Conceptual model of start-up business for strengthening Madrasah funding using Dynamic System approaches

E Prasetyaningsih*, P Renosori and M Satori

Industrial Engineering Program Study, Universitas Islam Bandung, Jl. Tamansari No.1 Bandung, Indonesia

*endangpras@gmail.com

Abstract. A start-up business is generally developed in a limited financial so that they grow slowly. It also happens on the Cassava Meatballs start-up business run by Madrasah Al-Binaa, one of an Islamic non-formal boarding school. Therefore, it is required some alternative tactics to provide the liquidity and get profits that will encourage the start-up business to grow, develop and be sustain. The start-up business contains some trade-offs so that this study uses Dynamic System approach to simulate the interrelationships among the variables. This study aims to develop a conceptual model of start-up business run by Madrasah Al-Binaa. It is expected that the conceptual model can represent the real system of the Madrasah start-up business. The conceptual model development is begun by observing the phenomena of the existing start-up business process, and then a causal loop diagram and their equations are built. The structure of the developed conceptual model consists of seven elements, i.e. customers, products, liquidity, debt, reputation, workers and household spending. The research method is descriptive analytics. The result shows that the developed model is different with the generic model. In the developed conceptual model, the entrepreneurs are not paid from private payoff, but allow to consider household spending.

1. Introduction

Education is a joint responsibility between the government and the society. Madrasah is an Islamic boarding private school that has long been developed in Indonesia. The Madrasah has a very strategic role in developing education, especially for children in remote areas to get education. Beside a formal curriculum, the Madrasah also provides religious knowledge to build Islamic character of faith and devotion to Allah Subhanahu Wata’ala. Therefore, its existence in the society is needed to accelerate improvement the quality of human resources.

The quality of education should be supported by enough funding. The limited funds owned by the Madrasah encourage the owner to find some alternative sources of funding so that the Madrasah can operate independently. Madrasah Diniyah Albinaa is a Madrasah located at Jl. Raya Arjasari km 7 Kampung Sukarasa RT 01 / RW14, Arjasari District, Bandung. The human resources consist of 7 Ustadz with 20 women joint to the ta’lim group, and 80 students. All the time, Madrasah Diniyah Albinaa relies fund for their activities by infaq, sodaqoh, zakat from the limited donors.

Against a background to meet the fund for activities independently, over the past 2 years the Madrasah have tried various start-up businesses e.g. Catfish Farming, Catfish Crackers, Cassava Meatballs and Cilok. Some of the start-up businesses are able to survive, but for the Catfish Farming and their processed product is no longer produced.
Some challenges faced include marketing and product quality. Recently, the start-up business that gives hope to grow and develop is the Cassava Meatballs business. These products are made of Cassava from the local Arjasari agricultural products, which are quite abundant. The Cassava is sold very cheap, i.e. Rp.800 – Rp. 1,000/kg, while the Cassava Meatballs can have sold on higher price due to the added value. Therefore, it is needed to study deeper to make this start-up business grow, develop and be sustainable using a model.

The start-up business is a complex system and has a dynamic behavior. Strategic approaches for modeling complex systems can be done by Dynamic Systems approach, while the dynamics of the system behavior can be simulated using a computer [1]. Therefore, the research method used in this research is the Dynamic System approach which is built based on data and information about the structure and behavior of key elements. The variables involved have complicated interrelations and many trade-offs.

The problem in this study is how the Madrasah can improve the Cassava Meatballs start-up business so that it can develop, and be sustainable. Finally, the Madrasah can operate their activities independently. This study aims to develop a conceptual model of start-up business run by the Madrasah using a Dynamic Systems approach, so that the start-up business can develop and be sustainable.

In the literature, Schwarz and Schöneborn develop a dynamic model of the evolution of small startup businesses based on simplified company theory. This model explains the evolution of the company which involves both growth and decline to bankruptcy simultaneously [2]. A generic model templates for entrepreneurs to develop their own company's using Dynamic Systems model has been proposed by Huang and Kunc [3]. Abdelkafi and Täuscher develop a business model for sustainability (BMfS-business model for Sustainability-) by creating value for various stakeholders and the natural environment has been developed by Abdelkafi and Täuscher [4]. BMfS is built on creating a feedback loop that reinforces the value created by the customer, the value captured by the company, and the value for the natural environment using a Dynamic Systems approach. Cosenz explore how System Dynamics modelling can provide a methodological support to business model design with the intent to better communicate business strategy and manage performance [5].

The business start-up life cycle includes 3 stages, i.e. the bootstrap stage, the seed stage, and the creation stage [6]. The main challenges of business start-up include "entrepreneurship", "innovation", "technology", and "economics" [6], but they are critical success factors of startups as well [7]. The growth of start-up businesses must be supported by the availability of information, efficient processes, attitudes that support start-up business owners, offering training opportunities, and the availability of supporting services [8], the importance of social media for promotion tools even as part of business strategy [9], the availability to the crowdfunding platform access [10], extensive pre-startup activities, and various expansion activities [11].

Based on the previous research, it can be seen that Dynamic System approach can be used to study variables that make a start-up business grows, develops and be sustainable. This study will develop a start-up business model using a Dynamic Systems approach by referring to Huang and Kunc model [3].

This paper is organized as follows. Section 2 describes the Methodology, Section 3 explains the Result, Section 4 discusses the result, and Section 5 shows the conclusion.

2. Method

This study uses descriptive analytics methods to develop a conceptual model of the Cassava Meatballs start-up business. The conceptual model refers to the start-up business generic model proposed by Schwarz and Schöneborn [2]. The steps of model development refer to the stages in the dynamic system modeling, namely the making of Causal Loop Diagram and their equations, and the development of Stock Flow Diagrams. The Causal Loop Diagram is compiled based on the business process of the Cassava Meatballs start-up business run by Madrasah AlBinaa, while the Stock Flow Diagram is compiled based on the Causal Loop Diagram.
3. Results

3.1. Start-up business generic model

The start-up business generic model is constructed by Huang and Kunc as seen at figure 1 [3]. The start-up business includes eight main resources, i.e. potential customers, customer base, order/product in process, services in process, staff, cash availability, assets and company reputation. In addition, financial variables in the form of financial information, are considered to be a very important elements of the startup, because the information effects on business survival. The financial variables are revenue, profit, cash in, cash out, service account for revenue, product account for revenue, total operating costs, total production costs, total staff costs, hiring budget, marketing budget and investment budget.

The start-up business generic model is described as six feedback loops; i.e. staff (B1), company reputation (R1), customer (R2), service in process (R3), assets (B2), and profit (B3) feedback loops.

![Figure 1. Generic model of start-up business [2].](image)

3.2. Conceptual model of cassava meatballs start-up business

The conceptual model of the Cassava Meatballs start-up business is constructed by referring Business Process of Cassava Meatballs that is described as follows:

The main business run by Madrasah Diniyah Albinaa is starting from the market potential of the Cassava Meatballs products to the product sales. When the orders are received from the customers, materials are purchased. This will increase inventory and inventory costs. The order will be produced when the materials and staff are available. Product completed are then shipped. The number of orders processed and the number of product completed affect a backlog. If the backlog occurs, additional employees are needed to adjust capacity in order to be delivered the product just in time. The number of products shipped and product prices will determine revenue. The revenue should be used to buy materials, to provide holding cost, employee cost, and marketing cost. The difference between revenue and total costs (material cost, employee cost, holding cost and marketing cost) is called as profit. Model of Huang and Kunc states that all payment includes private payoff determine cash availability which represent a liquidity [3]. All unavoidable payments decrease liquidity. However, in the practical situation at the Madrasah start-up business the entrepreneur uses the revenue as household spending. The entrepreneur does not pay from the profit as private payoff.
The Business Process that has been described can be drawn into the Causal Loop diagram shown in figure 2.

![Causal loop diagram of Madrasah Cassava Meatballs start-up business.](image)

**Figure 2.** Causal loop diagram of Madrasah Cassava Meatballs start-up business.

### 3.3. General equations formulation

Refer to the Causal Loop Diagram seen at figure 2, then general equations are formulated as follows:

- New customers = potential customers + targeted customers  

\[ \text{(1)} \]

- Product completed = \( \begin{cases} \text{if order} > \text{capacity, product completed} = \text{capacity} \\ \text{if order} < \text{capacity, product completed} = \text{order} \end{cases} \)  

\[ \text{(2)} \]

- Order backlog = orders – Product completed  

\[ \text{(3)} \]

- Staff = staff needed + current staff  

\[ \text{(4)} \]

- Stock of material = amount of raw material purchase – material to produce  

\[ \text{(5)} \]

- Material cost = amount of material to product completed * material price  

\[ \text{(6)} \]

- Marketing cost = marketing budget allocation  

\[ \text{(7)} \]

- Staff wages = number of staff * wage per staff  

\[ \text{(8)} \]

- Stock costs = material stock x holding cost per unit  

\[ \text{(9)} \]

- Revenue = (product shipped x product price) + service cost  

\[ \text{(10)} \]

- Profit = revenue - (material costs + employee costs)  

\[ \text{(11)} \]

- Liquidity = profit + debt – stock cost – marketing cost  

\[ \text{(12)} \]

### 4. Discussion

In figure 2 it can be seen that the Cassava Meatballs business start-up model run by Madrasah Diniyah Albinaa consists of 7 elements, namely potential customers, customer base, services, product completed, liquidity and company reputation. In the conceptual model developed there is no asset element because investment is not made when there are additional staff as shown in the generic model. In the Cassava Meatballs case, investments are made when there is an increase in capacity to buy the main equipment.
In addition, in the case of Cassava Meatballs, the entrepreneur does not get paid as a private payoff as shown in the generic model, but the entrepreneur uses the income to fulfill household needs. This happens because the Cassava Meatballs business is the main source of income for the entrepreneur's family. This allows the cash deficit so that debt is required for operational cost. The debt will increase the cash, but it also increases the payments. This always happens, so that the companies are increasingly burdened by the debt. The Cassava Meatballs start-up business finally stop producing because they are unable to get debt for operational cost. Besides, the marketer has an accident and make him cannot work anymore.

5. Conclusion
The developed conceptual model has two differences from the generic model, i.e. the entrepreneur does not pay from the profit as private payoff, but the entrepreneur uses revenue to fulfill household spending, and asset element does not used in the developed conceptual model.

The developed model should be evaluated to make it valid, and then the right strategy should be found to make the Cassava Meatballs start-up business be sustainable. This needs further research.

Acknowledgement
This research was supported by funding from Research Grant of Research and Community Service (Lembaga Penelitian dan Pengabdian Masyarakat) Universitas Islam Bandung

References
[1] Zali M R, Najafian M and Colabi A M 2014 System Dynamics Modeling in Entrepreneurship Research: A Review of the Literature Int J Supply Oper Manag 1 347–370
[2] Schwarz R and Schöneborn F 2005 An evolutionary model of a small start-up firm AfschetAssoFr 1–12
[3] Huang X and Kunc M 2012 Modeling Start-ups using System Dynamics: Towards a generic model Proc 30th Int Conf Syst Dyn Soc 2012 1–22
[4] Abdelkafi N and Täuscher K 2016 Business Models for Sustainability From a System Dynamics Perspective Organ Environ 2016 29 74–96
[5] Cosenz F 2017 Supporting start-up business model design through system dynamics modelling Manag Decis 2017 55 57–80
[6] Salamzadeh A and Kawamorita H 2015 Startup Companies- Life Cycle and Challenges 4th Int Conf Employment, Educ Entrep Epub ahead of print 2015
[7] Kim B, Kim H and Jeon Y 2018 Critical success factors of a design startup business Sustainability 2018 10 1–15
[8] Eagle K A 2016 Encouraging Entrepreneurship: Resources Supporting Small Business Startup and Growth ProQuest Diss Theses 2016 170
[9] Basri W S and Siam M R A 2017 Maximizing the social media potential for small businesses and startups: A conceptual study Int J Econ Perspect 2017 11 241–245
[10] Mihaela H 2017 Financing Small Businesses: From Venture Capital to Crowdfunding Stud Bus Econ 2017 12 63–69
[11] Lebrasseur R, Zanibbi L and Zinger T J 2003 Growth Momentum in the Early Stages of Small Business Start-Ups Int Small Bus J 2003 21 315–330