

Model design to develop online web based questionnaire

Julian Wesley¹, Fifilia², Cynthia Catrine¹, Dennis Antony¹, Ferdian Rizky Estefan¹

¹Computer Science Department, School of Computer Science, Bina Nusantara University, Indonesia 11480

²Information System Department, School of Information Systems, Bina Nusantara University, Indonesia 11480

Article Info

Article history:

Received Jul 19, 2021

Revised Jun 15, 2022

Accepted Jul 01, 2022

Keywords:

Design

Features

Online

Questionnaire

Web Based

ABSTRACT

This research aims to create a web-based application for sharing questionnaires. The developed features are creating questionnaires, sharing questionnaire in the dashboard, filter the questionnaire as the requested criterias, exchange the rewarded coins for gifts, export questionnaire data to a document, set a limit for the questionnaire for each device. The development will be using data collecting using questionnaire and literature study. Then, software development life cycle (SDLC) waterfall research methodology will be used for the website system development. Result of this research will be a website application that will be used for questionnaire maker so that they can reach the respondent count target, have a suitable respondent (minimize respondent who does not meet the criteria), and also can collect more validated data.

This is an open access article under the [CC BY-SA](#) license.



Corresponding Author:

Julian Wesley

Computer Science Department, School of Computer Science, Bina Nusantara University

Jakarta, Indonesia 11480

Email: julianwesley@binus.ac.id

1. INTRODUCTION

Data is the source of information. Data is an illustration of things and events that we face, a reality that describes real events and unity [1]. To be able to draw conclusions, a data collection stage is needed. Data collection method is a technique used by researchers or system analysts to be able collect important facts [2]. So the process of collecting data is important, because the information collected and how it is explained is determined by the methodology and analytical approach applied by the researcher in the research [3]. Survey is an activity that aims to collect information about a large population and relatively quickly [4]. The basic characteristic in applying the survey method is data collected that has certain standards which are generally designed in the form of questionnaires or interviews [5]–[7].

One of the most frequently used methods to collect research data is a questionnaire, because the main purpose of a questionnaire is to help extract data from respondents. The advantages of using a questionnaire are that it saves a budget, does not require special equipment, the measurement results are based on user opinions also can provide information about the strengths and weaknesses of a product or service [8]. Questionnaires allow quantitative data to be collected in a standardized manner so that the data is internally consistent and coherent for analysis [9]. Questionnaires also have more advantages than it disadvantages, particularly for the low response rate [5], [6], [10]–[12].

Generally, in traditional way researchers will print out questionnaires and distribute them to respondents randomly or even to some selected respondent [13], [14]. There are several ways available to create and share questionnaires, such as via the web, email, and more [15], [16]. However, distributing questionnaires via email is rarely used because it is less practical, and causes a lack of respondents' answers [17]. Currently

most of practitioners also using questionnaires that already available on the website because they are considered more effective related to the sensitive issues, can reduce the risk of social bias, and respondents can answer more honestly because there is no interviewer, allows more data to be collected than with conventional mailed paper questionnaires [18]–[20]. Dissemination of questionnaires using web can be used to collect data without limitations of space and time also making it easier to recruit large numbers of participants, so the respondents can fill it out anywhere and anytime they want by online [20]. The main obstacle in data collection through questionnaires is not all surveys can be successfully carried out [21]. Problem that is often faced in data collection through questionnaires is the difficulty of getting the respondents, so that the predetermined target number of respondents is difficult to achieve. That low participation of respondents of this questionnaire is called non-response error, which is divided into three types, namely individuals who do not participate or non-response units, individuals who leave when filling out a survey or partial non-response, and individuals who fail to provide an answer to an individual question or non-response item [22].

In addition to the number of respondents, the validity of the data also very important. The low response rate in data collection will allow the research data to be not credible and have a poor quality. Biased research results make it lack or even have no credibility to be used as a basis for policy making by the authorities [23]. One of technique to check the validity or credibility of the data is triangulation technique. Data triangulation is checking data by means of re-examination, or in colloquial terms it is called check and recheck. Data that is declared valid through triangulation will provide confidence for researchers about its validity, so there will be no doubt in making the conclusions about the research conducted [24].

Based on these problems, we want to develop an idea to create a web-based application that brings together respondents with questionnaire makers. By implementing a web-based application, it will help to distribute the questionnaire without being hindered by time and place, so that can become a solution for data collection. There are some added features such as coin collection features. The application of this current trend is expected to increase the response rate, the motivation of respondents in completing when filling out the questionnaire [25], as well as increasing the number of respondents who can fill out the questionnaire, and it is hoped that the respondents do not leave in the middle of filling out the questionnaire. An additional feature that will be added in the design is the filter feature, so that the questionnaire can only be filled out by respondents who meet the criteria, as well as the share on dashboard feature so that the questionnaire can be viewed and filled out by more respondents.

2. METHOD

This study aimed to establish the concept and model of online questionnaire design, in order to develop the model, waterfall in software development life cycle by Sommerville [26], where the development phase is carried out sequentially. The advantage of using this method is that the data collection process must be defined first. The following are the details of the stages in designing an application based on the framework from the Figure 1.

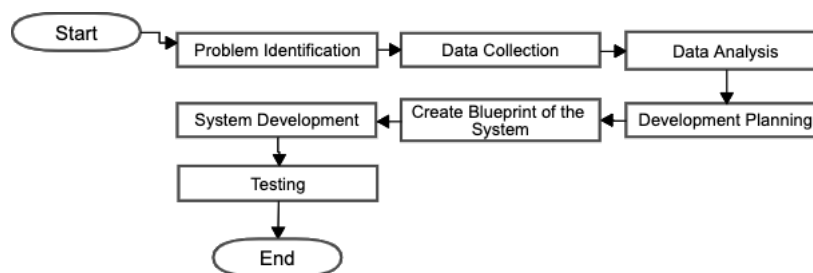


Figure 1. Application research and development flow

- Problem identification: at this stage we identify the problems faced by many people around, which solutions have not been found yet.
- Data collection: at the data collection stage, in addition to using literature studies and comparison of similar applications, questionnaires were also used as a tool to collecting data. The questionnaire was

prepared a Likert scale and a Guttman scale. Likert scale 5 level with neutral label in the middle/third position is used, while Guttman scale is a scale that has firm answers, such as true or false, yes or no, ever or never, and so on.

- Data analysis: after getting the result of distributing the questionnaires, we analyzed the results of the questionnaires.
- Development planning: at this stage, the author makes a timeline to arrange the application development schedule to be more structured.
- Create blueprint of the system: at this stage, we design the system by creating unified model language (UML) class diagrams, an entity relationship diagram (ERD), and designing mockups or application user interfaces [27].
- System development: at this stage, we start the application using the Laravel framework, the Angular framework, and MySQL.
- Testing: at the testing stage, we test the system on the application by testing with the black-box testing method.

3. RESULT AND DISCUSSION

Data collection using literature study technique is carried out to support application development, bench-marking on several similar applications, and also with questionnaire. Questionnaire is carried out within a period of 1 month (October 2020 – November 2020) through online media. The following below are the results and analysis obtained.

3.1. Similar application analysis

The following below are the result of bench-marking on several similar applications using three types of online questionnaire applications. Similar applications offer several features to make it easier for users. Some features that make BuddyQ differs with existing application includes profile to make it easier for user to manage their profile, questionnaire making, set respondent criteria to be able the user to set the criteria of the respondents, data convert, filter the questionnaire, reward feature by points, coin exchange, limitation of respondents per devices, change themes. This comparison is carried out to find out and compare the features of three types of applications, as well as a reference in adding features to the application that will be designed. The detail comparison can be seen on the Table 1.

Table 1. Comparison table of features with the similar applications

Features	X apps	Y apps	Z apps	BuddyQ
Profile	v	x	v	v
Questionnaire making	v	v	v	v
Set respondent criteria	v	x	v	v
Questionnaire sharing on dashboard	v	x	x	v
Questionnaire sharing by shareable link	v	v	v	v
Data convert	x	v	v	v
Filter the questionnaire	v	x	v	v
Rewarding feature by points	v	x	x	v
Coin exchange	v	x	x	v
Limitation of respondents per device	x	x	v	v
Change themes	x	v	v	v

3.2. Respondent description

Questionnaire distributed to 1383 respondent by using online media, though only 124 respondents who filled it in completely. Among 124 respondent who filled out, it was known that 117 respondents had made an online questionnaire while 7 respondents had never made it. There are 19 questions regarding the habits and activities of users of the online questionnaire application, which consist of several categories, including: the user demographics, the usefulness of the questionnaire application from the user's perspective, difficulties in using the application, the importance of the features offered in the online application.

3.3. Questionnaire data analysis

3.3.1. Features highlight

Based on the result of data collection and also a comparison of similar applications, the features that can be developed to create an online questionnaire filling application, include: i) coin feature: this feature will be developed to provide rewards to users, especially respondents from online questionnaires. This feature is adapted from similar applications that reward respondents. However, this application will provide flexibility in the rewards withdrawal that collected from the results of filling out the questionnaire. This feature aims to attract respondents' interest in filling out online questionnaires; ii) filter questionnaire feature: this feature will be developed to help users, especially questionnaire maker to perform data processing of respondent who filled out; and iii) questionnaire sharing on dashboard feature: this feature will be developed to help users share their questionnaires, so more respondents can fill out.

3.3.2. Features in the application

All features in the application design based on the data obtained includes:

- Profile: the profile feature allows users to fill in their personal data which will be used for filtering needs. Personal data that needs to be filled in is full name, date of birth, gender, occupation, and domicile.
- Questionnaire making: users can create a questionnaire according to their needs, change the appearance of the questionnaire they created by adding a photo as a header, and change the theme of the questionnaire to a variety of color choices.
- Questionnaire sharing: users can share their questionnaire on the application dashboard and create as a shareable link. Questionnaires that are distributed to the application dashboard can be filled out by the other users who meet the criteria set by the questionnaire maker.
- Limit the number of respondents: this feature allows users to set how many response limits they want to receive. In addition, users can also set whether they want to use the limit per device feature, so that no respondent can use their electronic device to fill out the same questionnaire more than one time.
- Determine respondent criteria: the questionnaire maker can set the respondent's criteria, such as the age, gender, occupation, or domicile, so that the questionnaire created by the maker can only be filled out by specific respondents who match the target.
- Questionnaire filter: this feature will filter which questionnaire will appear on the dashboard for each user. Users can only view and fill out the questionnaires if they are match with the criteria set by questionnaire maker.
- Data export: after the questionnaire makers get the final results or responses, they can export the data obtained into documents with .xlsx extension or excel.
- Coin collection and exchange: if the user has filled out the questionnaire from their dashboard, they will get a number of coins. After reaching a certain amount, the collected coins can be exchanged for various types of attractive prizes such as balances or vouchers.

3.4. Proposed system design

From the data collected through literature studies, bench-marking of similar application, and questionnaires. Then those data will be analyzed to be used in the online questionnaire application design stage. At the design stage of this proposed system, we create an entity relationship diagrams (ERD), class diagrams, and user interface.

3.4.1. Class diagram

Class diagram serves to show the class name, attributes, workings, and relationships between classes in the proposed system. The class diagram describes the process flow of the designed application, by describing the class diagram components according to the feature offered in the online questionnaire design. Class diagram of the proposed system can be seen in Figure 2.

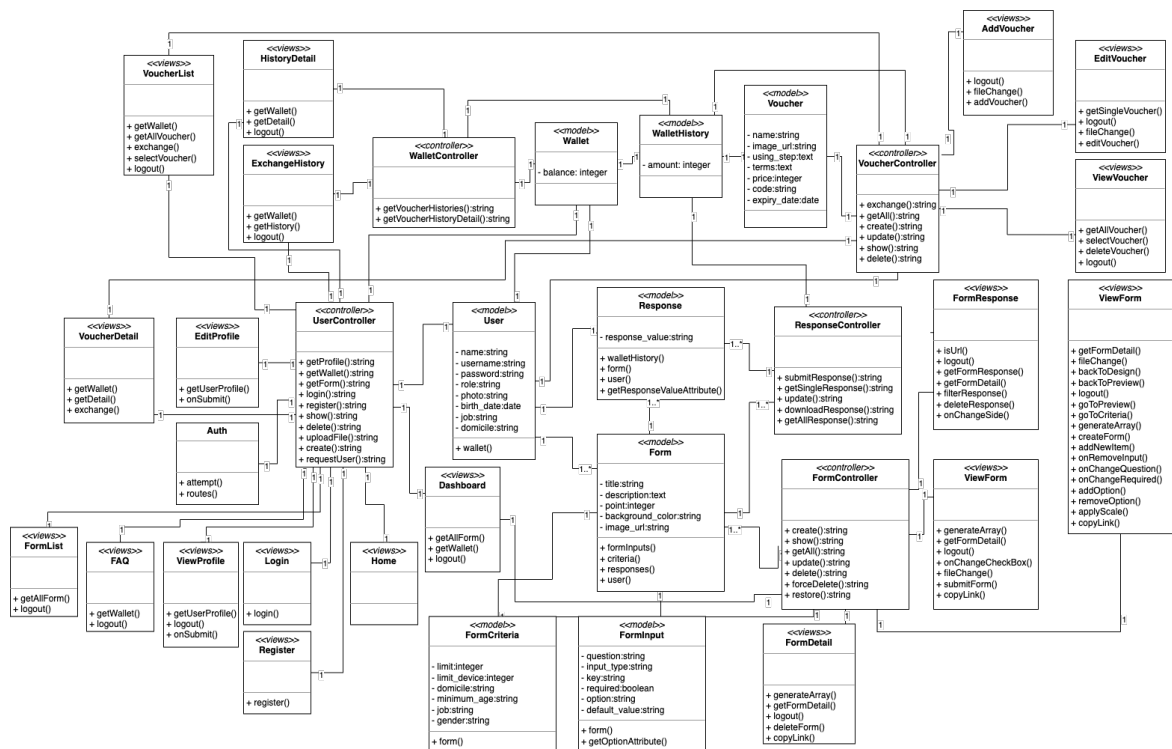


Figure 2. Class diagram design of application

3.4.2. ERD

In addition to the class diagram, the following is an ERD design from the online questionnaire application design. Based on the data that has been analyzed, then a design is formed that describes the relationship between entities and their attributes in detail. The following is a detailed ERD plan which can be seen in Figure 3.

3.4.3. User interface

Figure 4 shows the home page, which is can be seen by the registered user in the application for the first time. On this page, user can fill out the questionnaire by pressing *isi kuesioner* on the list of questionnaires provided. Users can also view the total coins owned, go to the my form page by pressing the *buat form* or *form saya* on the side navbar, go to the coin exchange page by pressing *aku mau hadiah* or *tukar koin* on the side navbar, as well as to the frequently asked question (FAQ) page by pressing the *FAQ* button on the side navbar. Figure 5 shows the my form page, where users can create a new questionnaire by pressing the *buat form baru* button or view a questionnaire that has already been created before. To create the new questionnaire, user can use “add questionnaire page”. On this page, user can design the questionnaire according to their needs, such as change the background color, write the title of the questionnaire, or even create the questions. Figure 6 shows questionnaire preview page, which can be seen by users when they finished design the new questionnaire in the Figure 5. This page displays the results of the designed questionnaire that has been made. On this page we can also find out how the questionnaire looks for respondents, so that we have the same look and feel with the respondents.

Figure 7 shows view questionnaire results page, which can be seen to see all the repondents’ respond. In this page, user can also choose whether they want to stop receiving incoming responses by enabling the *berhenti menerima respons* toggle. Apart from that, users can also download all received responses as ‘.xlsx’ or as Microsoft Excel file extensions. Filter feature also will be created in this page to make it easier to find the needed data. Figure 8 shows coin exchange page, which will display various prizes that can be exchanged by users using the collected coins. If user presses the *lihat detail* button, they will be redirected to the prize details page. To get the gift, user only need to press the *tukar sekarang* button on the desired prize. On this page, users can also view the history of the gifts that have been redeemed by pressing the *histori penukaran*.

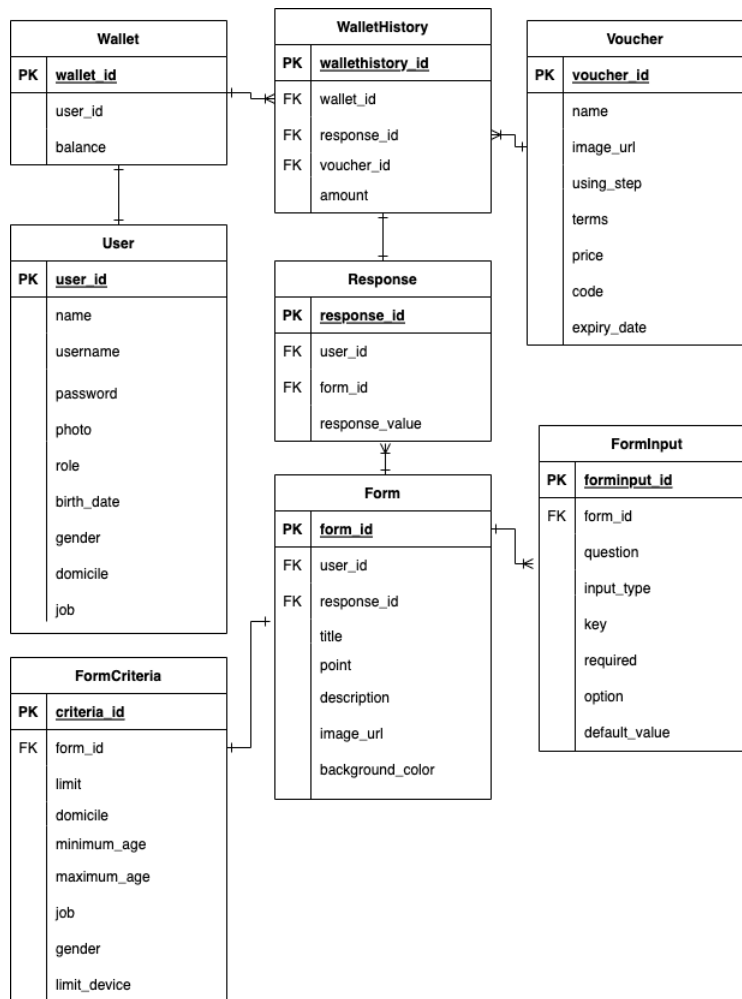


Figure 3. Entity relationship diagram of application



Figure 4. Home page design

Figure 5. Add questionnaire page design

Figure 6. Questionnaire preview page design

Figure 7. View questionnaire results page design

Figure 8. Coin exchange page design

4. CONCLUSION

This research focuses on the development of features in an online-based questionnaire application, that are expected to help the problem of response rate while filling out the questionnaire in the data collection stage. Additional feature development is carried out using bench-marking and data collection through questionnaires. Bench-marking is done to find out similar applications and see the features offered, while questionnaire data is used to see the habits and features expected by users when using similar applications. The UML design made is to be applied to the development of an online questionnaire system in the future. The development of this application will be carried out by building new similar applications using basic features in data collection and also applying the expected features by the users, so that it can help to mitigate problems in the usage of online questionnaire application users.






REFERENCES

- [1] P. Ranganathan and N. J. Gogtay, "An introduction to statistics - data types, distributions and summarizing data," *Indian journal of critical care medicine*, vol. 23, 2019, doi: 10.5005/jp-journals-10071-23198.
- [2] T. Connolly and C. Begg, *Database Systems: A Practical Approach to Design, Implementation, and Management*, Pearson Education, 2015. ISBN 9781292061849. [Online]. Available: <https://books.google.co.id/books?id=k11TDwAAQBAJ>.
- [3] E. Paradis, B. O'Brien, L. Nimmon, G. Bandiera, and M. A. T. Martimianakis, "Design: Selection of data collection methods," *Journal of graduate medical education*, vol. 8, no. 2, pp. 263-264, 2016, doi: 10.4300/JGME-D-16-00098.1.
- [4] J. Ponto, "Understanding and evaluating survey research," *Journal of the advanced practitioner in oncology*, vol. 6, no. 2, pp. 168-171, 2015. [Online]. Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4601897/>.
- [5] D. D. Dillman, *Mail and Internet Surveys: The Tailored Design Method (2007 update with new Internet, visual, and mixed-mode guide)*, New York: John Wiley, 2007. ISBN 047003856X, 9780470038567.
- [6] D. A. Dillman, "The Design and Administration of Mail Surveys," *Annual Review Sociology*, vol. 17, pp. 225-249, 1991, doi: 10.1146/annurev.so.17.080191.001301.
- [7] M. Kasunic, "Designing an effective survey," *Software Engineering Institute*, Sep. 2025. [Online]. Available: <https://resources.sei.cmu.edu/library/asset-view.cfm?assetid=7277>.
- [8] A. Purwinarko, M. Subagja, and A. Yanuarto, "The evaluation of final assignment system using the USE questionnaire approach," *Scientific Journal of Informatics*, vol. 7, no. 2, 2020, [Online]. Available: <https://journal.unnes.ac.id/nju/index.php/sji/article/view/26053>.
- [9] S. Roopa and R. Menta Satya, "Questionnaire designing for a survey," *The Journal of Indian Orthodontic Society*, vol. 46, no. 4, pp.






- 37-41, Jun. 2012, doi: 10.5005/jp-journals-10021-1104.
- [10] R. M. Groves and E. Peytcheva, "The impact of nonresponse rates on self-selection bias a meta-analysis," *Public opinion quarterly*, vol. 72, no. 2, pp. 167–189, 2008, doi: 10.1093/poq/nfn011.
- [11] L. Kanuk and C. Berenson, "Mail surveys and response rates: A literature review," *Journal of marketing research*, vol. 12, no. 4, pp. 440–453, 1975, doi: 10.2307/3151093.
- [12] J. R. Nevin and N. M. Ford, "Effects of a deadline and a veiled threat on mail survey responses," *Journal of Applied Psychology*, vol. 61, no. 1, pp. 116–118, 1976, doi: 10.1037/0021-9010.61.1.116.
- [13] L. Hohwu, H. Lhysol, M. Gissler, S. H. Jonsson, M. Petzold, and C. Obel "Web-based versus traditional paper questionnaires: a mixed-mode survey with a nordic perspective," *Journal of medical Internet research*, vol. 15, no. 8, 2013, doi: 10.2196/jmir.2595.
- [14] J. F. Ebert, L. Huibers, B. Christensen, and M. B. Christensen, "Paper- or web-based questionnaire invitations as a method for data collection: Cross-sectional comparative study of differences in response rate, completeness of data, and financial cost," *Journal of medical Internet research*, vol. 20, no. 1, 2018, doi: 10.2196/jmir.8353.
- [15] J. R. Evans and A. Mathur, "The value of online surveys," *Internet Research*, vol. 15, no. 2, Apr. 2005, doi: 10.1108/10662240510590360.
- [16] N. Michaelidou and S. Dibb, "Using email questionnaires for research: Good practice in tackling nonresponse," *Journal of Targeting, Measurement and Analysis for Marketing*, vol. 14, pp. 289–296, 2006, doi: 10.1057/palgrave.jt.5740189.
- [17] R. Kent and H. Brandal, "Improving email response in a permission marketing context," *International Journal of Market Research*, vol. 45, no. 4, pp. 1–13, 2003, doi: 10.1177/147078530304500404.
- [18] P. Vicente and E. Reis, "Using questionnaire design to fight nonresponse bias in web surveys," *Social Science Computer Review*, vol. 28, no. 2, May 2010, doi: 10.1177/0894439309340751.
- [19] A. L. Holbrook, M. C. Green, and J. Krosnick, "Telephone versus face-to-face interviewing of national probability samples with long questionnaires: Comparisons of respondent satisficing and social desirability response bias," *Public Opinion Quarterly*, vol. 67, no. 1, pp. 79–125, Mar. 2003, doi: 10.1086/346010.
- [20] J. C. Wyatt, "When to use web-based surveys," *Journal of the American Medical Informatics Association: JAMIA*, vol. 7, no. 4, pp. 426–430, Jul. 2000, doi: 10.1136/jamia.2000.0070426.
- [21] A. Diamantopoulos and B. B. Schlegelmilch, "Determinants of industrial mail survey response: A surveyon-surveys analysis of researchers' and managers' views," *Journal of Marketing Management*, vol. 12, no. 6, pp. 505–531, 1996, doi: 10.1080/0267257X.1996.9964432.
- [22] V. Toepoel, "Selecting survey software," SAGE Publications Ltd, London, 2016, doi: 10.4135/9781473967243.
- [23] A. Bowling, "Mode of questionnaire administration can have serious effects on data quality," *Journal of Public Health*, vol. 27, no. 3, pp. 281–291, 2005, doi: 10.1093/pubmed/fdi031.
- [24] N. Carter, D. B-Lukosius, A. Dicenso, J. Blythe, and A. J. Neville, "The use of triangulation in qualitative research," *Oncology Nursing Forum* vol. 41, no. 5, pp. 545–547, Sep. 2014, doi: 10.1188/14.ONF.545-547.
- [25] O. Lipps *et al.*, "Incentives in surveys," Jun. 2019, doi: 10.24449/FG-2019-00008.
- [26] I. Sommerville, *Software Engineering*, ser. International Computer Science Series. Pearson, 2011. ISBN 9780137053469. [Online]. Available: <https://books.google.co.id/books?id=l0egcQAACAAJ>.
- [27] J. W. Satzinger, R. B. Jackson, and S. D. Burd, *Systems Analysis and Design in a Changing World*, Cengage Learning, 2015. ISBN 9781305465268. [Online]. Available: <https://books.google.co.id/books?id=pzR-BAAAQBAJ>.

BIOGRAPHIES OF AUTHORS







Julian Wesley      currently holds a dual appointment as a Software Engineer at Grow Financial PTE. Ltd. and Lecturer Specialist of Game Application Technology at Bina Nusantara University in Jakarta, Indonesia. He can be contacted at email: JulianWesley@binus.ac.id.







Fifilia      currently holds a dual appointment as a Senior Manager at ElysianNxt and Lecturer of Information System at Bina Nusantara University in Jakarta, Indonesia. She can be contacted at email: fifilia1302@binus.ac.id.







Cynthia Catrine     currently is a final year undergraduate student in Computer Science major. Cynthia worked as a Quality Assurance in PT. Emerio Indonesia in their internship, and also do a freelance as a Social Media Specialist in a Coding Studio company based in Jakarta. She can be contacted at email: cynthia.catrine@binus.ac.id.



Dennis Antony     currently is a final year undergraduate student in Computer Science major. Dennis worked as a Quality Assurance in PT. Emerio Indonesia in their internship. He can be contacted at email: dennis.antony@binus.ac.id.



Ferdian Rizky Estefan     currently is a final year undergraduate student in Computer Science major. Ferdian worked as a .NET Developer in PT. Emerio Indonesia in their internship. He can be contacted at email: ferdian.estefan@binus.ac.id.