User-Centric Development of Good Delivery Applications Using Design Thinking and Business Model Canvas

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Abstract

INTRODUCTION: The development of internet technology drives companies to innovate and integrate technology into business processes. This study focuses on designing a goods delivery management application using a combination of Design Thinking and the Business Model Canvas (BMC). Design Thinking emphasizes user needs, while BMC ensures business sustainability. Through stages of empathizing, defining, ideating, and prototyping, this research maps user needs, business requirements, and application frameworks to address inefficiencies and modernize goods delivery processes, improving accuracy and operational effectiveness.

OBJECTIVES: This research is to design a goods delivery management application by combining Design Thinking and the BMC to align user needs with business goals, addressing inefficiencies, and improving operational processes and data accuracy.

METHODS: The research method includes five stages: literature study, data collection (empathize), problem analysis (define), ideation (solution sketch, wireframe, user flow), and prototyping. This approach combines Design Thinking and BMC to address user and business needs.

RESULTS: Defining business process inefficiencies, creating user personas and empathy maps, developing user journey maps and information architecture, designing wireframes and user flows, and proposing a Business Model Canvas (To Be).

CONCLUSION: The study highlights inefficiencies in goods delivery processes and proposes a new BMC strategy, emphasizing user-centric application development, real-time updates, resource allocation, and modular features, with future recommendations focusing on user experience enhancement and application evaluation.

1. Introduction

The development of internet technology has brought companies one step further in its application in modern life [1]. Current technological developments are a trigger for companies to immediately explore the potential to improve performance further, thereby generating revenue for the company [2], [3]. The existence of technology in a company has become an indispensable requirement to support various activities and decision making. To create technology that is competitive in the market, companies need to design systems [4] that are human-centered (users) aka human centric [5]. Companies are required to create new innovations as a result of intense business competition. Innovation is not only related to creativity in producing

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products and services, but also related to the process of developing new technology. Therefore, companies need to design applications that suit business needs [6], [7]. A company's ability to develop and utilize applications is an important factor in winning the competition. The development of new technology can make businesses survive, especially in companies engaged in the delivery of goods.

Currently, goods delivery companies' business processes still focus on conventional methods which have not yet implemented technology. Every day the company sends goods via sea transportation in large quantities (tonnage). As time progresses, it cannot be denied that companies are starting to look at the world of information technology in their business development efforts. However, the company realizes that the use of technology has not yet reached an effective and efficient point. The problems that arise are slow transaction data collection, long data processing times, and inconsistencies in the reports produced. Apart from that, the process of collecting master data is still done manually using paper which tends to have an impact on reducing data accuracy. Things like this are the reason companies hope to design a goods delivery management application that can help manage business processes.

The rapid development of internet technology has pushed goods delivery companies to adapt and utilize digital solutions to improve efficiency and competitiveness. Conventional business processes result in slow data collection, inconsistent reporting, and manual processes that hamper operational effectiveness. This situation creates an urgent need for an innovative and integrated management system that aligns user needs with business objectives to optimally implement digital transformation.

However, before designing the application, it is necessary to design an innovative business model using the help of the Business Model Canvas (BMC) at the Design Thinking method stage. The Design Thinking method is able to connect business needs and application development that were previously unthinkable. Design Thinking describes experiments and resources to stimulate the growth of innovation [8]. In previous research, the Design Thinking method was chosen because it is human-centered to integrate user needs, technical possibilities and business requirements [9], [10]. The Design Thinking method is designed to understand user needs and experiences, so that the resulting solutions better match their expectations. However, Design Thinking focuses too strongly on the user, so it is possible to ignore important business aspects, such as revenue, human resources, and others [11]. Therefore, a method that focuses on business structure is needed, namely BMC. BMC was chosen to solve the problem in this research because it provides a simpler representation of the business model by visualizing nine key elements [12]. BMC can help goods delivery companies in the process of identifying customer segments, value proportions, channels, customer

relationships, revenue streams, key resources, key activities, key partnerships and cost structures.

A combination of design thinking and BMC is needed to provide balance between users and business. Design Thinking provides a focus on the user, while BMC provides a framework to ensure that business and sustainability needs are also considered. The combination of Design Thinking and BMC can provide a holistic approach, covering aspects of creativity, user needs and business structure. This research contributes by combining Design Thinking and Business Model Canvas (BMC) methods in designing a user-oriented good delivery application while considering business sustainability. Design Thinking is used to understand user needs and experiences, while BMC provides a framework for compiling business components such as value propositions, customer segments, and key activities. The result of this research is a prototype that integrates user journey maps, information architecture, and wireframes as a comprehensive model to improve operational efficiency and support application development in the logistics sector.

Based on the background of these problems, this research uses the Design Thinking and BMC methods to design a goods delivery management application. A combination of Design Thinking and BMC methods is needed to understand user needs by designing business models from the perspective of application users. The stages of Design Thinking are divided into five, namely empathize, define, ideate, prototype, and test [13]. However, this research only reached the prototype stage because it focused on making BMC first before implementing it in application form. The first stage is to empathize by exploring and understanding user problems to draw an empathy map. The second stage is define to describe the current problem in the form of BMC. Apart from that, a user journey map and information architecture were created to map the information that will be displayed in the application. The third stage of ideation produces a solution as a basis for making a prototype, in the form of a wireframe and user flow. The fourth stage of the prototype focuses on creating a solution in the form of BMC by mapping the business perspective after designing the application. This research aims to develop a goods delivery management application based on recognizing user need patterns that are in line with the company's business needs.

2. Material and Method

2.1. Design Thinking and BMC

Design Thinking provides a thinking framework that creates innovative designs based on human-oriented thinking [14]. Meanwhile, BMC focuses on deepening user business needs by defining key elements such as customer segments, value propositions, and revenue sources. Design Thinking provides a focus on the user, while BMC

provides a framework to ensure that business and sustainability needs are also considered.
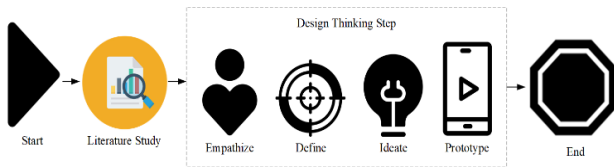

Figure 1. Research Stages [18]

The combination of Design Thinking and BMC helps translate understanding from stakeholders into concrete elements in the business model [15]. BMC is divided into several important components, namely customer segments for those who use the product, value proposition (product uniqueness), channels (how it reaches), customer relationships (maintaining relationships with users), revenue streams (flow of incoming funds), key resources (assets -important assets), key activities (supporting business success), key partners (business partnerships), and cost structure (potential expenditure) [16], [17].

2.2. Research Methods

The steps in conducting this research are shown in Figure 1 as follows [19], [20]:

- First Stage: Literature Study. Collect reference materials related to Design Thinking and BMC methods. This theory is obtained through internet media, reading sources, such as books that are related to and support the research process.
- Second Stage: Collect Data (Empathize). The second stage is to explore and understand user problems by conducting an engagement approach or interviews with stakeholders. Apart from that, data was extracted regarding problems and needs, who are the target users of the goods delivery management application. The collected data is used to create a persona and empathy map.

Table 1. User Persona Documentation

Aspect	Description
Persona Identification	Name: Dirgantara Rendy Age: 34 Years Sex: Male
Role and Task	• Mr. Dirga is the administrator. • Mr. Dirga manages transaction data collection and reporting
Objectives	• Assist internal employees with the transaction data collection process. • Speed up and save resources during business process. • Reduce errors in data recording and reporting
Segment	• Mr. Dirga is an employee at a goods delivery service company. • Married
Skill & Knowledge	• Mr. Dirga can communicate and coordinate well. • Mr. Dirga understands the goods delivery business process well and is skilled in creating documentation
Context/Environment	• Mr. Dirga understands that innovation can help improve a company's business processes. • Mr. Dirga feels that the role of internal and external parties is important in maximizing the company's business processes
Personal and Psychological	• Mr. Dirga is skilled at decision making. • Mr. Dirga was able to coordinate quickly

- Third Stage: Problem Analysis (Define). The third stage is analyzing and understanding the problems that have been collected at the empathy stage in the form of a Business Model Canvas (BMC). Creating a user journey map to describe the steps or processes that users go through in interacting with the application to be created. Next, create an information architecture that functions to map the information that will be displayed so that users can carry out the functionality of the goods delivery management application easily.

- Fourth Stage: Ideate. The fourth stage is to produce an idea or sketch solution as a basis for making a prototype. The sketch solution is in the form of a wireframe as a sketch of the basic appearance of the application, then user flow which is used to understand the flow or process in each application functionality.
- Fifth Stage: Prototype. Focuses on creating solutions in the form of BMC by mapping the business perspective after designing the application.

3. Results and Discussion

3.1. Design Thinking and BMC

The empathize stage is the basis of the design thinking method which aims to explore problems, understand target users and their usage environment in developing goods delivery management applications [21]. Before understanding the problem, it is necessary to describe the business process that users go through in Figure 2. Figure 2 depicts the user journey map of the goods delivery management application running for shipper, forwarder, carrier, notify party, consignee. The process starts from the shipper as the party sending the goods by asking the forwarder/delivery service company to send the goods using a carrier as the carrier of the goods that have been entrusted. Goods that have been received by the carrier will be sent back to the forwarder who represents the delivery of the goods to the consignee/recipient of the goods using the carrier who is responsible for delivering the goods to their destination. During the goods delivery process, every time the goods are received by the forwarder and carrier will be notified to the consignee until the goods reach their destination. After defining the business process, the next step is to define the problem.
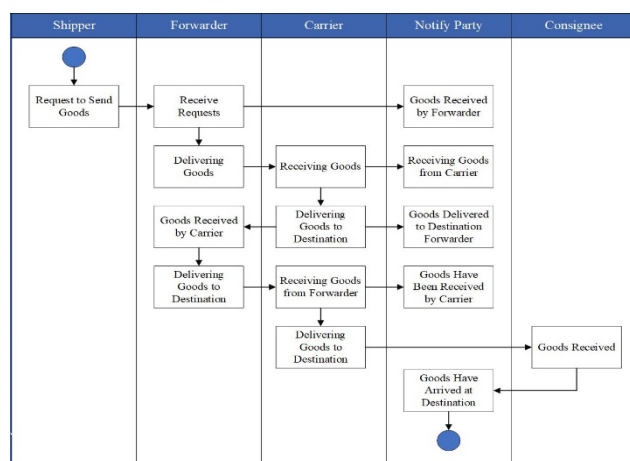

Figure 2. Business Process of Product Shipping

The problems obtained are based on the explanations and questions that have been asked during discussions with goods delivery service companies. One of them is the desire to speed up and save resources when collecting transaction data and reporting data. Based on data acquisition and determining user characteristics, the next stage is creating a persona. The information needed to create a persona includes name, role, demographics (age, status and education), biography, hopes and problems [22]. From these information criteria, personas are created for admin actors (managing master data), forwarder (providing delivery services), carrier (carrier of goods from forwarder), shipper (sending goods), consignee (owner of goods or recipient of goods) and notify party (providing information regarding the status and location of goods). One example of an admin persona is in Table 1.

Table 1 is an example of a user persona from a goods delivery service company administrator. The next process is creating an empathy map to understand the needs and problems of the actors who play an important role in creating this goods delivery management application. Table 2 shows the empathy map of the administrator user persona.

Table 2 shows the empathy map, which is divided into four quadrants, namely says (user opinion), thinks (user interests), does (user actions), and feels (emotional representation) with the user persona in the middle.

3.2. Problem Analysis (Define)

After defining the needs, the next step is to create a Business Model Canvas (BMC) that is currently running for the goods delivery service company. The results of BMC identification of goods delivery service companies are divided into:

a. Customer Segments. In terms of geography, goods delivery service companies are currently still focused on their internal needs. Currently, the user's focus is on the administrator.

b. Value Proposition. This value is realized in the form of solving problems faced or fulfilling needs. Goods delivery service companies have several value propositions, namely structured file documentation and neatly stored data.

c. Channels. To communicate and convey value propositions, company administrators are still coordinating after updating the data. There is still coordination because the data is not updated directly.

d. Customer Relationships. Administrators still communicate directly via face to face/telephone when data updates are needed.9

e. Revenue Streams. The income from this goods delivery service company only comes from sea transportation with 20-inch containers and 40-inch containers. The percentage of revenue obtained is 20-inch containers (45.1%) and 40-inch containers (54.9%).

Table 2. Empathy Map Administrator

Aspect		Description
Says	•	Slow transaction data collection
	•	Long data processing time
	•	Inconsistency in report results
Thinks	•	The master data input feature is very necessary.
	•	The system must be able to facilitate the import and export of data.
	•	Can pull data for reporting

Does	• Process transactions manually • Tracking via telephone to the courier • Create reports with manual data input
Feels	• Can not wait. • Confused • Worry

f. Key Resources. The company's physical resources include buildings, vehicles and also assets supporting business operational processes. Intellectual resources in the form of partnerships with central brands and customer databases. In running its business, the company has human resources of 150 employees.

g. Key Activities. The company has master data input activities, price master data input, transaction processing, and report creation processes.

h. Key Partnerships. Partners who work together with companies can optimize the allocation of existing resources and activities. In this case, the company collaborates with forwarder, carrier and shipper partners.

i. Cost Structure. All operating businesses require costs. Companies have several fixed costs (electricity, employee salaries and bonuses, internet, consumption) and non-fixed costs (vehicle service, office stationery, lost package fees, parking).

At BMC (As-Is), the process that is taking place at the goods delivery service company is still running conventionally. Therefore, it is necessary to improve the business model to be more effective and efficient, to increase the productivity of the business enterprise. Next, create user journey maps which aim to map how users can interact with the application. Creating user journey maps based on the specifications of the needs of admin, forwarder, carrier, shipper, consignee and notify party actors. Figure 3 is an example of a user journey map from an administrator.
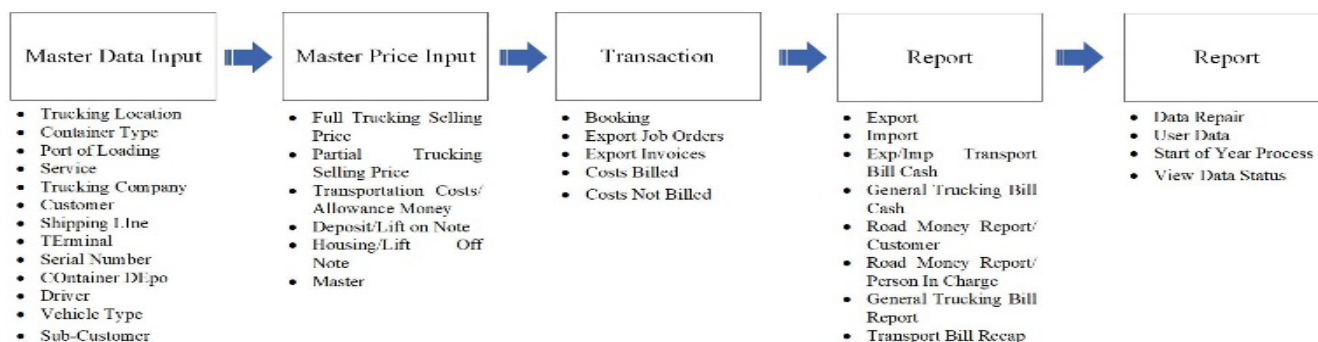

Figure 3. User Journey Map

After creating user journey maps, the next step is to create an information architecture to organize the information contained in the goods delivery management application. Table 3 shows the information architecture for administrators.

Table 3 shows the information architecture from the administrator actor side. This architecture is divided into files, price lists, transactions, finance, reports, and utilities.

Table 3. Information Architecture on Administrator

Menu	Sub-Menu
File	Type of Container, Type of Service, Stuffing Location, Port of Destination, Port of Loading, Trucking Company, Shipping Company, Agent Company, Warehouse, Exporter/Shipper/Consignee, Consignee/Notify, Consignee Import, Shipper Import, Airline, Sales, Field Officer, User, Serial Number, Choose Pointer, Team, Indexing, Offer Index.
Price List	Export (Selling Price Export, Incentive from Agent, Rebate from Coloader, Heavy Weight Surcharges, Searching Selling Rate, Quotation to Agent), Cost (Feeder Rate, Price Agent, Price Trucking, Warehouse, Operational), Import (Mechanic Changes, Do Charges Standard, Do Chargers Special).
Transaction	Stuffing Plan, Job Order, Return Request, Arrival Notice.
Finance	Invoice to Shipper, Credit Note, Finance Process, Refund Voucher, Proof of Cash Expenditures, Discount Voucher.

Report	Job Sheet Book, Shipper, Sales, Job Sheet Recap, Rebate Warehouse, Listing Approval Job, Listing Refund Not Yet Paid, Listing Job Not Create Invoice, Department, Booking by Inesia, Profit/Agent, Sales Commission.
Utility	Search File from B/L Number, Search File from Container No, Search File from Consignee/Notify, Search Invoice Number, Agenda Invoice & CN, Status Data, Early Years Process.

3.3. Solution Design (Ideate)

The ideate stage is a design phase that focuses on creating solutions based on the results of data collection [23]. In this phase, there is a wireframe which is the initial design of the application as an initial design reference. Figure 4 is an example of a main page wireframe from the administrator actor.

Figure 4 shows the results of the wireframe (low fidelity) display on the administrator actor's dashboard. Based on the results of the wireframe display (low fidelity), the next stage is creating a user flow which aims to describe the flow or stages in using the goods delivery management application. Figure 5 is an example of user flow in the form of a sequence diagram from the administrator's side.
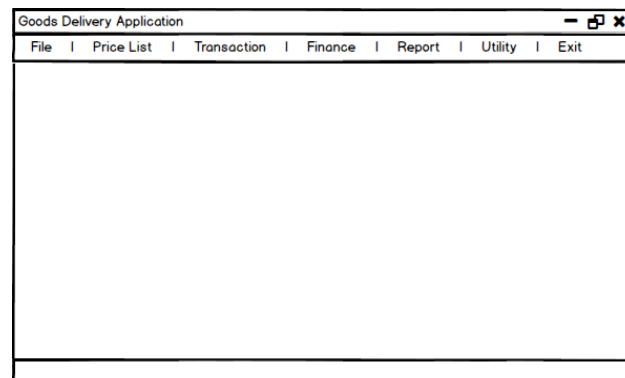
3.4. Build Representation (Prototype)

The prototype stage focuses on creating solutions from the ideate stage in the form of BMC (To Be). The results of the new BMC analysis as an alternative strategy for goods delivery service companies are as follows:
a. Customer Segments. Increase the focus of user segments accessing the system. Currently the system can only be accessed by internal company administrators. Other industrial cooperation partners do not yet have access rights to this application.
b. Value Proposition. Goods delivery services will continue to be needed, especially in the modern era like today, so this will also be a challenge because more and more new delivery services will emerge. Even though the company has many useful values, it needs to create new innovations, namely updating data in real-time. This will be an added value and a good value proposition for the company's business development [24].
c. Channels. In order for the company's business processes to be more effective and efficient, administrators need to carry out intensive socialization regarding the use of applications.
d. Customer Relationships. In terms of personal assistance, the company should have an administrator who handles transaction processing and reporting.
e. Revenue Streams. Sells products for packaging materials such as cardboard, bubble wrap, duct tape, and goods packaging services. By increasing the number of these products sold, the income stream increases to develop even better applications.

Figure 4. Wireframe Administrator Dashboard

f. Key Resources. In carrying out its business processes, companies currently need improvements in terms of organizational structure and human resources. Apart from that, it is necessary to update the application database so that transaction data is updated regularly.
g. Key Activities. Increase sales activities by selling products for packaging materials, such as cardboard, bubble wrap, duct tape, goods packaging services. By adding this activity, you can increase revenue streams for updating application services.
h. Key Partnerships. Add partners/parties who use the goods delivery management application, so it is not limited to just administrators.
i. Cost Structures. Manage the costs of developing and maintaining goods delivery management applications.3.5. Business Model Canvas (BMC)

At the stage of exploring the problem (empathize), the results were that the goods delivery service company wanted to create fast transaction data collection, save resources, and reduce errors in recording and reporting data. Problem mapping based on company employee user personas. Then, create empathy maps based on user personas using the four-quadrant technique, namely says, thinks, does, and feels. The says quadrant contains what users said out loud in interviews, such as "slow transaction data collection," "long data processing times," and "report inconsistencies." The thinks quadrant contains what the user thinks and what is important to the user. The master data input feature is very necessary, the system must be able to facilitate data import and export and be able to retrieve data for reporting. The does quadrant includes actions taken by users, namely processing transactions manually, tracking by telephone to the courier, and creating reports with manual data input. The feels quadrant represents the user's emotional state, namely impatient

waiting, confused and worried. At the problem definition stage, problem mapping is based on nine BMC categories where there is a need for designing goods delivery management applications. Then, the needs in each system are mapped into user journey maps and information architecture.
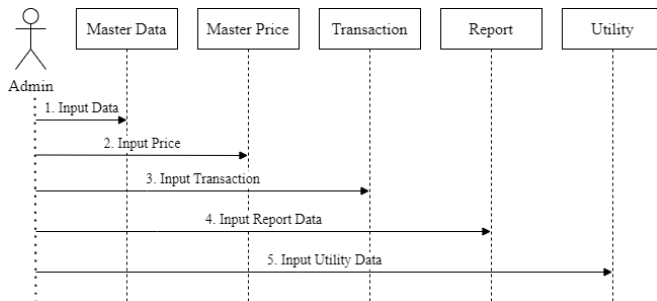

Figure 5. Administrator Sequence Diagram

The results of the user journey maps show a visualization representation of the user who manages the goods delivery management application. The user journey map divides the administrator's process in accessing the application, namely the need to input master data, master input prices, transactions, reports, and utilities. Meanwhile, the information architecture displays sub-menus for each menu in the goods delivery management application. Next, enter the solution design (ideate) stage in the form of a wireframe and user flow. The wireframe depiction is in the file, price list, transaction, finance, report and utility menus. Next, user flow is used to determine the flow or process in every application functionality [25]. The flow depiction uses the help of sequence diagrams for admin, carrier, consignee, shipper, forwarder and notify party users. Admin can input master data, price data, transaction data, report data and utility data. Carriers can input master data, provide reports, and correct personal data or check data status. Consignees can input recipient data, receive report data, and check data status. Shippers can input delivery data, delivery report data, and check data status. Forwarders can input master data and provide delivery reports. Notify party can input master data, provide reports on the status and location of goods.

At the prototyping stage, create a business model canvas (To Be) as a basis for returning the goods delivery management application. The results of the new BMC analysis as an alternative strategy for goods delivery service companies, namely increasing the focus on user segments that access the system, updating data in real-time, socializing application use to administrators, allocating resources appropriately, and managing application development and maintenance costs. Thus, BMC mapping can provide an overview of key aspects such as the requirements needed to develop a goods delivery management application. Based on the results of the research that has been carried out, suggestions that can be

given for further research are that there is a need to improve the user experience design and carry out an evaluation (test stage) to determine aspects of success and user satisfaction with the design of the goods delivery management application.

4. Conclusion

User persona mapping and empathy maps provide an overview of various problems in goods delivery service companies. The research results show that there is a new business strategy in goods delivery service companies. The business strategy consists of increasing focus on user segments that access the system, updating data in real-time, socializing application use to administrators, allocating resources appropriately, and managing application development and maintenance costs. Thus, BMC mapping can provide an overview of key aspects such as the requirements needed to develop a goods delivery management application. The requirements that have been collected become the basis for benchmarking the development of goods delivery management applications. The modules developed are divided into master data input, price master input, transactions, reports, and utilities. The potential that exists in goods delivery service companies can be developed by building a new BMC. The results of implementing the BMC business model have the potential to build a goods delivery management application that suits user needs and the company's business processes.

Based on the results of the research that has been carried out, suggestions that can be given for further research are that there is a need to improve the user experience design and carry out an evaluation (test stage) to determine aspects of success and user satisfaction with the design of the goods delivery management application.

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