

Mobile Business Intelligence Application Design for Retail Micro and Small Enterprises (MSEs)

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Abstract

Micro and Small Sized Enterprises (MSE's) contribute significantly in the economic growth of a country as they provide jobs and helps reduce poverty rate. In the Philippines, there were about 99% of small and micro businesses as reported in the year 2020. These businesses require support in terms of technology for them to be motivated and make good decisions in their business operations. This research aims to determine the perceptions of SME's in using mobile application with Business Intelligence/ Business Analytics (BI/BA) and come up with a conceptual design of a system. A survey was conducted to 31 owners and managers with questions about Transactional Data, Visualizations, Product Inventory, and Reports and affinity analysis was used to assess their responses. Results showed that respondents need a simple mobile application that can handle voluminous amounts of data, present real time data/information, graphs and other visual aids, provide historical business data, options to export and import data, automated insights, and generate reports. Respondents also want the mobile application to not allow other users to view their business data without their consent and should not use terminologies that are difficult to understand. The researchers came up with the prototype design covering respondents' requirements.

Keywords

Business intelligence, business analytics, micro-small enterprises and mobile application

1. Introduction

Every day, large amounts of data is being generated by digital platforms, business transactions and the people themselves. In a strategic business perspective, relevant data to a certain enterprise shouldn't only be recorded as means to knowing the state of the business but they need to be processed by analytical tools such that they could make informed decisions for the business and opportunity costs are minimized.

In a literature review conducted in 2017 by Marilex Rea Llave, the author said that SMEs are still lagging in terms of business intelligence and analytics capabilities. This is because of the limited resources that they have which is also evident in the study of Adeyelu, et. al. (2016) on developing a framework for mobile analytics applications for SMEs. In their paper, they found that not only the factors are the resources but also on the technological aspect. This could mean that generally, SMEs are recognizing a certain level of complexity as a limitation in the use case of business intelligence tools.

A mobile application for business analytics was developed by Motta et al. (2014), primarily developing and implementing it for a customer care company. In their study, they developed a framework specifically for integrating mobile analytics applications that is service-oriented. Moreover, their framework included a reference model for implementing such technology solutions for mobile analytics.

Mobile internet devices such as smartphones and tablets are almost everywhere and are relatively cheaper than procuring a personal computer for similar purposes. Considering that analytics is a need for businesses and the limitations that are naturally put on MSEs, the researchers are proposing to evaluate the expectations of micro-small enterprises on a mobile business intelligence application and output a design for it.

1.1 Scope and Limitation

This study is primarily focused on determining the expectations of retail micro-small enterprises on a mobile business analytics platform. Purposive sampling was used in this study to acquire substantial data. The respondents were chosen as they are the target users of the mobile business analytics platform, once developed. The respondents were given a semi-structured questionnaire with their consent to participate. This study does not cover the development of a mobile business analytics platform but only the high-level design of it. The study is limited to businesses in the retail industry.

2. Related Literature

2.1 Micro and Small Enterprises

Micro and Small enterprises play a significant role in overall economic development. They are part of the development of jobs in this economy that we are in. These enterprises intensively contribute to the achievement of critical targets of every national economy, thus becoming the backbone of social-economic progress (Neagu, 2016). By generating increased income and jobs, small and medium enterprises boost the country's economy.

2.2 Business Intelligence for Enterprise

Business intelligence is currently viewed as a response to certain adverse incidents that suddenly impact enterprises, regardless of whether they are big or small business firms (Fourati-Jamoussi & Niamba, 2016). It is also considered to be a separate and technical field dominated by engineers and programmers (Solberg Soilen, 2015). These tools greatly help these enterprises in providing significant business information to enterprises and organizations, in addition, there are different business intelligence tools per enterprise (Fourati-Jamoussi & Niamba, 2016). Business intelligence or BI are vital for every enterprise. It is utilized by enterprises and organizations to monitor and discover business trends and other significant business information which enhances their decision-making capabilities and enables them to adapt immediately. BI provides or enhances enterprise capabilities such as analyzing customer's buying trends, easily identify opportunities, improve productivity by saving time through information sharing, monitor your competitors and improve financial and market knowledge (Al-Hassani, 2015).

Noonpakdee et al. (2018) on their research on the implementation of big data for small and medium enterprises, aims to present the capabilities, readiness, and challenges for SMEs to implement big data, which has the potential to be used as a guideline for other SMEs. They observed and utilized in-depth interview on 40 SMEs that are in either production or service industry of Thailand. Based on their results, 90% of their respondents are not ready for the implementation due to the reason that most owners of SMEs sees IT investments such as big data still not suitable for their organization this goes for business analytics and business intelligence as well which was evident on the results of Gudfinnsson and Strand's (2017) research on the challenges encountered by Small and Medium Enterprises in adopting Business Intelligence. According to their study the main challenges in adopting BI for SMEs based on literature reviews and case study on 3 companies includes insufficient skill and knowledge in Business analytics and in perceiving the advantages of BI that would aid in increasing revenue. Gauzelin and Bentz (2017) interviewed 50 SME managers and 150 SME employees to gather data for their study which focuses on the impact of business intelligence to SMEs in France and unlike big data which strategic value may seem too vague for SMEs, 89% of their respondents agreed that business intelligence analytics implemented to their business provides significant technological support for a reliable and timely knowledge based decision making. Fourati-Jamoussi and Niamba (2016) evaluated and studied business intelligence tools by using task-technology fit and technology acceptance questionnaires to 134 respondents, and according to their findings only 29% of their respondents does not utilize business intelligence tools often which clearly shows that business intelligence analytics can be easily valued by SMEs.

2.3 Mobile Business Intelligence Applications

Developing a mobile analytics application for micro-small enterprises needs to be informed by the business factors so that the end product may be effective on supporting business decisions. According to Llave (2017), in their literature review, there is still little conceptual work in the field, therefore developing a research on mobile analytics may benefit not only the companies but also the research area.

A study was conducted by Adeyelu, et al. (2016) on Development of Mobile Business Intelligence Framework for Small and Medium Enterprises in Developing Countries. In their paper, the authors aimed to create a framework that is centered on the factors affecting the deployment of mobile business intelligence tools against the business. Considering the capabilities of SMEs to deploy BI tools, their study outputted factors and ranked them based on frequencies and then hypothesized their significance on deployment of MBI. In their rankings, the expectations of the business in terms of how it would strategically support the business has the highest rank and the graphical user interface ranked after security, compatibility and competency factors. This means that the businesses must be able to see first the relative importance of those factors other than focusing mainly on the design. The focus of the MBI tool should be on its practical importance other than the ease of use on its GUI design. Their paper would be very useful for both assessing and developing the mobile analytics application, where it would allow us to consider the factors in their framework that should be taken into consideration to deploy MBI tools, such as that it was concluded that organizational factors, technological compatibility and technological complexity should be all taken into account so that successful integration is achieved.

3. Methodology

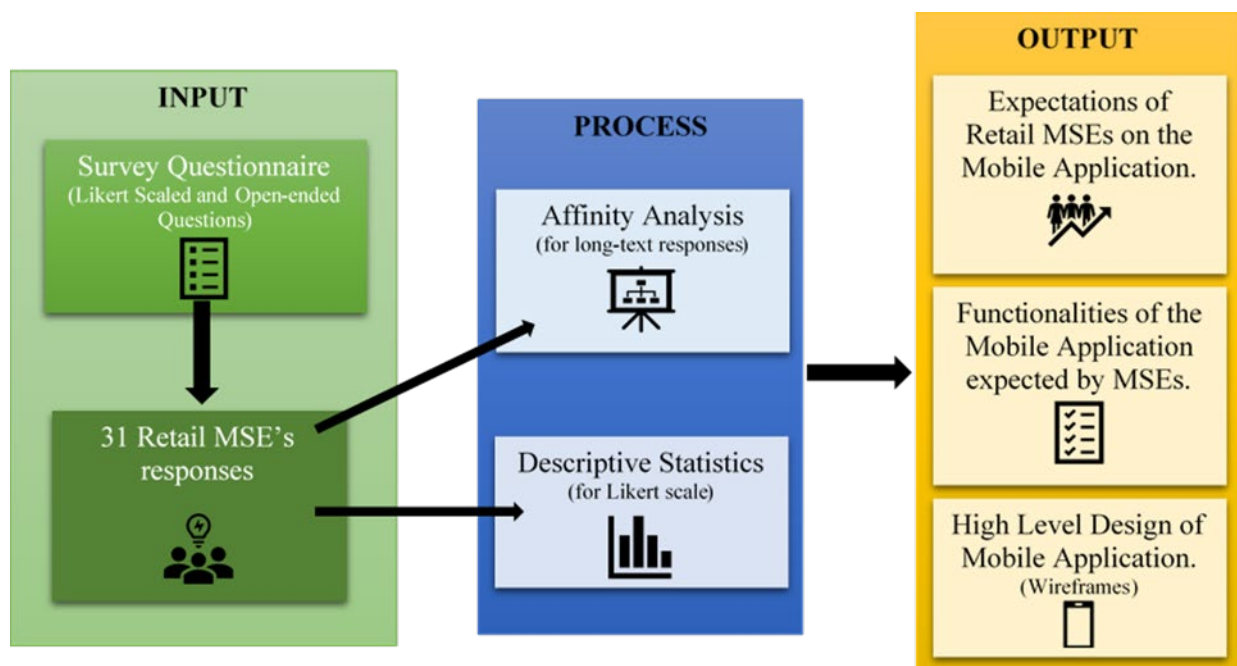


Figure 1. Conceptual Framework

3.1 Input-Process-Output

The researchers as seen in Figure 1, gathered data from 31 retail Micro and Small Enterprises via survey questionnaire and analyzed those data using affinity analysis for the responses to the open-ended questions of the survey and descriptive statistics, specifically the mean measure of central tendency for the responses to the Likert scaled questions of the survey to determine the expectations of retail MSEs on the mobile application. Also, to determine the other functionalities of the mobile application expected by MSEs. To be able to develop a high-level design of the mobile application using wireframes.

3.2 Statistical Treatment and Analysis Tools

Affinity Analysis

An affinity diagram would be developed by the researchers based on the respondents' answer to the open-ended questions on the survey. This analytical tool would allow the researchers to discover similarities and relationships between the 20 responses. Formulation of themes and patterns on the premise of the respondents' answer would enable the formulation of definite functionalities of the mobile application expected by the target users.

Descriptive statistics: Mode and Mean Measure of Central Tendency

This tool is mainly used by the researchers to classify and describe the responses on the Likert scale questions of the survey. This provides the researchers with ample information and description for the desired design and functionality of the mobile application of MSEs.

4. Results and Discussions

4.1 Affinity Analysis

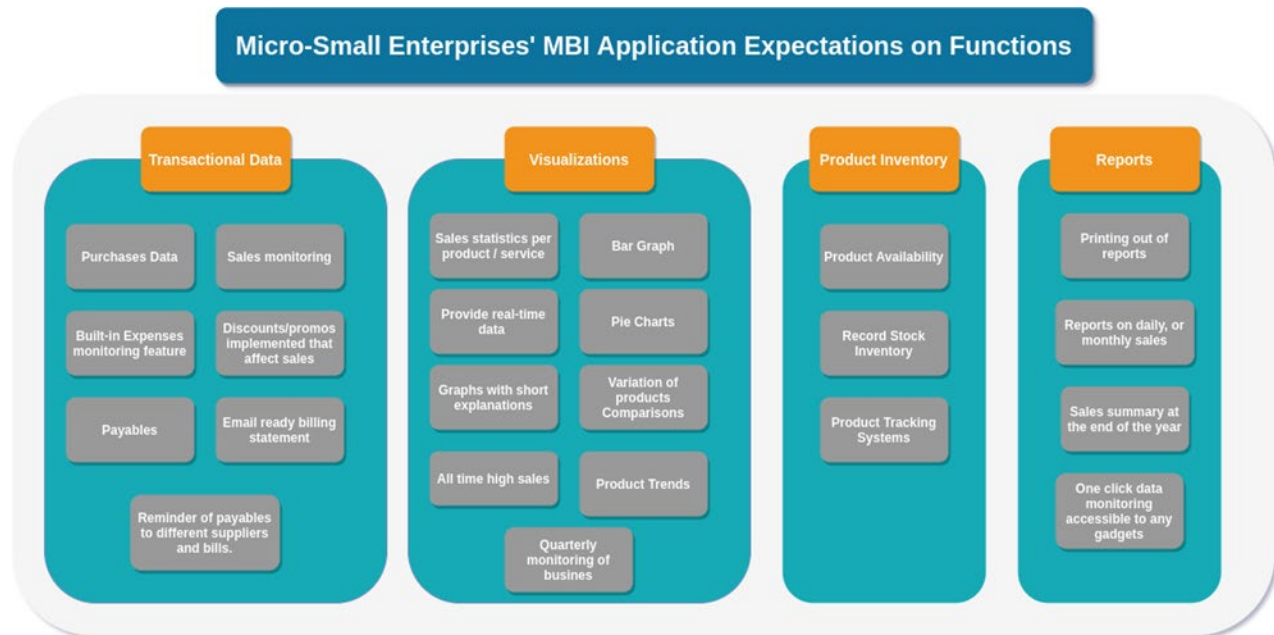


Figure 2. Affinity Analysis Diagram of MSEs Expectations on the mobile application.

Figure 2 is the affinity diagram showing the results of the affinity analysis after grouping, summarizing, and categorizing the responses by drawing their similarities and relevance to certain aspects of the application namely, *Transactional Data, Visualizations, Product Inventory, and Reports*.

For Transactional Data, respondents expect the application to be able to *process purchases data, have sales monitoring, have built-in expenses monitoring feature, apply and show discounts/promos implemented that affects sales, payables, have an email ready billing statement, reminder of payables to different suppliers and bills*.

For Visualizations, respondents expect the application to present *sales statistics per product/service, variation of products comparisons, product trends, all time high sales, quarterly monitoring of business provide real-time data, in pie charts, bar graph, and other graphs with short explanations*.

For Product Inventory, respondents expect the application to *record stock inventory, have product tracking systems and show product availability*.

For Reports, respondents expect the application to allow *printing of reports, have a one-click data monitoring accessible to any gadgets, have reports for sales summary at the end of the year, and reports on daily or monthly sales*.

4.2 Descriptive Statistics, Mean

Table 1: Means of Indicators for MSEs' Expectations

Indicator	Mean	Verbal Description
1. The BI/BA platform tool should be able to handle voluminous amount of data	4.32	Strongly Agree
2. The BI/BA platform tool should be able to present real time data/information	4.48	Strongly Agree
3. The BI/BA platform tool should be able to provide historical business data	4.35	Strongly Agree
4. The BI/BA platform tool should be able to provide options to export and import data	4.42	Strongly Agree
5. The BI/BA platform tool should be able to produce narrative summaries for reports	4.26	Strongly Agree
6. The BI/BA platform tool should be able to be used by multiple users in the same enterprise at the same time	4.03	Agree
7. The BI/BA platform tool should be able to show graphs and other visual aids based on the enterprise's data	4.55	Strongly Agree
8. The BI/BA platform tool should allow the creation of graphs and other visual aids based on the enterprise's data	4.61	Strongly Agree
9. The BI/BA platform tool should allow customization of graphs and other visual aids based on the enterprise's data	4.45	Strongly Agree
10. The BI/BA platform tool should be able to provide a log in function	4.55	Strongly Agree
11. The BI/BA platform tool should be able to provide unique accounts for users	4.16	Agree
12. The BI/BA platform tool should be able to do data forecasting such as sales forecast	4.13	Agree
13. The BI/BA platform should be able to generate reports (e.g. weekly reports, monthly reports)	4.48	Strongly Agree
14. The BI/BA platform tool should provide automated insights	4.23	Strongly Agree
15. The BI/BA platform tool should not be too much complicated	4.71	Strongly Agree
16. The BI/BA platform tool should not be accessible by every employee	4.32	Strongly Agree
17. The BI/BA platform tool should not allow other users to view my business data without my consent	4.55	Strongly Agree
18. The BI/BA platform tool should not be able to share my business data without my consent	4.45	Strongly Agree
19. The BI/BA platform should not require internet access to use	4	Agree
20. The BI/BA platform tool should not use terms that are difficult to understand	4.84	Strongly Agree

Based on the mean of the respondent's answers shown in Table 1, with an average mean of **4.43** they **strongly agreed** that the BI/BA tool of the mobile application should be able to *handle voluminous amounts of data, present real time data/information, provide historical business data, options to export and import data, a log in function, automated insights, produce narrative summaries for reports, show graphs and other visual aids based on the enterprise's data,*

allow the creation and customization of graphs and other visual aids based on the enterprise's data, generate reports. Respondents also **strongly agreed** with average mean of **4.57** that the BI/BA tool of the mobile application *should not be too much complicated, should not be accessible by every employee, should not allow other users to view their business data without their consent, should not be able to share their business data without their consent, and should not use terms that are difficult to understand*. Respondents **agreed** with average mean of **4.08** that the BI/BA tool of the mobile application *should be able to be used by multiple users in the same enterprise at the same time, provide unique accounts for users, do data forecasting such as sales forecast, and should not require internet access to be used*. This information coming from the target users was the basis for the design of the mobile application that would be presented in this research by form of interactive wireframe models.

4.3 Wireframes

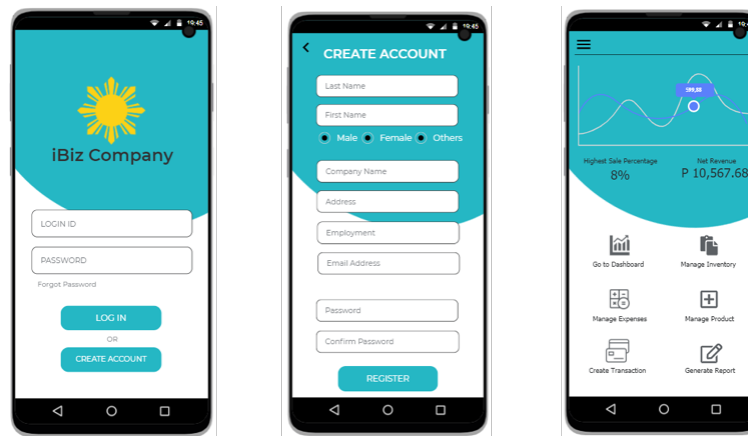


Figure 3. Login, Account Creation and Main Menu Screens

Figure 3 shows the login screen is where the “log in” and “create account” functions are located. In the case that the user forgets their account, the login screen should prompt a “forget password” feature to recover lost passwords. After logging in the home screen is displayed, and a dashboard is on top. The buttons for the different main pages are namely: Dashboard, manage inventory, manage expenses, manage product, create transaction, and generate report.

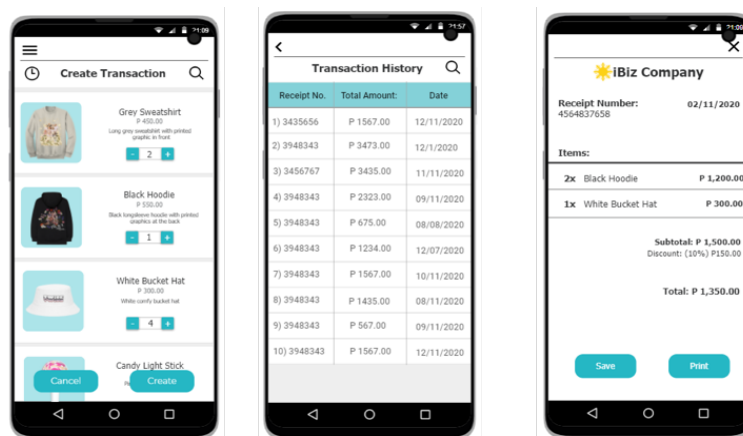


Figure 4. Transaction Related Screens: Record Transaction, History and Receipt

Figure 4 shows the create transaction screen, the upper left the clock icon will be able to bring the user to the transaction history screen; in case the user may want to check their past transactions. In the upper right screen, the search icon will be able to bring the users to a search pop-up screen. Every time a sale was made by a customer, the user can update the inventory and reports by deducting the number of items that was purchased by the customer. Users

can decrease or increase the number of purchased item by tapping the “– “or “+ “button or they can simply type in the number. After pressing the create button, the app will show a virtual receipt of the transaction.

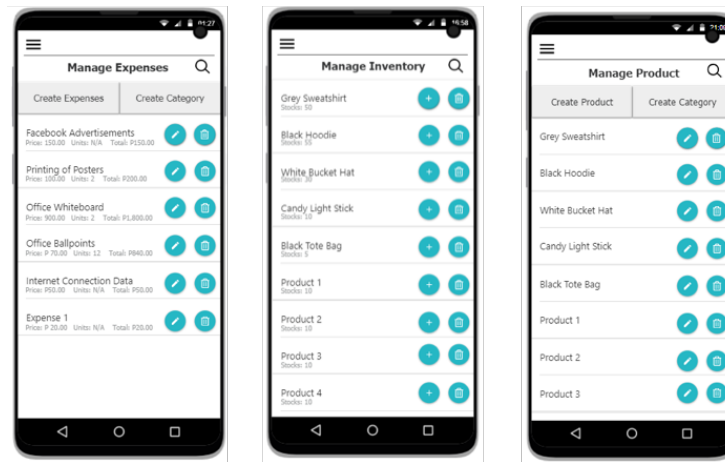


Figure 5. Manage Screens: Expenses, Inventory and Product

Figure 5 shows the manage expenses screen, users can see their expenses and they can search edit and delete expenses too. Users can also create expenses, record or create expenses category. In the manage inventory screen, users can add or delete products to the inventory record. Users can also search for a product with the search feature. In the create product screen, the users can create products and product categories in this page. Users can also see here the products and product categories they created. Users can also edit products, delete products, and search for products here.

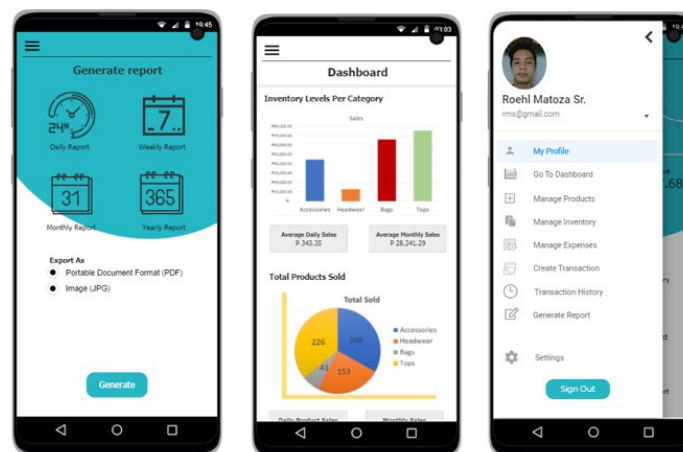


Figure 6. Reports, Dashboard and Side Navigation Menu

Figure 6 shows the generate report screen users can choose which kind of report do they want to see be generated. They can choose from *Daily report*, *Weekly Report*, *Monthly report* and *Yearly Report*. In this screen, users can also export the reports as an Image file with file type JPG or in a Portable Document Format. The user just needs to press the chosen type of report and then press the generate button. In the dashboard screen, users can monitor the real-time state of their sales, and inventory here and understand them easier with the help of data visualizations. The navigation menu is used by the users to easily navigate through the pages of the application without the need to go back to the home page every time they need to go to the other pages.

5. Conclusion

This study aimed to develop a design for a mobile application based on the expectations of owners and managers of Micro and Small Enterprises, it was determined based on the affinity analysis that the responses fell relevance to certain aspects for the application namely, **Transactional Data, Visualizations, Product Inventory, and Reports**. *Transactional Data* related expectations includes the following, being able to process purchases data, have sales monitoring, have built-in expenses monitoring feature, apply and show discounts/promos implemented that affects sales, payables, have an email ready billing statement, reminder of payables to different suppliers and bills. Relevant expectations pertaining to *Visualizations*, includes the application being able to present sales statistics per product/service, variation of products comparisons, product trends, all time high sales, quarterly monitoring of business provide real-time data, in pie charts, bar graph, and other graphs with short explanations. *Product Inventory* relevant expectations is for the application to record stock inventory, have product tracking systems and show product availability. While *Reports* related expectations are to allow printing of reports, have a one-click data monitoring accessible to any gadgets, have reports for sales summary at the end of the year, and reports on daily or monthly sales. Analyzing the means of responses for Likert scaled questions an average mean of **4.43** showed that the respondents **strongly agreed** that the BI/BA tool of the mobile application should be able to handle voluminous amounts of data, present real time data/information, provide historical business data, options to export and import data, a log in function, automated insights, produce narrative summaries for reports, show graphs and other visual aids based on the enterprise's data, allow the creation and customization of graphs and other visual aids based on the enterprise's data, generate reports. Respondents also **strongly agreed** with average mean of **4.57** that the BI/BA tool of the mobile application should not be too much complicated, should not be accessible by every employee, should not allow other users to view their business data without their consent, should not be able to share their business data without their consent, and should not use terms that are difficult to understand. Meanwhile an average mean of **4.08** **agreed** that the BI/BA tool of the mobile application should be able to be used by multiple users in the same enterprise at the same time, provide unique accounts for users, do data forecasting such as sales forecast, and should not require internet access to be used. Utilizing this information as basis, the researchers were able to develop a design for a mobile application in the form of wireframe models.

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Biographies

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