

**BUSINESS PLAN DEVELOPMENT FOR SCIENTISTS: CASE STUDY TSUNAMI WARNING****Madlazim, M^{*}. Fida Rachmadiarti, Masriyah, Sifak Indana, Dyah Permata Sari****Universitas Negeri Surabaya, INDONESIA***Corresponding author: madlazim@unesa.ac.id**ABSTRACT**

In order to start a company and commercialize a great technological innovation, it is necessary to develop an effective business plan. The present study proposes the scientific development of such a business plan named “Educational Design Research” (EDR). This EDR plan aims to produce a 2021-2025 methodology for the Faculty of Mathematics and Natural Sciences of the Surabaya State University to address, among other things, the analysis, design, preparation, evaluation, and final reporting, for use in issuing and implementing effectively tsunami warnings in Indonesia. At the design stage of this project, the researchers involved in the present study compiled a business plan based on theory, and provided examples of procedures that could be readily accessed, evaluated and implemented in issuing tsunami warnings. The business plan was developed in close cooperation and thorough discussions with other units of the Faculty of Mathematics and Natural Sciences of the University. The revised business document plan was subsequently provided to a consultant for additional evaluation, recommendations, and revisions. The results of the present study are in the form of a business plan document for adoption in more effective earthquake and tsunami warnings, using the “Jokotingkir” technology.

Keywords: *Business plan, tsunami warning, entrepreneurship, Jokotingkir, disability.*

1. INTRODUCTION

Developing a good business plan before implementing a company's business operations is essential for long-term success. Garcia, R., F., et al (2019) found evidence that the process of making a business plan resulted in highly valued entrepreneurial competencies, and whether the business plan was real or fictitious, it did not affect the level of entrepreneurial competence. Several researchers who have studied entrepreneurial competence are Man et al. (2002), and Bakkali et al. (2010). Indeed, rare research comes with knowledge of analyzing students' perceptions of the attainment of these competencies (Tounés et al., 2014). However, to the authors' knowledge, no studies have examined the effect of such perceptions on the achievement of the competencies in question. Therefore, further research is needed to identify the benefits of business plans in terms of developing entrepreneurial competencies, especially for scientists (Momete D. C., 2018).

The present study discusses key elements of a business plan approach which could help scientists reach realistic estimates of potential revenue, that could offset operational expenses of an effective management program of added protection from tsunamigenic hazards in Indonesia. As stated, in order to start a company and commercialize a great technological innovation, it is necessary to develop first an effective business-type plan. Especially, if investment capital and resources are needed - as in this case – the preparation of a proper operational document is needed, to validate the experience of those involved as it is done for business start-up companies. This approach is supported by the results of research by Kiznyte J., et al., (2016), in order to ensure that the goals of the company are viable and that there is an understanding of what needs to be done for a program to become successful. However, most scientists rarely have such experience in creating plan documents and most likely don't know how to properly structure them. Therefore, by using a business-like approach, the present study focuses on the plan that is most relevant to innovations related to science, such as the “Jokotingkir” technology, which is an externally-focused business plan for start-up companies. Since every business plan is different, it should not be necessary to follow a certain rigid format in formulating, if changes may lead to better results. After all, the point of any business plan is to state what approach will lead to more successful outcomes. Thus, making a document look like a standard business plan is second to none. Whatever approach is used in formulating a plan of action, it is important to include all the necessary information, and this can also increase the entrepreneurial competence of scientists (Momete D. C., 2018). In the present paper, we focus on developing a business plan type of document using the Jokotingkir technology that can function for the effective dissemination of earthquake and tsunami warnings.

2. LITERATURE REVIEW

As indicated, a business plan is a typical part of entrepreneurship courses. In almost all entrepreneurship courses, a business plan is the typical end product. According to Katz (2014), it is an excellent task and method to increase the level of student learning related to entrepreneurship. According to Honig (2004), a business plan can be defined as a written document that describes a company's current and future profile; it is a maturation process that facilitates the progression from an idea to a final project. Evidence suggests that business schools teach business plans because they help current and future entrepreneurs manage activities that involve a high degree of complexity and uncertainty (Kahrs, 1995). Although there are different suggestions on how to build a business plan, most include the following (Blenker et al., 2006): description of the business area, description of the management team, description of market segments, marketing plan, business, organizational systems, implementation, assessment of risk, and funding. In general, as in business, a scientific plan should include the following similar components:

(1) Company Review - A review of one to three sentences of the company description. The description should be to the point in order to effectively grab the reader's attention, then followed by a very brief description of the company and its organizational structure.

(2) Mission Statement - The company's mission statement must effectively state the company's goals. A mission statement must be written that will guide future strategy and high-level decision-making. A mission statement is not a marketing tool, but it should be written well.

(3) Management – This is an introduction of the management team, which should provide some background information about involved individuals, highlighting their strengths as they relate to the business and their position in the organizational structure. A bad management team can easily repel investors, so it is important to include in the introduction all the positive aspects, making sure the management team looks good in addressing effectively the company's operating plan.

(4) Market Analysis – Analysis and formulation of market/user analysis precludes the understanding by scientists of the technology market generated from plan documents. This market analysis should provide information about the competition, obstacles, market size, trends, challenges, opportunities, and benefits that the marketing approach presents.

(5) Scientific Background – For people involved in the formulation of an effective plan, it is important for them to have adequate technical knowledge and understanding of needed and specific technology for effective implementation. Since scientific products are highly technical, there is a need to demonstrate the procedures that will meet the identified goals. If possible, reference should be made to published literature. If a working prototype has been completed, some of the test results should be presented.

(6) Marketing Plan – Such a plan must discuss the means of promoting information dissemination and reiterate the benefits to designated recipients, as well as the means to help achieve the needed goals. Also included should be a projection of how the product – in this case concepts of disaster mitigation – should be presented in order to reach maximum response and achieve maximum effectiveness. Such approach must utilize all available channels of effective dissemination and on how managers of the plan must interact with the public.

(7) Operation Plan – This aspect of the plan should deal with the means by which the new technology will operate, in general, but also with emphasis on more important considerations.

(8) Projections – Such inclusion of future “financial plans”, will indicate projected goals and should emphasize the need for added worthwhile investments and improvements. These projections will be different for each participant, and will be based on the project's development time, on how long it will take to effectively reach recipients, on how long its product life cycle will be, and other relevant factors. Revenue resources for effective implementation will always involve some guesswork, so attention should be given that the sure your cost estimations are very close. It is better to have a slightly worse, but defensible financial outlook.

(9) Long Term Vision – The plan should include important long-term goals and expected achievements for life science start-up that are important to participating partners or investors. In order to build on the success of the earlier years, the plan should include careful long-term vision, and projections for expansion into new areas.

(10) Disclaimer - you need to include The plan must include a statement which must protect participants from potential liability. It will not be part of the full section but should included as an Appendix in smaller print at the end of the document's body. Basically, the disclaimer must state that some of the projections may be risky, not guaranteed, and that individuals or organizations they represent will not be liable if some of the information turns out to be somewhat incorrect (Hoyt, C. accessed from [http://biobm.com/2011/06/business-plans- for-life-scientist-inventors/.](http://biobm.com/2011/06/business-plans- for-life-scientist-inventors/))

3. METHOD

The design used to develop the business plan is named “Educational Design Research” (EDR) (Hogue, R.J., 2013). This EDR study is related to the motive of improving practice, which can be done mainly for the following goals:

1) Solving the problem: As stated in general terms, to reduce to some extent the gap between disciplines of STEM-related career.

2) Using acquired knowledge to create innovative work: This is achieved through the design, piloting and implementation of programs aimed at familiarizing instructors with the potentials of technology;

3) Improving the robustness and systematic nature of design practice: Establishing a set of design principles for implementing programs of instructor professional development to teach STEM-related topics through an inquiry-based approach by using specific technologies.

This EDR method adapted in this study aims to produce a technology Business Plan or resources’ management for the Faculty of Mathematics and Natural Sciences, Surabaya State University for the years 2021-2025. As previously stated, the different stages of the EDR include and address the needs for analysis, design, preparation, evaluation, and reporting. At the design stage, the researcher-compiled business plan design is based on theory and on examples of business plans that were accessed. At the stage of preparing a business plan, and in close cooperation and discussions with other units of Surabaya State University, a plan was prepared. Subsequently, several of the inputs for revising the business plan document were provided for evaluation to the designated consultant, in order to revise it and improve its functionality.

4. RESULTS AND DISCUSSION

The results of the business plan document development in this study are presented as follows:

1) Executive Summary - A reminder of daily seismic activity in areas of various countries in the region or globally, that have the potential for earthquakes and tsunamis, which can result in both physical and non-physical losses in Indonesia. However, most of the risk of earthquakes and tsunamis can be reduced with proper planning and preparation. In addition to strengthening buildings and encouraging residents to prepare for potential earthquakes and tsunamis, the Jokotingkir's technology is now available to provide warnings in four (4) minutes after an earthquake strikes, and in approximately thirty (30) minutes before the first tsunami waves hit a coast. This technology consists of a seismometer detecting the earthquake waves, satellites receiving and transmitting the seismic data, a server receiving and processing the earthquake information, which by using the available Jokotingkir software, can analyze and evaluate the seismographic data, which subsequently disseminates the earthquake and tsunami parameters – as shown by the illustration below (Fig. 1).



Figure 1. Performance scheme of the Jokotingkir technology

This Jokotingkir technology can also be used for people with special needs because it is equipped with a voice transmission capability which explains the earthquake and tsunami parameters, so that appropriate measures of disaster mitigation can be activated immediately. Furthermore, the Jokotingkir system can disseminate warnings, as well as instructions for evacuation or other methods of public safety protection.

2. Vision-Mission Statement Vision: The main role and mission of the Jokotingkir technology is to create faster and more accurate earthquake and tsunami warnings and provide the best service to the potentially threatened public.

3. Management: The management of Jokotingkir's organization is carried out transparently with the PDCA (Plan, Do, Check, and Action) stages with the following organizational structure: Manager, Treasurer, Marketing, Production quality control division staff, and Information and communication system division staff. The management team is very compact and good in running the Jokotingkir Organization, as they have good training and understanding of its functions and goals.

4. Market Analysis and Strength: (a) Includes the Jokotingkir's technology which - as stated - provides a fast and more accurate information for earthquake early warnings and tsunami prediction and is equipped with voice notification about information on earthquake and tsunami parameters, making it more suitable for people with special needs. (b) Permits quick response to all interested parties, thus avoiding time-consuming bureaucratic delays. (c) Results in low overhead costs, thus offering recipients best possible price. (d) Provides close attention to all recipients's requests and needs. (e) Allows flexible handling of each each case and request. (f). Enjoys a good reputation by satisfied recipients.

Weaknesses include: (a) Lower ability of staff response for certain areas, (b) Limited capital availability, (c) Occasional cash flow shortages, (d) Less strategic location of managing office.

Opportunities consist of: (a) Improving efficiency in the working sector, (b) Good governmental support of our program and goals, (c) Absence of intense competition in the sector we are engaged in, (d) Low initial capitalization for the start of our operations.

Threats consist of: (a) Keeping up and quick adopting with the rapid development of technology in this field, (b) Changing competitors' strategies which threaten our position in this area. (c) Lack of banking interest in financing funding for the industry we are currently working on.

Target Market: The majority of Jokotingkir's technology target market is state or private institutions that have duties and responsibilities for earthquake and tsunami disaster mitigation.

Table 1. The results for assessment of tsunami potential by using M_w and $Td750ex$ discriminants.

| Discriminant | Available (minutes after OT) | Threshold Value | True Warning (TW) | | | False warning (FW) | | |
|--------------|------------------------------|-----------------|-------------------|-----------|-----|--------------------|-----------|-----|
| | | | $TEV \geq 3$ | $TEV < 3$ | %** | $TEV \geq 3$ | $TEV < 3$ | %** |
| M_w | 15 | 7.0 | 36 | 0 | 71% | 13 | 2 | 29% |
| $Td750ex$ | 4 | 10.0 s | 39 | 2 | 76% | 12 | 0 | 24% |

*51 events classified; 39 occurrences have $TEV \geq 3$; ** percentage of True Warning or False Warning (Madlazim et al., 2021)

5. Scientific Background: The speed, accuracy and performance of the Jokotingkir technology have been tested through real-time earthquake data since 2012 until now. The Jokotingkir technology website can be accessed on the following website: (predict-tsunami.unesa.ac.id) and can also be accessed via android with the keyword (jokotingkir tsunami prediction). The results of the Jokotingkir technology trials have been published in several articles published in reputable international scientific journals (Table 1) (Madlazim et al., 2015; 2021). In addition, the Jokotingkir technology has been registered with IPR and patents.

6. Marketing Plan: In order to attract potential customers for the Jokotingkir Company and make it better known, there will be promotions from the social media. The special social media accounts will carry out promotions complete with websites containing promo-information and viral content. Because most likely users of the Jokotingkir technology are state institutions or seismological institutions, we intent to send brochures to all related institutions.

7. Operational Plan: The operating hours are from 08.00 am to 16.00 pm every day. A 24 - hour 7- day service is also set up specifically for online marketing staff.

8. Budgeting Projections Plan: The development of a financial plan - including identification of funding sources for one-time costs and ongoing costs – includes the development of a set of characteristic criteria and funding source for the Jokotingkir Earthquake Early Warning and Tsunami Prediction which involve: (a) A stable and sustainable source of income must be identified to finance ongoing operation and maintenance costs. (b) Costs for systems that are likely to increase in the future as a result of inflation, technological changes, and replacement of aging existing equipment. (c) Establishing an assessment of costs and benefits of the system. While access to the signal should not be restricted to only those who can pay, the costs for the system should still be borne by those who benefit.

9. Long Term Vision: This consists of: (a) Plans for expansion into new markets to build on the company's early years of success; (b) Adding new features of Jokotingkir technology to adapt technological developments to the needs of society.

The last business plan component of Jokotingkir's technology includes a Disclaimer, which states that the use of technology may have risks because earthquakes are one of the most common causes of tsunamis. Until now, there is no science and technology that can predict an earthquake at a certain time. This uncertainty applies to the Jokotingkir technology in predicting tsunami events.

The preparation of the ten components of a business plan from Jokotingkir's technology is based on the concept of a business plan for technological products produced by scientists (Garcia, R., F., et al., 2019; Kiznyte J., et al., 2016), and also on suggestions from a business consultant. All of the makers of these business plans are scientists, but who do not have specific experience in business. However, by preparing business plans accompanied with inputs from experienced consultants, the level of achievement of entrepreneurial competence increases. Therefore, developing a business plan supports the development of entrepreneurial skills, perhaps because business planners have a special entrepreneurial-oriented attitude (Garcia, R., F., et al., 2019). With the production of a business plan document and increasing entrepreneurial competence, it is hoped that Jokotingkir's technology company can also improve the expected income generation.

6. CONCLUSIONS

A business plan document specifically for earthquake and tsunami early warning technology has been developed in close collaboration and coordination with a professional technology business consultant. This document consists of ten components of a business plan, namely Executive Summary, Vision-Mission Statement, Management, Market Analysis, Scientific Background, Marketing Plan, Operational Plan, Budgeting Projections Plan, Long Term Vision, and a Disclaimer (Disclaimer).

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