock, but instead transfers orders from the customers and delivery is referred to as dropshipping. A simple measure of consumer satisfaction is the quality of logistics operations [8]. Moreover, in the case of dropshipping-based business models, where similarly profiled companies are working intensively to obtain clients to sell products supplied by the same distributors. The strength of this dropshipping is the exclusion of the need for your own warehouse and the engagement of financial resources in the products and the rate of order delivery while the weaknesses in this model are the lack of stock supply guarantees due to inventory mistakes [9]. Unfulfilled customer orders during inventory stockout can be a major obstacle to online retailers implementing drop-shipping strategy in a drop-shipping supply chain [10].

B. Activity Theory Approach

Activity theory has been used in theories and research for many software developments and analytic tools. In this literature review part, research papers that has used activity theory in analytic tools and education is separated. A study by [11] critically explores the concept of partnership and its practices in Australia, then presents a conceptual lens through activity theory through which challenges and opportunities can be studied, especially about free education within the current social climate. Moreover, using the activity theoretical framework, this study [12] focused particularly on 2 activities which are the market-based poverty alleviation activity through which the population of poverty tried to increase their income and poverty eradication and the activity of e-commerce implementation through which the governments of Longnan attempted to build a local e-commerce ecosystem. Another study conducts by [13] to expect a multi-scale analysis of three engineering engineers' activities over a period of one month and a research of the efforts of Chinese nursing doctoral students to publish in English is documented in this paper and the study used a multi-case study design. Lastly another study conducted by Ahmad [14] has focused on the use of activity theory to analyze the requirements of Muslim-based android application as a case study.

On the other hand, activity theory also can be seen used in enhancing collaborative support for software engineering techniques, tools and has been used by Lee [15] to explore the requirements of the interactive pen and tablet technology consumer interface for learning. Activity theory was used to evaluate and interpret the data as the guiding knowledge base. In addition, activity theory was also used to review for literature on using WhatsApp in teaching to develop higher order thinking skills and gathered multiple types of data from six doctoral students and one supervisor from a main research focused university in mainland China [16]. Other than that, [17] used activity theory to analyze how the lesson plans of teachers fulfil the learning needs of students and the educator. Lastly, activity theory also has been used by Lewin [18] to focus on the development of a scenario-driven learning design process, divided into two phases, for teachers from 15 European countries in total. The theory of activity is used to explore the contradictions that arose when such modifications were introduced into the established lesson planning activity system. Even though activity theory was first introduced as theoretical-based context analysis to define the structure and social context of human activities (theoretical) [23], however its usage was then expanded to human-technology context (technical) as well [24]. The application of activity theory in education learning and analytic tools are summarized in Table 1.

TABLE I. MULTIPLE APPLICATION OF ACTIVITY THEORY

Source	Application of Activity Theory	Applicability Classification
[11]	A theoretical lens though the activity theory by examining challenges and opportunities within the current climate concept, especially in relation to school university partnerships.	Theoretical
[12]	This study uses activity theory analysis to evaluate the influence of governments in continuing to develop ecosystem services for rural e-commerce and the implications of certain ecosystems on reducing poverty.	Technical
[13]	Activity Theory was used to facilitate a multi-scale study of the practices of three engineering designers.	Technical
[14]	This study use activity theory to analyze the requirements of a mobile application, specifically designed for Muslims environment on android platform.	Technical
[15]	Discovering the functionality requirements with modern pen and tablet technology using an activity theory lens for learning chemistry.	Technical
[16]	Data analysis by implementing the Activity Theory Lens for the topic of using WhatsApp in education learning to Improve Higher Order Thinking Skills.	Technical
[17]	This study examines to what circumstances the teaching methods and analysis of evaluation data of teacher candidates help facilitate their thinking about the learning needs of the students using activity theory.	Theoretical
[18]	The activity theory has been used to analyze the inconsistencies that occurred when certain improvements were implemented into the existing lesson planning activity framework.	Theoretical

III. METHODOLOGY

Activity diagram is used in this study to analyze the requirements and outcomes of multi-platform dropshipping application which run on both web and mobile platforms, adapted methodology from [6, 19]. Requirements are known to be the source for good system usability [20]. Figure 1,2, and 3 represent the requirements of the application in the context of activity and relevant subjects. To further elaborate each activity involved, the activity theory diagram was then decomposed into actions and operations [21] as displayed in Table II.

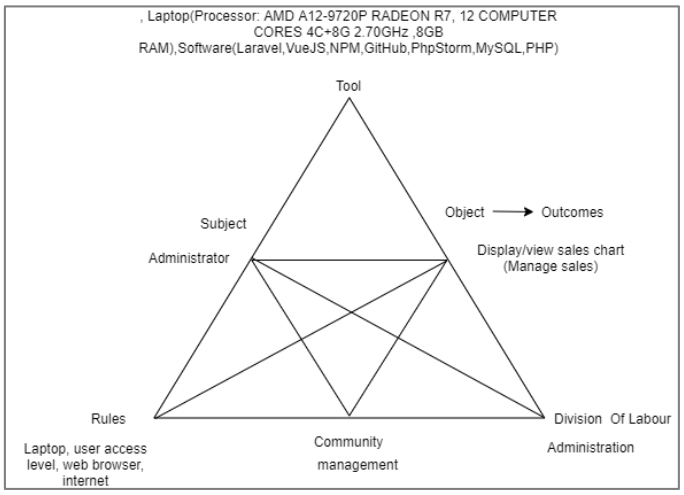

Fig. 1. Activity Diagram for Sales Management Requirements

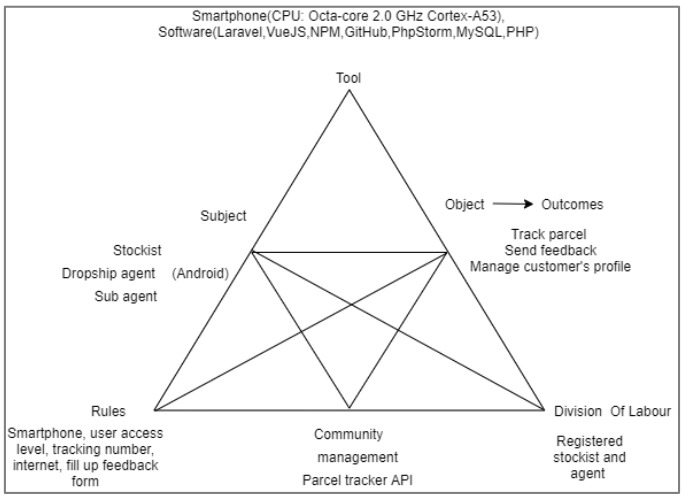

Fig. 2. Activity diagram for parcel tracking, feedback, and profile management

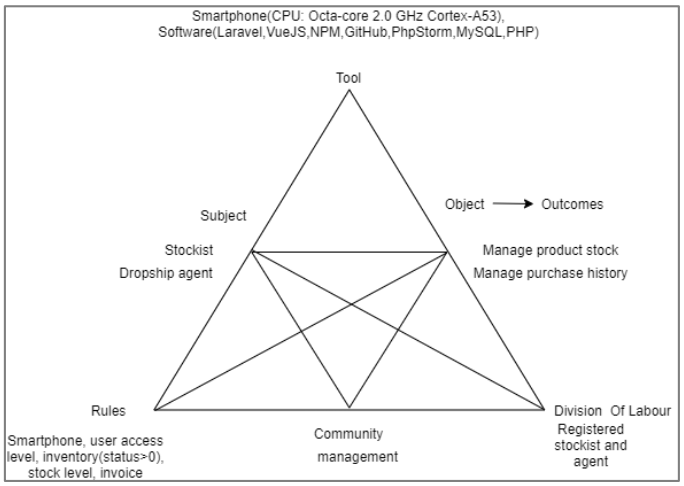

Fig. 3. Activity diagram for stock and purchase history management

The following table identify the actions and operations of the activity in dropshipping application. It is important to identify the operation in detail at this point, where the steps of activities, actions, and operations needed to be solved the specific issue in the dropshipping application and to give clearer picture on each requirements activities [21].

TABLE II. ACTIVITY DECOMPOSITION INTO ACTIONS AND OPERATIONS

Activity	Actions	Operations
Manage sales	Select	Choose month
	Select	Choose Item
	Display	Display sales summary chart
Track parcel	Select	Choose customer
	Select	Choose customer's item
	Complete form	Fill up form
	Track	Input tracking number
	Display	Display customer's parcel whereabouts
Feedback	Fill up form	Input comment
	Submit feedback	Display feedback
Manage customer profile	Complete form	Fill in customer details
		Fill in customer address
	Submit form	Display user profile
	Select	Choose mobile application platform
	Contact	Contact customer via chosen mobile application platform
Manage purchase history	Select	Choose customer name
	Display	Display customer purchasing history
Manage stock	Display	Display items
	Add/Update	Input items

IV. RESULTS AND DISCUSSION

This paper studied multi-platform dropshipping application for sales management activities. Activity theory was used to identify the user, the requirement of hardware and software, the rules for the system, every user role, and the outcomes for every activity that will be performing in the management system. After that, the activity was decomposed according to activity, actions, and operations [21]. Each action forms a usability unit for each purpose. In this case, the main activities were feedback of the user, managing customer profile, managing product stock, managing the sales and parcel tracking as defined by the client during requirements elicitation. By using the activity theory diagrams as in Figure 1, Figure 2, and Figure 3, it helps to recognize the actual scenario for each activity in details. It does not only help to identify the areas to focus on, but also to identify the appropriate resources during the requirements analysis process. It is important to identify the activity in specific at this point, where activities, actions, and operations are necessary to fix the specific issue in the application. The decomposition of actions and operations for each identified activity using activity theory diagram can help in identifying main entities of the system which will be useful for designing the database for the application. This approach is also useful in preparing structured test cases and test scenarios for the application at the latter stages of system development.

The structured requirements outlined in this study can be used for subsequent development stages such as design and construction, and as a basis for assessing the application's usability [22]. The study comprised of 6 main activities for this multi-platform system application which was implemented on web and mobile platform. Activity theory diagrams are able to provide clear requirements. Refer to Figure 1 of the activity theory diagram shows the administrator role in the management system to manage sales including viewing the sales chart. Administrator will view the summary of the sales chart by choosing the month and item to be displayed. Also, the activity is for the user such as stockist, dropship agent and sub agent to manage sales including to set target sales for every month and items. Figure 2 shows the activity of the stockist, dropship agent and sub agent to track parcel, send feedback and manage customer profile using mobile platform. Lastly in Figure 3 shows the activity diagram for stockist and dropship agent only to manage product stock and purchase history by updating product inventory and for the system to generate invoice for every customer's purchase. The requirements are clearly specified with all the required details when using activity diagram as analysis tool.

V. CONCLUSION

The study was conducted specifically to highlight the importance of the implementation of activity theory to analyze the requirements of software application on multi-platform by looking into the context of dropshipping application. The analysis reveals that the theoretical approach provided by the activity theory has benefit its technical implementation compared to conventional requirement analysis solution for developing multi-platform software. Therefore, this paper suggested the use of activity theory as an approach for the software requirements analysis of multi-platform system applications. The approach described in this study is replicable and provides a methodology for requirements analysis of other multi-platform applications.

REFERENCES

[1] J. T. Catanio (2006) Requirements Analysis: A Review. In: Sobh T., Elleithy K. (eds) Advances in Systems, Computing Sciences and Software Engineering. Springer, Dordrecht. https://doi.org/10.1007/1-4020-5263-4_64

[2] T. Iyamu (2017). Towards a conceptual framework for protection of personal information from the perspective of activity theory. *South African Journal*, 6.

[3] K. C. Denis Dennehy (2016). Going with the flow: An activity theory analysis of flow techniques in software development. *The Journal of Systems and Software*, 12.

[4] A. C. Antonio Gonçalves (2017). Developing Anti-Bribery Organization System Based on Quantitative Pair-Wise Information. *An approach based on Activity Theory*, 6.

[5] D. Chaffey (2016). Strategy, Implementation And Practice. *E-Business & E-Commerce Management*, 10.

[6] N. A. Nik Ahmad and S. A. Syed Zamri, "The cross platform application development adapted Spring framework to support front-end tendering services," 2014 International Conference on Computer, Communications, and Control Technology (I4CT), Langkawi, 2014, pp. 58-62, doi: 10.1109/I4CT.2014.6914145.

[7] N.A.N. Ahmad and Z.M. Kasirun (2011). Elicitation Strategies for Web Application Using Activity Theory. Journal Of Advances In Computer Research. Vol. 2, No. 3 (5), pp. 1–13.

[8] J. Stańczak, W Radziszewska, Z Nahorski - Intelligent Systems' (2015). Dynamic pricing and balancing mechanism for a microgrid electricity market, Springer Cham, pp. 793 – 806

[9] K. Witkowski (2020). Logistics Models In E-Commerce. Research Papers Faculty Of Materials Science And Technology In Trnava Slovak University Of Technology In Bratislava, 96.

[10] D. Lyth, R. K. (2020). Impact Of Stockout Compensation In E-Commerce. Operations And Supply Chain Management, 91.

[11] D. Bloomfield & H. T. Nguyen (2015). Creating and Sustaining Professional Learning Partnerships: Activity Theory as an Analytic Tool.. *Australian Journal of Teacher Education, 40*(11).

[12] L. Li (2016). Poverty alleviation through government-led e-commerce development in rural China: An activity theory perspective. *Wiley: Special Issue Paper*, 36.

[13] P. Cash (2015). Activity Theory as a means for multi-scale analysis of the engineering design process: A protocol study of design in practice. *CrossMark*, 32.

[14] N. A. Nik Ahmad, N. I. Akhbariee and M. Hafizuddeen (2013). Requirements analysis of android application using activity theory: A case study. 2013 International Conference of Information and Communication Technology (ICoICT), Bandung, 2013, pp. 145-149, doi: 10.1109/ICoICT.2013.6574563.

[15] C. Lee (2021). Exploring user experience of digital pen and tablet technology for learning chemistry: applying an activity theory lens. *Science Direct: Heliyon*, 9.

[16] R. Baguma (2019). Using WhatsApp in Teaching to Develop Higher Order Thinking Skills-a Literature Review Using the Activity Theory Lens. *International Journal of Education and Development using Information and Communication Technology* , 119.

[17] E. W. Chizhik (2018). Using Activity Theory to Examine How Teachers' Lesson Plans Meet Students' Learning Needs. *The Teacher Educator*, 2018, 85.

[18] C. Lewin (2018). Developing digital pedagogy through learning design: An activity theory perspective. *British Journal of Educational Technology*, 12.

[19] N. A. N. Ahmad, M. F. Hamzah (2020). Modernization of Ticketing System Using Re-Engineering Approach. Journal of Computing Technologies and Creative Content, 5(2), December 2020, pp. 13-17.

[20] Ahmad, N.A.N, Hamid, N.I.M, and Lokman, A.M. (2021). Performing Usability Evaluation on Multi-Platform Based Application for Efficiency, Effectiveness and Satisfaction Enhancement. International Journal of Interactive Mobile Technologies (iJIM), Vol. 15, No. 10 (2021), pp. 103-117. https://doi.org/10.3991/ijim.v15i10.20429

[21] D. H. Nguyen & D. C. Choon Poo (2016). Analysis and design of mobile health interventions towards informed shared decision making: an activity theory-driven perspective, Journal of Decision Systems, 25:sup1, 397-409, DOI:10.1080/12460125.2016.1187399.

[22] Nik Ahmad, N.A. and Hussaini, M. (2021). A Usability Testing of a Higher Education Mobile Application Among Postgraduate and Undergraduate Students. International Journal of Interactive Mobile Technologies (iJIM), Vol. 15, No. 09 (2021), pp. 88-102. https://doi.org/10.3991/ijim.v15i09.19943

[23] Iyamu, T., & Shaanika, I. (2018). The use of activity theory to guide information systems research. Education and Information Technologies. doi:10.1007/s10639-018-9764-9.

[24] Victor Kaptelinin & Bonnie Nardi (2018). Activity Theory as a Framework for Human-Technology Interaction Research, Mind, Culture, and Activity, 25:1, 3-5, DOI: 10.1080/10749039.2017.1393089.