IJTMER - M. Imron M

by jkie jkie

Submission date: 03-Aug-2022 07:06PM (UTC-0500)
Submission ID: 1874871463
File name: IJTMER_Manuscript_Template_2018.docx (104.25K)
Word count: 3408
Character count: 20202

International Journal of Trends in Mathematics Education Research (IJTMER)
Vol X, No X, Month 2018, pp. x-x (filled by editor)
ISSN XXX-XXXX (online)
Available online at http://ijtmer.com

Model SMEs Digital Disruption Management with Business Model Canvas and Integer Programming

M. Imron Mas'ud[1], Abdul Wahid[2]

[1,2] Program of Study Industrial Engineering, Universitas Yudharta Pasuruan, Indonesia, 67162

ARTICLE HISTORY
Received (filled by editor)
Revised (filled by editor)
Accepted (filled by editor)

KEYWORDS
SMEs
Digital Disruption
Business Model Canvas
Integer Programming

ABSTRACT

The Industrial Era 5.0 and the current covid 19 pandemic have made almost all large, medium, and small companies including MSMEs transform by strengthening their business online to survive and compete, but with the development of technology and intense business competition indirectly many penetrate the market and segments that are not good for other competitors, one of which is the MSME sector for processing products from silkworms in Pasuruan Regency. The purpose of this study is to model the management of digital disruption in SMEs Handicraft processing of silkworm products in Pasuruan Regency through the integration approach of Business Model Canvas (BMC) and integer programming. The results showed that the management of digital disruption of SMEs in the craft of processing products from silkworms requires understanding to be able to optimally utilize online media, especially Facebook, Instagram, and WhatsApp in an effort to market products to create added value and to be created into various types of variations so as to increase the selling price. high with an increase rate of 5% at the beginning of its implementation.

1. Introduction

The phenomenon of today's disruption has caused fundamental changes in everyday life, including SMEs. Handicraft processing products from silkworms in Pasuruan Regency, disruption has shifted from conventional to digital. The discourse that occurred as a result of the development of technology towards industry 5.0, in addition to having a positive impact, also had a negative impact on some incumbents or conventional business people (Horáková et al., 2022)(Ambrogio et al., 2022)(Crittenden & Peterson, 2019). Many of the incumbents feel threatened, this is because the conventional market has begun to reconstruct into a new market by incarnating through a digital market place or internet of things/internet for everything. Human needs that are increasingly complex make everything demanded to be sophisticated. Being human in the Disruptive era, not all of them will feel the positive impact, where out there are still many SMEs that seem to be forced to adapt to these changes (Stonehouse & Konina, 2020)(Horáková et al., 2022).

Currently, Indonesia has entered the industrial era 5.0, this is indicated by almost all facilities in the community that are fully digital, but the problem is that all communities, especially SMEs processing products from silkworms, are completely unaware of the logical consequences or impacts (Högberg & Willermark, 2022). of these changes. In fact, it is often debated and considered a threat, such as declining interest in shopping at conventional stores. Despite the fact that in the disruptive era, the consumption culture continues to increase, people have started to get used to doing shopping activities through the online system(Fritzsche & Gölzer, 2021)(Jesse, 2018)(Arianto, 2020).

SMEs craft processing products from silkworms in Pasuruan district which is the only one in Indonesia and in its manufacturing process involves many people with disabilities in the production process and the workers come from many regions (Halim, 2020)(Sarfiah et al., 2019). SMEs craft processing products from silkworms in Pasuruan district are members of the community of superior silk farmers (KUPU Sutera). Currently the silk butterfly has 2 variations of superior products, namely shoes and cloth, for fabric materials the products that can be produced vary such as clothes, masks, etc. The amount of production is uncertain and predictable because the marketing process is still conventional.

Departing from the above phenomenon, the researcher wants to analyze the change from the conventional market to the digital marketplace, which is considered to threaten the existence of the conventional market through the business model canvas on the management of SME products, processing silkworm products in Pasuruan Regency.

Business Model Canvas (BMC)

The Business Model Canvas (BMC) approach is used to increase value creation for a business, both in the form of industry and MSMEs, the results of which can provide a good framework for clarifying the creation of value propositions in the market (Braun et al., 2021)(Montenegro et al., 2021).

A business model is how an organization creates, delivers and captures value. A business model is a story that explains how a company works (Braun et al., 2021). The business model has two parts within a company. The first part includes all activities related to creating something such as designing, buying raw materials, manufacturing and so on. The second part includes all activities related to selling something such as finding and studying consumers, transacting, and distributing products, whether goods or services (Iheanachor et al., 2021).

CONTACT: Correspondent Author Name, emailname@gmail.com, University, City, Country

The Business Model Canvas was first developed by Alexander Osterwalder and Yves Pigneur, BMC makes it easy for business owners or decision makers to see a business from the aspects available on the canvas making it easier to analyze or even modify these aspects to be used as a basis for formulating a business model. effective strategy (Brunner & Wolfartsberger, 2020).

This business model represents four main aspects in a business, namely customers, offerings, infrastructure and financial sustainability which are categorized into 9 blocks that show the company's way of thinking in running a business (Burggräf et al., 2021). The 9 blocks are divided into two parts, the first part or on the right side makes it easier for companies to see the creation of an added value that can be offered through customer segments, value propositions, customer relationships, and channels. channels), and revenue streams. The second part or the left side makes it easier for companies to see the costs incurred or efforts to make cost efficiency through key resources, key activities, key partnerships, cost structure (Cardeal et al., 2022).

Elements in the Business Model Canvas include nine basic building blocks, namely Customer Segments, Value Propositions, Channels, Customer Relations, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure. Then the nine building blocks are described in more detail like a canvas (Strulak-Wójcikiewicz et al., 2020). So by using this canvas, a company's business model can be described in a single document that can be understood by all parties. The nine business model building blocks form the basis for a compact tool, called the Business Model Canvas (Novitasari & Mas'ud, 2020)(Burggräf et al., 2021).

Linear Programs

Linear programming is a widespread use of mathematical modeling techniques designed to assist managers in planning and making decisions in allocating resources.

Technically, there are five additional conditions of the linear programming problem that must be considered which are basic assumptions, namely:

1. Certainty (certainty)
2. Proportionality (proportionality)
3. Additivity
4. Divisibility (can be divided).
5. Non-negative variable (variable is not negative)

Integer Programming Linear Program Model

The mathematical model for formulating the general problem of allocating resources for various activities is called the linear programming model (Goerigk & Hartisch, 2021). This linear program model is a form and arrangement in presenting problems that will be solved by linear programming techniques (Karia et al., 2022). There are two types of linear programming models, namely:

- Objective function
- Limit function

The structure of the linear program mathematical model begins with objective functions, namely a mathematical function that reflects the model's objectives. The objective function must be minimized or maximized against a set of constraints so that in the objective function a statement about the direction must appear (Bakker et al., 2021). Therefore, there are only two possible objective functions, namely maximizing or minimizing. The standard form of a linear program is as follows:

Purpose function

Min(Max) $Z = \sum_{j=1}^{n} c_j x_j$

Limit function $\sum_{j=1}^{n} a_{ij} x_j \begin{pmatrix} \leq \\ = \\ \geq \end{pmatrix} b_i; i = 1, 2, 3, \dots, m$

$x_j \geq 0; j = 1, 2, 3, \dots, n$

Where:

Z : The objective function for which the optimal value will be sought
cj : An increase in the value of ai Z if there is an increase in the level of activity xj by one unit or the contribution of each unit of output of activity j to Z
n : Types of activities that use available resources or facilities
m : Type of limitation of available resources or facilities
xj : j activity level
aij : The number of resources i needed to produce each unit of output activity j
bi : The capacity of resource i available to be allocated to each activity unit

The set xj that satisfies the linear programming problem is called the solution (solution) of the linear program and each solution that satisfies the constraints is called the basic answer and from this basic answer a feasible solution is chosen (feasible solution) for the linear program. Each solution that optimizes the objective function is called an optimal feasible solution (Krutein & Goodchild, 2022). There are four possible solutions to the linear programming model, namely:

- Single solution (unique finite optimal solution).
- More than one solution (alternative finite optimal solution).
- The solution is not limited (unbounded optimal solution).
- Has no solution (empty feasible region).

Linear Program Completion

The following are the steps in solving the simplex method:

Step 1: Identify the decision variables
Step 2: Determine the objective function, whether to max/min
Step 3: Formulate the existing constraint factors in the form:
≥ The most or maximum embodiment of information
≤ Embodiment of the least or minimal information
= The most adequate embodiment of information
Step 4: Change the objective function & constraint variable into an impulsive function by shifting all CnXn to the left, formulate the constraint factors in the form:
The constraint function uses the symbol then it must be added + S
The constraint function uses the symbol then it must be added –S+A
The constraint function uses the symbol = then it must be added + A
note : S = slack variable, A = Artificial
Step 5: Arrange the obtained equations into the iteration table
Step 6: Determine the key column, by:
For maximization: select the column with the most negative value [zi – cj]
For minimization: select the column with the largest most positive value [zi – cj]
If there is more than one, select one (any)
Step 7: Determine the key row, by:
Choose from the smallest positive ratio value
If there is more than one, select one (any)

Based on the results of the resulting decision variables, the Integer Programming method can be categorized into three forms (Migo-Sumagang et al., 2022).

- Total Integer Programming If the resulting decision variable is entirely in the form of whole numbers (integer), the base variable has a positive integer value or zero.
- Binary Integer Programming If the resulting decision variables are all binary numbers (1 and 0), it is also called zero one integer programming.
- Mixed Integer Programming If the resulting decision variable is partially in the form of an integer.

2. Research Method

This research generally begins with literature study, data collection, data processing, system design, system testing, and

analysis of results. While the writing of research reports begins at the beginning to the end of the study. In detail, this research was designed in the following order: Research Location This research was conducted on MSMEs in Pasuruan Regency which are engaged in the craft of processing products from silkworms. The location choice was purposive with the consideration that the MSME product processing craft from silkworms is one of the economic business units of the surrounding community but has not shown positive developments that are better from year to year and even tend to decline.

Data Collection

Data was collected by means of interviews, direct observation, and documentation. The data collected in this study consisted of two kinds, namely primary data and secondary data. Primary data is data obtained through direct interviews from the owners of SMEs processing products from silkworms based on a list of questions (production data, sales) that have been prepared previously. While secondary data which is supporting research data obtained from institutions or agencies related to research.

Data Analysis

The data collected in the data collection stage needs to be processed first. The goal is to simplify all data collected and presented in a good and neat arrangement for later analysis. Data processing is needed to translate the figures obtained, then processed and analyzed using the Business Model Canvas (BMC) Approach.

Stages of data analysis

The stages of data analysis in this research are as follows:

- site survey
- problem identification
- formulation of the problem
- data collection
- data processing
- analysis and interpretation
- conclusion

3. Result and Analysis

3.1. Business model canvas (BMC)

Customer segments

The customer segment describes and describes the market share taken, namely the middle and upper class people. The type of customer segment, where the problem is that there are no oroo product providers that can be purchased online with the updated mode

Value proposition

The middle and upper class community with their products have the potential to be developed, which requires a little touch, including making online buying and selling information facilities. This is a plus for the silk lover community so that later it will be easy to get product updates.

Channels

The channel used by the middle and upper class people in developing product results is to create a website/application specifically for buying and selling products or maximizing online media such as Facebook, WhatsApp, and Instagram.

Customer relationships

The relationship between coastal communities in developing prouct with their customers is in groups and individually, and the use of social media.

Revenue streams

The revenue stream obtained by coastal communities in two ways by coastal communities through online marketing and presenting product photos.

Key resources

The main resources for the silk butterfly are Internet human resources and internet infrastructure.

Key activities

The key activities carried out by coastal communities are service operations, including partnerships and online marketing.

Key partnerships

The main partners that need to be owned by coastal communities are Academic, Business, Government, Expedition service.

Cost structure

The costs structure incurred by coastal communities in developing fish catch management in meeting online needs in the form of hosting and domain costs, operational costs, website maintenance and maintenance costs.

Figure 1. BMC Digital Disruption Management

3.2. Integer Programming

Based on the results of data collection, it was found that there were five types of products: shoes, masks, scarves, headscarves, and clothes.

Function Purpose

The objective function to be obtained is product optimization to minimize operational costs. The optimization can be written mathematically as follows:

$$Min\ Z = \sum_{j=1}^{4}\sum_{i=1}^{5} c_{ij}x_{ij} + \sum_{k=1}^{2}\sum_{j=1}^{4} c_{jk}x_{jk}$$

Where:

Z = Total Cost
c_{ij} = Transportation cost (i) to marketing area(j)
c_{jk} = Cost of distributing products from the marketing area (j) by means of transportation (k)
x_{ij} = Number of products transported (i) to the marketing area (j)
x_{jk} = Number of products distributed to the marketing area (j) by means of transportation (k)

Barrier Function
The limiting function in this optimization problem is as follows:

- Number of products (i) in each type of product (j)

$$\sum_{j=1}^{5} x_{ij} \geq s_1$$

with = {1,2,3,…5}
where:
i = 1→ Shoes
i = 2→ Mask
i = 3→ Shawl
i = 4→ Veil
i = 5→ Clothing

- The number of products originating from (i) transported to the marketing area (j) <= capacity of the marketing area (j)

$$\sum_{i=1}^{4} x_{ij} \leq b_j$$

with = {1,2,3,4}
where:
j = 1→ Malang
j = 2→ Surabaya city
j = 3→ Sidoarjo
j = 4→ Pasuruan

- The number of products sent from the marketing area (j) by means of transportation (k) <= the number of products (i) sent to the marketing area (k)

$$\sum_{k=1}^{2} x_{jk} \leq \sum_{i=1}^{5} x_{ij}$$

With j = {1,2}

- Number of deliveries to marketing areas (j) by means of transportation (k) = number of product needs by means of transportation (k)

$$\sum_{j=1}^{2} x_{jk} \leq d_k$$

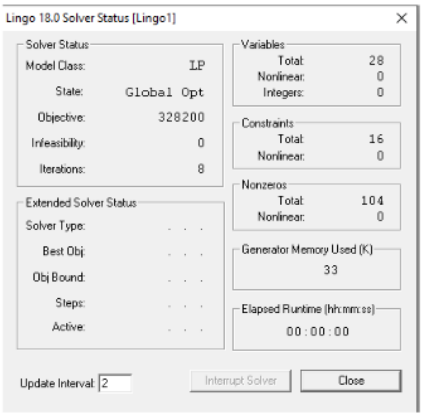
with = {1,2}
where:
j = 1→ J&T
j = 2→ JNE

Formulation in LINGO

```
!number of supplies;
@for(supply_number(i):@sum(supply_marketing(i,j):(sup-
ply_ij(i,j))))>=supply(i));
!amount sent;
@for(marketing_area(j):@sum(supply_marketing(i,j):sup-
ply_ij(i,j))>=@sum(shipping_demand(j,k):shipping_jk(j,k)));
!marketing demand;
@for(marketing_area(j):@sum(supply_marketing(i,j):(sup-
ply_ij(i,j))))>=demand(j));
!number of expeditions;
@for(expedition(k):@sum(shipping_demand(j,k):(ship-
ping_jk(j,k)))=capacity(k));
```

The results of the computations are obtained in the form of an objective function (z) of 328.200 (in thousands) with optimal global status with 8 iterations and 28 variables with 16 constraints. which is divided into the total number of cooperative societies.

Figure 2. Output lingo application status



4. Conclusion

4.1. Sampling

Based on the results of the discussion above, the optimal value of profits that can be obtained by cooperatives is Rp. 328,200,000, while the digital disruption management model for MSMEs. into a variety of products that are produced so that profits can be optimal.

Acknowledgements

The author expresses his deepest gratitude to the Ministry of Education, Culture, Research, and Technology as the funding provider for the 2022 PDP program research, Universitas Yudharta Pasuruan, and the reviewers who have provided many inputs for the perfection of this article.

References

Ambrogio, G., Filice, L., Longo, F., & Padovano, A. (2022). Workforce and supply chain disruption as a digital and technological innovation opportunity for resilient manufacturing systems in the COVID-19 pandemic. *Computers and Industrial Engineering*, *169*(April), 108158. https://doi.org/10.1016/j.cie.2022.108158

Arianto, B. (2020). Pengembangan UMKM Digital di Masa Pandemi Covid-19. *ATRABIS: Jurnal Administrasi Bisnis (e-Journal)*, *6*(2), 233–247. https://www.jurnal.plb.ac.id/index.php/atrabis/article/view/512

Bakker, S. J., Kleiven, A., Fleten, S. E., & Tomasgard, A. (2021). Mature offshore oil field development: Solving a real options problem using stochastic dual dynamic integer programming. *Computers and Operations Research*, *136*(March), 105480. https://doi.org/10.1016/j.cor.2021.105480

Braun, A. T., Schöllhammer, O., & Rosenkranz, B. (2021). Adaptation of the business model canvas template to develop business models for the circular economy. *Procedia CIRP*, *99*, 698–702. https://doi.org/10.1016/j.procir.2021.03.093

Brunner, M., & Wolfartsberger, J. (2020). Virtual reality enriched business model canvas building blocks for enhancing customer retention. *Procedia Manufacturing*, *42*(2019), 154–157. https://doi.org/10.1016/j.promfg.2020.02.062

Burggräf, P., Wagner, J., Heinbach, B., & Wigger, M. (2021). Design of a Methodological Framework for Adaptive Remanufacturing-

based Business Models. *Procedia CIRP*, *98*, 547–552. https://doi.org/10.1016/j.procir.2021.01.149

Cardeal, G., Ferreira, B., Peças, P., Leite, M., & Ribeiro, I. (2022). Designing Sustainable Business Models to Reduce Spare Part Inventory. *Procedia CIRP*, *105*, 171–176. https://doi.org/10.1016/j.procir.2022.02.029

Crittenden, V., & Peterson, R. A. (2019). Digital Disruption: The Transdisciplinary Future of Marketing Education. *Journal of Marketing Education*, *41*(1), 3–4. https://doi.org/10.1177/0273475319825534

Fritzsche, A., & Gölzer, P. (2021). Industrial Applications of Artificial Intelligence: From Grand Stories of Digital Disruption to Actual Progress. *Procedia CIRP*, *104*, 683–688. https://doi.org/10.1016/j.procir.2021.11.115

Goerigk, M., & Hartisch, M. (2021). Multistage robust discrete optimization via quantified integer programming. *Computers and Operations Research*, *135*(June), 105434. https://doi.org/10.1016/j.cor.2021.105434

Halim, A. (2020). Pengaruh Pertumbuhan Usaha Mikro, Kecil Dan Menengah Terhadap Pertumbuhan Ekonomi Kabupaten Mamuju. *Jurnal Ilmiah Ekonomi Pembangunan*, *1*(2), 157–172. https://stiemmamuju.e-journal.id/GJIEP/article/view/39

Högberg, K., & Willermark, S. (2022). Strategic Responses to Digital Disruption in Incumbent Firms– A Strategy-as-Practice Perspective. *Journal of Computer Information Systems*, *41*(May), 1–12. https://doi.org/10.1080/08874417.2022.2057373

Horáková, J., Uusitalo, O., Munnukka, J., & Jokinen, O. (2022). Does the digitalization of retailing disrupt consumers' attachment to retail places? *Journal of Retailing and Consumer Services*, *67*(February), 102958. https://doi.org/10.1016/j.jretconser.2022.102958

Iheanachor, N., David-West, Y., & Umukoro, I. O. (2021). Business model innovation at the bottom of the pyramid – A case of mobile money agents. *Journal of Business Research*, *127*(January), 96–107. https://doi.org/10.1016/j.jbusres.2021.01.029

Jesse, N. (2018). Organizational Evolution - How Digital Disruption Enforces Organizational Agility. *IFAC-PapersOnLine*, *51*(30), 486–491. https://doi.org/10.1016/j.ifacol.2018.11.310

Karia, T., Adjiman, C. S., & Chachuat, B. (2022). Assessment of a two-step approach for global optimization of mixed-integer polynomial programs using quadratic reformulation. *Computers and Chemical Engineering*, *165*(November 2021), 107909. https://doi.org/10.1016/j.compchemeng.2022.107909

Krutein, K. F., & Goodchild, A. (2022). The isolated community evacuation problem with mixed integer programming. *Transportation Research Part E: Logistics and Transportation Review*, *161*(November 2021), 102710. https://doi.org/10.1016/j.tre.2022.102710

Migo-Sumagang, M. V., Tan, R. R., Tapia, J. F. D., & Aviso, K. B. (2022). Fuzzy mixed-integer linear and quadratic programming models for planning negative emissions technologies portfolios with synergistic interactions. *Cleaner Engineering and Technology*, *9*(April), 100507. https://doi.org/10.1016/j.clet.2022.100507

Montenegro, J. F., Contreras, P. A., & Saenz, F. (2021). Hybridization of the Kano model and business model canvas: aeronautical and metalworking industry in Bogota, Colombia. *Heliyon*, *7*(10), 1–12. https://doi.org/10.1016/j.heliyon.2021.e08097

Novitasari, & Mas'ud, M. I. (2020). Integrasi Linier Programming dan Program Dinamik Untuk Menentukan Jumlah Produksi Kopi Yang Optimum di Ud. Gading Mas. *JKIE (Journal Knowledge Industrial Engineering)*, *7*(1), 30–37. https://doi.org/10.35891/jkie.v7i1.2095

Sarfiah, S., Atmaja, H., & Verawati, D. (2019). UMKM Sebagai Pilar Membangun Ekonomi Bangsa. *Jurnal REP (Riset Ekonomi Pembangunan)*, *4*(2), 1–189. https://doi.org/10.31002/rep.v4i2.1952

Stonehouse, G. H., & Konina, N. Y. (2020). Management Challenges in the Age of Digital Disruption. *Advances in Economics, Business and Management Research*, *119*(Etcmtp 2019), 1–6. https://doi.org/10.2991/aebmr.k.200201.001

Strulak-Wójcikiewicz, R., Wagner, N., Lapko, A., & Hacia, E. (2020). Applying the business model canvas to design the E-platform for sailing tourism. *Procedia Computer Science*, *176*, 1643–1651. https://doi.org/10.1016/j.procs.2020.09.188

IJTMER - M. Imron M

ORIGINALITY REPORT

6%	5%	4%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to Coventry University Student Paper	1%
2	Submitted to National School of Business Management NSBM, Sri Lanka Student Paper	1%
3	iiesindependent.org Internet Source	1%
4	jbhost.org Internet Source	1%
5	www.researchgate.net Internet Source	1%
6	Submitted to UCSI University Student Paper	<1%
7	Diane Aparecida dos Reis Silva Farina. "Entrepreneurship education through the lenses of entrepreneurial competences, intention, and confidence.", Universidade de Sao Paulo, Agencia USP de Gestao da Informacao Academica (AGUIA), 2021 Publication	<1%

8	zenodo.org Internet Source	<1%
9	managementpapers.polsl.pl Internet Source	<1%
10	Jorge F. Montenegro, Pablo A. Contreras, Fabiola Sáenz. "Hybridization of the Kano model and business model canvas: aeronautical and metalworking industry in Bogota, Colombia", Heliyon, 2021 Publication	<1%
11	krishikosh.egranth.ac.in Internet Source	<1%
12	www.coursehero.com Internet Source	<1%
13	www.ijtmer.com Internet Source	<1%
14	www.emvco.com Internet Source	<1%

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		