

Business Model Feasibility based on Customer Development Method: The case of Worm Reactor Product

W S Dewobroto¹ and K V Rachmandi²

¹ Department of Entrepreneurship, Faculty of Social Science, Podomoro University, Jakarta, Indonesia

² Department of Industrial Engineering, Faculty of Industrial Technology, Trisakti University, Jakarta, Indonesia

¹wisnu.dewobroto@podomorouniversity.ac.id, ² vedikanzi@gmail.com

Abstract. In 2018, The Ministry of Environment and Forestry recorded the average people of Indonesia contributed around 2.5 liters of waste per day or 625 liters from total population. Despite this fact, with good management, waste can also bring benefits and many advantages. An innovator from Jogja Puji Heru Sulistiyono, who utilizes enzyme from worm can process waste properly. Worm reactor is the media for the worm to be able to process the waste into compost and beneficial for the environment. The research was conducted to identify the Value Proposition of worm reactor product using Customer Development method and business feasibility analysis. Based on the research result, the value of worm reactor is that in the waste processing using worm reactor which are no waste sorting needed, no bad odor, and easy to use. Based on the business feasibility analysis, it was concluded that consumer for worm reactor product is Sanitation offices, Government's park offices and independent waste processing such as household. From the financial aspects, the initial investment of IDR 259,338,000, break event point for worm reactor product every year of 75 units sold in average, and payback period for 3 years, then worm reactor business is feasible to do.

Keywords: Entrepreneurship, Business Model, Customer Development, Design Thinking, Business Feasibility Study, Worm Reactor

1. Introduction

It is known that waste volume in Indonesia is around 1 million cubic meter per day, and only 42% of it is well transported and managed. Therefore, non-transported waste every day is around 348,000 cubic meters or around 300,000 tons [8].

Worm reactor, which was researched and developed in Jogja by Puji Heru Sulistiyono, is an innovation that utilizes worm enzyme that can transform organic waste into compost. Compost fertilizer is useful to recover physical of soil condition, improve soil fertility, improve the activity of soil microbe, suppress the growth of plant disease, and safe for environment. This innovation is the answer of the existing waste problem because using this innovation, organic waste can be reprocessed into useful product and beneficial to the community.

Based on the background discussion, a feasibility study shall be conducted to the worm reactor product so that it can be marketed and can meet the potential customers demand in processing the waste into compost fertilizer. Feasibility study of a business must meet three aspects of Design Thinking:

Desirability, Feasibility, and Viability. The research was started with customer development process to create a product required by customer and used as the solution to the customer problem.

The purpose of this research is to design the value proposition of the worm reactor product and then followed by business model design of worm reactor product. Then, business model feasibility is made to the worm reactor product.

2. Theoretical Background

2.1. Customer Development and Empathy Map

Customer Development is a four steps framework to find and validate that you have to identify the market for your product, establish appropriate product features that answer the customers need, test the correct method to obtain and convert the customer, and use the appropriate resources to increase the business scale [2]. Customer development has 4 steps in creating an innovation: Customer Discovery, Customer Validation, Customer Creation and Company Building.

Furthermore, *Empathy Map* is created to produce stronger business model because the customer profile will require better value proposition, more comfortable approach to the customer and better customer relationship. Eventually, it will give deeper understanding on how the customer is satisfied to the product/service value compared to the price they pay [13]. The followings are 4 points to be included into the empathy map: Say (what respondent say), Think (what respondent think), Feel (what respondent feel), and Do (what respondent do)

2.2. Experiment Board

Experiment Board is a startup method used to measure the validity of a measurement to a research or survey based on assumption [6]. Experiment Board is useful to support the Business Model Canvas to translate the customers' need or customers' problem. Experiment Board aims to validate the customers need. After validation, MVP or Minimum Viable Product will be obtained.

2.3. Business Model Generation.

Business model can be defined as the description of strategy to be made by a business before competing with others. Many strategies must be explained in a business model because they are related to many aspects in a business. Business model, among others, regulates the purpose of direct relationship with supplier, distributor and customers. One of the analysis tool that helps to organize business model in a structured way called business model canvas. This business model canvas was first introduced by Alexander Osterwalder with 9 (nine) primary elements, namely Customer Segments, Value Proposition, Channels, Customer Relationships, Key Activities, Key Resources, Key Partners, Cost Structures, and Revenue Streams [13]

2.4. Feasibility Study

Feasibility Study is an activity that assess to what extend the benefit is obtained in doing business activities/projects and it is the consideration in making a decision, whether to accept or refuse a business idea/project being planned. The term feasible in this case is the possibility of the business idea/project to be beneficial, both in term of financial benefit and social benefit. 3 main components in the Feasibility Study refer to the design thinking concept of Desirability, Feasibility, and Viability [3]

3. Research Methodology

Research methodology is a systematic thinking process consisting of research stages that must be done in order to find solutions to solving a problem. Research methodology is used as a guide during research to be more directed towards a solution and conclusion. The following are the steps in dataprocessing:

3.1. Customer Discovery (Understanding the Consumer using Questionnaire and Empathy Map)

Questionnaire is the first stage in the data processing. Research questionnaire was distributed to 100 respondents in Jakarta area. The questionnaire was used to find out the characteristics and level of interest of the respondents who conduct the data processing. Moreover, Empathy map was created to identify what are actually felt and required by the respondents in regard with the waste processing. The result from empathy map was used to design work reactor product according to respondents' desire and requirement.

3.2. Customer Validation and Creation (Validation using Experiment Board and Minimum Viable Product Development)

Experiment board used to test the customer validation to the worm reactor product was the Javelin Board. Iteration conducted to the pivot would be asked by way of interviewing the respondents. The interview result with the respondents would be placed on the valid and invalid column. The valid data from respondents would be used as reference regarding what are required by the respondents. Next step is creating Minimum Viable Product. MVP has *sufficient* feature to test at the market, and to achieve the target, all unnecessary features would be discarded and only the core features of the product would be used.

3.3. Company Building (Designing Business Model using Business Model Canvas and Feasibility Study)

Business Model Canvas explains the business model of the worm reactor business that is filled into 9 blocks of Business Model Canvas. 9 blocks to be filled were Value Proposition, Customer Segment, Channels, Customer Relationship, Key Activities, Key Resources, Key Partner, Cost Structure, and Revenue Stream. The 9 blocks were filled based on the interview result with Puji Heru Sulistiyono as the innovator of the worm reactor. Based on Business Model, Feasibility Study was conducted to determine whether the worm reactor product has met the requirement for Commercial Used. Business feasibility was measured based on the design thinking criteria that is divided into three: feasibility, viability, and desirability.

4. Result and Discussion

4.1. Questionnaire

Questionnaire is design based on interview that conducted to the first 30 respondents to find out the attributes considered important by the respondents in regard with the worm reactor product. The interview was conducted to the respondents in Jakarta area. The statements in the questionnaire were questions that include the important factors of the worm reactor and were based on the quality dimension theory that cover 5 (five) dimension of Performance, Features, Durability, Conformance, Perception [4]

Table 1. Questionnaire of Worm Reactor Attributes

No	Attributes	Dimension
1	Worm reactor product has larger capacity	Performance
2	Worm reactor product is environmentally safe	
3	Worm reactor product is easy to use	Features
4	Worm reactor product does not emit bad odor	
5	Worm reactor product received review from the users	Perception
6	Worm reactor product has high durability	Durability
7	Worm reactor product has stronger raw materials	
8	Worm reactor product has already been patented	Conformance
9	Worm reactor product has received license from the Ministry of Environment	

4.2. Characteristics and Behavior of the Waste Processor

From the result of the research questionnaire on the characteristics and behavior of the waste processor, it can be concluded that:

1. The type of existing waste processing was 64% compost, 15% chopping, 8% compacting and others, 3% biogas, and 2% plastic beads.
2. The gender of of the waste processor was 51% male and 49% female.
3. The age of respondents who conduct waste processing was 30% of 40-49, 25% of >50, 24% of 30-39, 20% of 20 – 29, 1% of < 20.
4. Respondents who sort the waste were 67% and 33% do not sort the waste.
5. 52% respondents had no idea of proper waste processing, and 48% respondents have knowledge on proper waste processing.
6. The daily processing was 39% of reduce, 31% recycle, 30% reuse and 0% others.
7. 47% respondents derived the information of waste processing from the Internet, 19% from magazine, 14% from newspaper, 13% from television, 4% from radio and 3% from others.
8. The type of waste mostly disposed of was 59% household waste, 34% plastic waste, 3% others, 2% metal waste, 2% glass waste.
9. 50% respondents conducted the processing at home, 33% in the office, 14% at the park, and 4% others.
10. The process did by the respondents was 41% processed the waste into fertilizer, 37% incinerated, 19% landfilled, and 3 others.

4.3. Research Questionnaire on the Worm Reactor Attributes

The result of questionnaire on worm reactor attributes scored highest on the Durability with average value of 4.36. This dimension assessed whether or not the product has strong durability. One more in the Durability dimension is to have robust raw materials. The both attributes were considered important by the customers because durability in use is one of the criteria if the respondents want to purchase a product. According to Kotler and Armstrong [6], product quality is the capability of a product to perform its function which includes the durability, endurance, preciseness, easy operation, and repair as well as other valuable attributes.

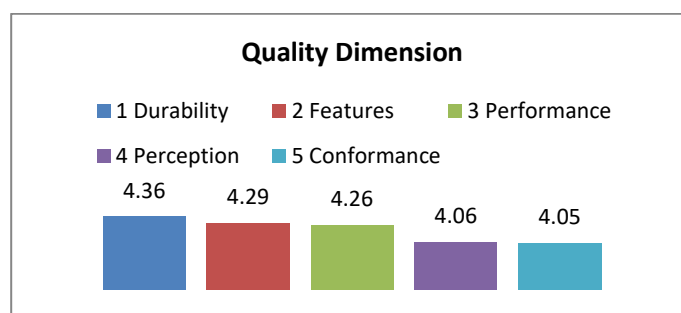


Figure 1. Quality Dimension of Worm Reactor

The dimension with second highest score is Features dimension with average score of 4.29. Features dimension is any extra subject added to a product. The question in Features dimension was whether or not the worm reactor product do not emit odor during the waste processing and whether worm reactor product is easy to use. The third highest dimension is Performance, which scored 4.26. This dimension contains main function of the worm reactor product. The statement in this dimension is whether or not the worm reactor product has large capacity and environmentally safe.

In addition, there are two dimensions with relatively small score: the Perception dimension (4.06) and Conformance dimension (4.05). The presence and non-presence of these dimension will not have significant impact.

4.4. Empathy Map

There are four aspects in Empathy map, namely What People Say, Think, Feel and Do.

- The “say” aspect based on the respondents may conclude that waste processing is intensive work, which requires waste processing equipment, and the processed waste must produce something useful and reusable. It is also known that there were also constraints during the waste processing.
- On the “think” aspect, respondents stated that the waste processing equipment is very important and the result is reusable. It could be said that the respondents who conducted waste processing realize the important of waste processing and the it will be more beneficial if the result of the processing can be reusable. In other word, waste will not only be waste but becoming something more useful.
- The “feel” aspect gives the description on what they feel during the waste processing. In this aspect, the respondents gave statements such as they require waste processing equipment, the waste processing equipment is not available, and the waste is not sorted. From this statement, it can be said that respondents require any equipment that is easy to use and requires no large space.
- The “do” aspect is related to the waste processing. In this aspect, the respondents have conducted the waste compacting, waste chopping, and waste sorting. It seems that what has been done by the respondents was only limited to these activities and they have not processed the waste into something reusable.

4.5. Experiment Board and Minimum Viable Product (MVP)

Based on validation to the potential customer using Experiment board, here are target market, problem and also solution

- Target market: developer waste management (residential house, apartment), independent waste processor such as house hold
- Problem: Waste processing
- Solution: Waste processing equipment that does not emit odor during the waste processing

Then, next process is to make MVP in form of worm reactor process (Figure 2). It was offered to 50 potential customer and 75% was interested and gave feedbacks. As a result, MVP and validation process suggested the advantages of the worm reactor, namely :

1. No waste sorting required
2. Waste processing does not emit odor
3. Waste processing equipment is easy to use

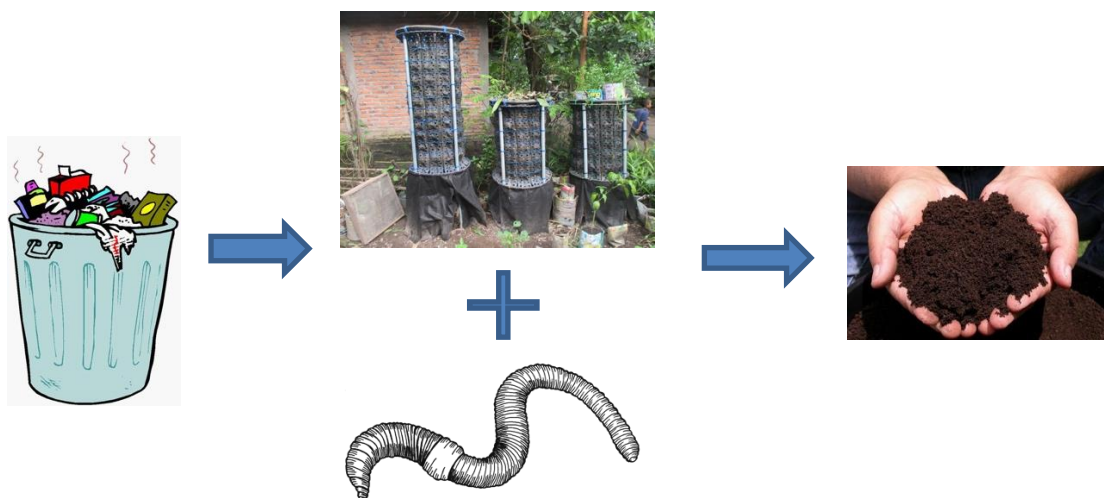


Figure 2. Process of Worm Reactor (Waste, Worm reactor and Earthworm, compost)

4.6. Business Model (Desirability, Feasibility, Viability)

4.6.1. *Desirability (Customer Segment, Value Proposition and Customer relationship)*. Customer segment is obtained from the interview result and questionnaire from the respondents who conduct waste processing. The customer segment of worm reactor product was developer waste management (residential house, apartment), independent waste processor such as house hold. Value proposition of the worm reactor product is the waste processing that does not emit odor, practical or easy to use and that requires no waste sorting. Customer Relationship is the way of worm reactor manufacturer to maintain the relationship with the worm reactor customers. It is done by providing product warranty and free product installation.

4.6.2. *Feasibility (Key Activities, Key Resources, Key Partners)*. Key activities are any activities that support worm reactor business. In this case, the worm reactor business conduct the activity of product marketing, product assembly and product development. Moreover, key resources is the main resources of the worm reactor business. Key resources of the worm reactor business are Researcher, finance, marketing, product design. These divisions make the worm reactor business to be feasible and run smoothly.

For key partners, worm reactor business has 2 main partners which assists the operation of worm reactor business. First is the workshop that manufacture the product. Second is community of waste management solution. This partner assists the worm reactor business in delivering the order of worm reactor product to the customers.

4.6.3. *Viability (Channels, Cost Structure, Revenue Stream)*. In term of Business Viability, Channels is the key aspect use to promote and market the worm reactor product. Internet and exhibition are two main channels because its easy to be accessed and possible to make direct sell and meet the potential customer.

Furthermore, here are the investment, operating cost needed for worm reactor business.

Table 2. Investment Detail of Worm Reactor Business

Description of Business Investment	Amount	Total	Total
Site Rent (Cibinong) / Year	IDR 18,000,000	5 Years	IDR 90,000,000
Daihatsu Gran Max PU	IDR 110,000,000	1 Unit	IDR 110,000,000
Table MT 3001, Beech Color	IDR 600,000	4 Units	IDR 2,400,000
Chair VXS 80 H	IDR 610,000	6 Units	IDR 3,660,000
Cabinet V602	IDR 2,500,000	2 Units	IDR 5,000,000
Filling Cabinet V303	IDR 1,500,000	2 Units	IDR 3,000,000
Computer set	IDR 6,500,000	2 Units	IDR 13,000,000
Printer	IDR 1,700,000	2 Units	IDR 3,400,000
Whiteboard Stand	IDR 900,000	1 Unit	IDR 900,000
Telephone Unit	IDR 235,000	4 Units	IDR 940,000
AC	IDR 2,700,000	1 Unit	IDR 2,700,000
Director	IDR 3,500,000	1 Person	IDR 3,500,000
Marketing	IDR 2,500,000	1 Person	IDR 2,500,000
Admin	IDR 2,500,000	1 Person	IDR 2,500,000
R&D	IDR 2,000,000	2 Persons	IDR 4,000,000
Maintenance	IDR 700,000	1 Month	IDR 700,000
Promotion	IDR 2,000,000	1 Month	IDR 2,000,000
Cost of 6 Products	IDR 1,523,000	6 Units	IDR 9,138,000
			IDR 259,338,000

Based on the table above, the investment required to operate the worm reactor business is in amount of IDR 259,338,000. Moreover, it is estimated that operational cost amount of IDR 22,293,333 per month.

• *Revenue Stream*

Figure 3 shows the Revenue Stream of the worm reactor product for 5 years. The business feasibility of the worm reactor from the financial aspect may be seen based on the Net Present Value, Internal Rate of Return, Payback Period, and Break Event Point.

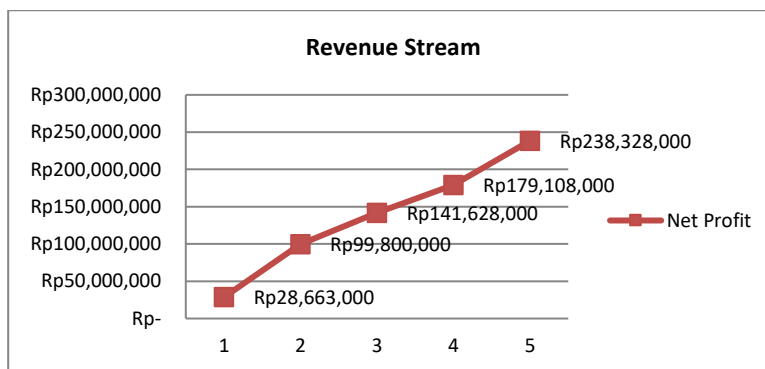


Figure 3. Revenue Steam of Worm Reactor

Based on the the calculation of NPV of the worm reactor business has positive value (IDR 13.117.746) so that it is a feasible business. Moreover, according to the IRR is 32.06%/year, meaning that IRR is higher than the current bank interest rate of 4.75% / year and therefore it will be profitable for the worm reactor business.

The following is the IRR formula:

$$IRR = P1 - C1 \times \left(\frac{P2-p1}{C2-C1} \right) \tag{1}$$

P1 = *Discount Factor 1*,

P2 = *Discount Factor 2*,

C1 = NPV 1,

C2 = NP V2

$$IRR = 30\% - IDR. 13,117,746 \times \left(\frac{35\%-30\%}{-Rp.18.712.874 - Rp.13.117.746} \right) = 32.06\% / \text{Year}$$

Based on the calculation in Table 3, the worm reactor business will have its payback period within 3 years. Moreover, Break Event Point (BEP) for the worm reactor business is the average of 75 unit sold/ year.

Table 3. Payback Period

Year	Net Profit / Year	Cumulative Net Profit
0	0	-IDR 259,338,000
1	IDR 28,663,000	-IDR 230,675,000
2	IDR 99,800,000	-IDR 130,875,000
3	IDR 141,628,000	IDR 10,753,000
4	IDR 179,108,000	IDR 189,861,000
5	IDR 238,328,000	IDR 428,189,000
Total	IDR 687,527,000	
PBP Calculation	2.93	Year
PBP	3	Year

5. Conclusion

Business Feasibility is categorized into three: Desirability, Feasibility, and Viability. For desirability, the customer segments of the worm reactor are the Office of Sanitation, Office of Park, and Independent Waste Processing. Value Proposition of the worm reactor is that it does not emit odor, easy to use and practical. Channels of the product are Internet and exhibition. Customer Relationship is established with the workshop that manufactures the product and the delivery service of the product. Feasibility category is Key Activities of the worm reactor which includes product manufacturing, marketing, and development. Key partner of the worm reactor is the workshop that manufactures the product and waste management community. Key Resources are 4 employees that work for the worm reactor product. For the Viability category, the initial capital of the worm reactor product is IDR 259,338,000. Payback Period for the worm reactor product is 3 years and the average Break Event Point for 5 years is 75 products. *Net Present Value* is IDR 13,117,746. And Internal Rate of Return is 32.06% which means that the business is feasible.

6. References

- [1] Arikunto S 2006 *Prosedur Penelitian Suatu Pendekatan Praktik*. (Jakarta: Rineka Cipta)
- [2] Blank S and Dorf B 2012 *The Startup Owner's Manual*. (California: K&S Ranch, Inc.)
- [3] Brown T and Wyatt J 2010 *Design Thinking for Social Innovation*. (California: Stanford Social Innovation Review)
- [4] Dewobroto W S 2011 *Penggunaan Business Model Canvas Sebagai Dasar Untuk Menciptakan Alternatif Strategi Bisnis dan Kelayakan Usaha*. (Jakarta: Faculty of Industrial Technology, Trisakti University)
- [5] Dewobroto W S 2014 *Journal of Business Model Generation and Lean Startup Method as The Basis for Business Development Feasibility Study, Case Study of PO. Gajah Mungkur Sejahtera*. (Jakarta: Fakultas Teknologi Industri, Universitas Trisakti)
- [6] Indradi I 2013 *Analisis Kelayakan Usaha Perikanan Laut Kabupaten Kendal*. (Semarang: Universitas Diponegoro)
- [7] Indriani 2015 *Indonesia Perlu Kerja Keras Tangani Sampah*. [Online] Accessed on March 3, 2015. Retrieved at <http://www.antara.net.id/index.php/2015/03/03/indonesia-perlu-kerja-keras-tangani-sampah/id/>.
- [8] Kasmir and Jakfar 2003 *Studi Kelayakan Bisnis*. (Jakarta: Kencana)
- [9] Sumartini P H S 2014 *Pemanfaatan Ban Bekas*. [Online] Accessed on May 19, 2014.
- [10] Suprobo F P 2012 *Kajian Design Thinking: Pelaksanaan Proyek Desain Produk*. (Surabaya: Universitas Widya Kartika)
- [11] Newnan D G 2011 *Engineering Economic Analysis*. (Oxford: Oxford University)
- [12] Osterwalder A and Pigneur Y 2010 *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. (New Jersey: John Wiley & Sons, Inc.)