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GENERAL DESIGN OF DECISION SUPPORT SYSTEM TO SUPPORT BUSINESS AGILITY: A CASE STUDY AT MINING SERVICES COMPANY

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ABSTRACT

This study aims to identify and explain the design of business models as well as the general design of Decision Support System that supports business agility at Mining Services Company. Presented study is a qualitative research with a prospective case study method, while the key informants are Commissioner, Director and Vice President of the company. The results showed that the company has a standard method in applying business strategies agility, still rely on the competence of each management. The design of business model is used by using the Business Model Canvas analysis and SWOT analysis. As at the design stage Decision Support System in general, some components of the information system designed include model, output, input, database, technology and control. It is able to make the process faster and more accurate analysis until it provides the preferred priority of solution schemes from company to customer.

KEY WORDS

Decision Support System (DSS), business agility, business model, SWOT, mining services, company.

Information systems play a vital role in efficient operations, effective management, and the success of organizational strategy, including the company as a business organization. The balance of information technology and human resources in a company efficiently and effectively can achieve the strategic goals of the company. Which in this era of globalization, the use of information technology can create strategic advantage (O'Brien, 1996). Information technology can increase the speed of the company's work, and it generally can change the speed of the process of the work so as to increase flexibility and improve company performance.

In this study, the company that became the object is a private company engaged in mining services in particular area of Equipment Management (EM). The definition of Equipment Management is the scope of service company covering the management of equipment throughout its life cycle. Starting from the calculation and selection to meet the needs of equipment, operation, repair and maintenance, spare parts and logistics, to the disposal or resale. Armed with the available resources, the company started its sales activities by offering products such as spare parts and repair & maintenance services for equipment where the company has a network with the manufacturer or its dealer. Its first year of operation, recorded revenue from the sale of spare parts and repair and maintenance services although not too large.

During its business trip, the company often finds potentially of business opportunity. This means that management understands the key to success of these opportunities. But the company is constrained in certain aspects to handle it on its own. Some of the constraints include: not having the required capacity, lack of specific experience in the work requested, incomplete licensing, the terms of the support or cooperation with certain parties and others. The opportunities that come not only from the field of Equipment Management. This condition encourages management to find ways to still be able to capture the business opportunities by optimizing all their resources owned and keeping it safe for the company. It is undeniable that company needs these business opportunities to continue generating increased revenue, company must continue to grow. To face this situation, company

implements strategic business agility strategy, which generally begins with understanding and identifying what is needed for the success of the business, to the key things and details. Then choosing which is able to take responsibility and which role can be or should be fulfilled by other parties. Furthermore, take into counting the agreement to win with all relevant stakeholders needed, complement and harmonize all aspects required to achieve the success of the business.

Looking at the importance of the role of information systems, namely decision support system (DSS), which can be a solution for the management company in carrying out its strategy. Making process, gathering information, analyzing, performing calculations, and ultimately making the decision becomes more effective (safe and accurate) and more efficient (faster). With this the research is done about the design of business models and the design of Decision Support System (DSS), which support our business model.

LITERATURE REVIEW

Business Model. Business organizations are aimed at providing goods and services to consumers distinguished from their ability to pay of goods and services in accordance with the laws of the market (Kusdi, 2009). Each company has a business model, either stated explicitly or implicitly. Business model describes the design or architecture of how companies create and provide value to the customer, then the customer pays on values, these then the company changed the payment into profits (Chesbrough, 2006; Teece, 2010). In addition, the business model that becomes abstract representation of the organization that includes conceptual, textual, also financial products and services offered to consumers is targeted and strategic goals of the organization (Al-Debeiet al., 2008). The business model becomes the answer to the various questions about how a company works. The business model is well-known answer questions put forward Peter Drucker: who is customer? the what is the value for the customer?. In addition the business model also answers the basic question carried out by the managers: how to make money from a business? (Magretta, 2002).

There are many explanations about the business model, according to George and Bock (2012), which is a core aspect of a business that informally and formally has goals, business process, customer targets, strategies, infrastructure and operational policies including culture. Zott and Amit (2011) find that business models are more widely raised in non-academic articles than by academic journals. From a study of the theme of the business model, they concluded that the literature on business models is still relatively young and scattered. The concept base is still thin, but they suggest at least three concepts about business model, namely: (1) business model archetype (e-business model), (2) business model as activity system, (3) business model as cost / revenue architecture.

The business model applied to the company according to the place of the research is the business model according to Osterwalder et al., (2010) which describes the thought of how an organization creates (creates value), provides (delivers value), and capture (captures value), in the context of the economic, social, cultural or otherwise. Business model construction process is part of the business strategy. The tool to describe the business model of a company, which was named Business Model Canvas (BMC). A template for documenting the existing business model or for developing new business models. There are nine elements of BMC namely customer segments, customer relationships, channels, value proposition, key activities, key resources, key partners, revenue streams and cost structure.

SWOT Analysis. SWOT analysis is a planning method to describe and evaluate an organization, business or project opportunities based on four factors. Four factors are the strength, weakness, opportunity and threats. Strengths and weaknesses are internal factors, while opportunities and threats are external factors. By considering the internal and external factors are expected to process the evaluation and analysis can be more comprehensive.

However, a limited SWOT analysis only provides an overview of the situation, not solving problems or generating solutions. Therefore this analysis is intended to provide a

basic insight of the strategy required based on the four factors of SWOT. In addition, the effectiveness of this analysis is also greatly influenced by the quantity and quality of information on which to base the identification and measurement of these four factors. When the information possesses a weak and inaccurate, the SWOT factors identified are also weak. Which certainly resulted in the strategies taken is not quite effective to solve the problems faced by or achieve the objectives to be achieved.

A combination of factors SWOT provide four configuration options that can be an alternative to determine the most appropriate strategy (Rangkuti, 2015):

a. Configuration SO (Strength-Opportunity), is a configuration option that utilizes the potential of the power company to win and reach the greatest opportunities.

b. Configuration ST (Strength-Threat), is a configuration option that utilizes the power of the company to cope with threats coming.

c. Configuration WO (Weakness-Opportunity), is a configuration option to exploit the opportunities provided by minimizing the weaknesses that exist in the company.

d. Configuration WT (Weakness-Threat), is a configuration option that minimizes the weaknesses of the company and seeks to avoid the potential of emerging threats.

This research does not use SWOT analysis in isolation, but used it in conjunction with BMC analysis. So that in the process of identifying each element of the business model, in addition to using BMC framework and approach, also conducted a SWOT analysis based on the data obtained. Before finally assigning information that represents each element. Until its ninth fully identified to be appropriate TMR business model and capable of supporting the applied business agility strategy. From a business model that has been identified is then carried its DSS general design process.

Business Agility

Seeing from its ability to adapt, business agility is able to respond effectively and efficiently to the needs of both proactive and reactive and able to face the uncertainty of the environment (Dove, 2006). In studies conducted on mining services company, adjustments and changes are made either internally or in relations with external parties to realize a business model that is required in order to succeed in a business opportunity that is taken. The company choses to execute a business agility strategy to capture business opportunities are found that can increase revenue and maintain its business growth.

For a large company, an information system is needed. The demands of business activities as well as the demands of current regulations require the development of information systems in order to maintain some daily activities as well as the basis for the development activities in the future. In one case, the information system owned by an organization are a lot of related to the past, in the sense of handling the records about what has already occurred in the organization. But it is also related to the present in the sense of the word presenting information about the current status of the organization. Also related to the future within the meaning of the presentation of information that can be used in determining the strategy and the actions to be taken in the future. Information is very important for management in decision-making. Specific and structured information as needed will help the users, and can be obtained from the information system.

The information system that has a primary function to provide information in order to help management take a decision is called Decision Support System (DSS). DSS can be fully computer-based, human-based or a combination of both. DSS generally serve middle or top-level management, on the planning or analysis process. DSS usually generates a sequence or a choice between several alternatives. Decision-making is the act of election management in the best alternative to achieve the target. After a decision is taken then the activities are carried out. Decisions that are routine and repeatitive are called programmed or structured decision. What is programmed is not a decision made by the computer through a computer program, but a collection of procedures performed repeatedly. However, at higher levels of management, in general, the decision is more not programmed or unstructured.

The decision by the management can be grouped into three types (Jogiyanto, 2001): non-programmed decision or unstructured decision; semi programmed decision or semi-structured decision; programmed decision or structured decision.

Unstructured decisions are not repetitive and do not always happen. This type of decision is made by top management. Information needed for unstructured decision making is often not easy to obtain because it is not easily available and is usually sourced from the outside environment. Management experience becomes very important for unstructured decision making. To support decision making activities requires useful information, where the type of information required for each level of management is different. The lower level management of the information type is detailed because it is used primarily for operation control. As for higher level management the type of information is increasingly filtered or more efficient.

Information System (IS) Development. System development can mean constructing a new system to replace the old system as a whole or improve existing systems. System development background can be due to the emergence of problems, to seize a particular opportunity, or to fulfill certain instructions/directions from leaders or outside organizations such as government regulations. With the development of the system is expected to increase in terms of performance, information, control, efficiency or service.

The system development process through several stages of the system is planned to start with the system implemented, operated and maintained (maintenance). When the operating system has been developed to encounter the problems that cannot be solved the maintenance is necessary to develop a system to overcome back and the process is returned to the first stage, the system planning stage. This cycle is called the system development life cycle (SDLC: System Development Life Cycle).

According to Turban et al., (2010), system development life cycle (SDLC) is a structured framework and is used in large IT projects that consist of sequential process to develop information systems. The main stages are system analysis, design or system design and system implementation.

METHODS OF RESEARCH

The type of research used is qualitative research with case study method. The case study is an exploration of a system or case / various cases over time through in-depth data collection and involving a rich variety of resources in a context (Creswell, 1998). Based on the cases studied, according to Endraswara (2012), the case study method is divided into two groups. The first is a case study that examines the deviation of fairness and case studies that examine towards the development of (prospective). In this study using a prospective case study because it is based on problems that occurred in the company, the necessary handling to make a business decision for the sustainability of the company.

The study was conducted on mining services company in South Jakarta, Indonesia. The study also chose to focus on the appropriate issues that have been formulated: how to design a business model, and how common draft Decision Support System (DSS) to support the company's business model. Referring to Systems Development Life Cycle (SDLC: System Development Life Cycle) then the scope of the research is limited to the stages of System Analysis and General Design of System.

A case study research data was obtained with several techniques, namely: depth interviews, observation of participation, and documentation. The key instruments in the interview are Commissioner, Director and Vice President of the company. Observations of participation is done by direct observations to the location.

RESULTS AND DISCUSSION

Business Model Concept and SWOT Analysis. A business model is a fundamental tool for a company to run their business. In this study, both Business Model Canvas (BMC) approach and SWOT (strength – weakness – opportunity – threat) analysis were conducted to identify each element of a business model. That two steps are needed not only to mapping the pattern of business but also to define how the business agility strategy will be applied. Thus, a holistic map of business model will be a great guideline for a company. The

data collections from the respondents (commissary, director, and vice president) or from the key persons identified some elements of BMC in the mining service company are:

The company understands that to gain more business opportunity than the national company or private national/multinational company was not simple. With the limited experience as a startup company and only rely on technical qualification and appropriate administration, they need to discover a unique idea to win from their competitors. Through element value proportion, the company could provide a valuable benefit for their customers, therefore they might excel the market leaders. The SWOT analysis illustrate in table 1.

Table 1 – SWOT Analysis Matrix on Value Propositions Element

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
VALUE PROPOSITIONS	Financial condition flexibility might associate between customers and manufacturer	-	Inflexible financial conditions that commonly found in the national company might be unsuitable for the manufacturer.	-
	Variation innovation concept of business model and proactive take apart as composer.	Limited Experience	Conservative business system generally employed in national company. The national company must adhere the regulations that set up by the government, such as procurement regulations and collaboration with other national company.	-
	A great networking with several parties such as expertise, manufacturers, investors, and government	-	-	-

Source: research result, 2017.

The mining service company illustrates various excellent strategies for their improvement:

- Eminent product with advanced technology that is not retained by the competitors.
- The new product shall be compatible with the product that owned by the customers. Provide a relatively low economic trial rather than the competitors, prior to the procurement process. Therefore the customers get the proof of the sample product before the procurement process.
- Provide a rejuvenation service for all customers tools with free of charge, customers only have to pay if they decide to modify their tools with the latest one. Supervise a complete consignment process with the inventory management, including procurement process, stock check, and delivery process to the drilling site.

This element helps to identify and classify the segment of targeted customers. Whereas the targeted customers are the priority of the whole segments. According to SWOT analysis, it shows that there is a combination of customers segment configuration, which are SO (Strength-Opportunity) utilize the company potential to achieve bigger market opportunity and WT (Weakness-Threat), minimizes the weakness of the company to avoid future threats. Further SWOT analysis illustrate in table 2.

Table 2 – SWOT Analysis Matrix on Customer Segment

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
CUSTOMER SEGMENT	Have a broad networking system with national company and government.	Limitation of the capital	Stable financial conditions	Not every national company and their groups have the same financial stability

Source: research result, 2017.

The third element is the channel, in this point the strength of the company is not only the ability to gain relation like explained before in customer relationship but also the ability to link with any level of organization in the market is emphasized. Hence the weakness of the company that has limited experiences, and the potential threats shall be well managed. The company prioritizes direct appointment for the procurement process. Moreover, to introduce the product and the excellence of the service, the company decide to make intense market penetrations to the key person through informal communication. According to SWOT analysis, it is identified than channel has the tendency to follow an alternative configuration, ST (Strength Threat) utilize their potential strength to overcome the future threats.

Table 3 – SWOT Analysis Matrix on Channel Element

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
CHANNEL	Wide spread link towards any level and function	Limited working experiences		Several working period and experience are required.
	The ability of management to gain a good networking system.			

Source: research result, 2017.

From the work that has been done, the company required to establish a relationship with the customer formally and informally. Informal communication created in general through opportunities outside the official communication associated with the work between the company and the customer organization. Such as communication through forum alumni ties, golf community and so forth. Relations between the two are complementary and a special concern of management. It aims to enable the company to capture what the customer needs as thoroughly and accurately as possible. On the other hand, formal relationships often provide only limited information. While informal relationships can be obtained complete information, beyond the technical and administrative limits usually obtained from formal relationships. SWOT analysis, in this element, the company has the strength of management that has good networking ability. This is evidenced by almost all major customers in the company has a good relationship with upper management levels, middle to bottom. Indeed, the weakness is a relationship with upper and middle management customers still need to handle by management. With the amount of management consisting of Commissioners, Directors and Vice Presidents, then under certain conditions sometimes the interest to maintain the relationship is not well organized. In addition, the pattern of a formal and informal relationship like this also has a high cost of relationship potential threat. Therefore a great coordination between parties is crucial.

Table 4 – SWOT Analysis matrix on Customer Relationship

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
CUSTOMER RELATIONSHIP	The ability of management to gain a good networking system. i.e: with Legislative members, Ministries, Local Government and others	The ability to make networking system rely on the management		Potential cost of maintaining relationship relatively high.

Source: research result, 2017.

In this element, the company gets the revenue that is the sale of the trade and services. Market revenue is gain from the selling of goods such as machine units, components or spare parts. While income from the service attained from the charge of services, for instance, equipment improvement, equipment maintenance, management contract, fabrication project, inventory management contract and others. Further analysis of revenue elements, as follows:

- The company could provides extra value in technical service, management, and the new way of business. Moreover, the company could give a great pricing rather than their competitors that meet the customers budget.

- Improvement in billing scheme, that suitable with customers' need.

- In terms of value based on revenue streams, service work, especially fabrication projects, contribute more that dominates the company's sales pattern. Despite, the fabrication projects are low in term of profit for the company. Whereas a non-fabrication service such as repair and maintenance services, maintenance contracts provides a larger percentage of profit. As for the sale, the degree of profit varies depending on cooperation or support from each manufacturer/dealer.

- In term of price quotation, the company commit to continuously updating their pricing due to meet the customers' need by regularly survey the market, competitors and also customers.

There are two important aspect in SWOT analysis of key activities, which are trading and service.

Table 5 – SWOT Analysis Matrix on Trading in KeyActivities

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
KEY ACTIVITIES	Comprehensions and experiences in sales and marketing		Manufacturer commonly work with national company and their group	
	Experience and ability to deal with manufacturer			Manufacturer doesn't provide suitable pricing scheme
	Have import licence	Inadequate experience and ability of import system.		Unexpected expenses from clearance process
	Comprehensions and experiences in managing inventory and logistic	Insufficiency facility in inventory and logistic management		

Source: research result, 2017.

From the SWOT analysis (Table 5) it shows that key activities can be classified in two configurations, which are SO (*Strength Opportunity*) utilize the potential strength to get bigger opportunity and ST (*Strength Threat*) turn the strength into a weapon to overcome the threats.

Table 6 – SWOT Analysis Matrix on Service in KeyActivities

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
KEY ACTIVITIES	Ability and experience in project planning	Staff that have limited project experience	Collaboration with expertise in thecnical but lacking in project planning ana management	-
	Have a good link and competency to design a suitable business model	-		-
	-	-	Bussines opportunity on high segmented customers	Posibility to pairs with incompeten parties
	-	-	Have a service partner with high technical competence but less on sales competence	-

Source: research result, 2017.

From the SWOT analysis (Table 6) it shows that key activities has tendency to one configuration, SO (*Strength Opportunity*) utilize the potential strength to get bigger opportunity.

In trading, the key resources is the key person shall have knowledge, experience, and networking sytem in term of: *Dealership Management* or *distributorship*, *Equipment Management*, Inventory Management and logistic, Process and sales management.

Beside, from legal aspect company should have importing licence and working permit required to carry out trading activity.

Table 7 – SWOT Anslsis Matrix on Key Resources of Trading

Element	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
KEY RESOURCES	Human resources that have capability on dealership management, equipment maintance, inventory and logistic management, sales		International manufacturer show interest in Indonesian dealer.	
	Have import licenses	Limited team member.		

Source: research result, 2017.

From the SWOT analysis (Table 7) it shows that key activities can be classified in two configurations, which are SO (*Strength Opportunity*) utilize the potential strength to get bigger opportunity.

While for the service job, key resources define as the key person who has several abilities, experience, and networking in project planning and management. Furthermore, other key resources that are identified is a human resource with ability in fabrication service and telecommunication.

Table 8 – SWOT Analysis Matrix on Key Resources of Service

Elemen	SWOT Analysis			
	Strength	Weakness	Opportunity	Threat
KEY RESOURCES	Human resources with project management ability	Insufficiency facility.	Unprofessional vendor in term of company management and project management	
	Human resources that have a good link with service provider(equipment management, project, telecommuniacion, industry)	-		Team development as overhead burden as well as business development
	-	-	Hindrance in marketing for service company	Ensure a great competency and commitment between partner

Source: research result, 2017.

In the key partner's elements of the trading, the strengths are: extensive corporate network, human resources (HR) with the capability of dealership-management, knowledge, and experience of sales and marketing, and import licensing. While the hindrance is the limited team member. Many manufacturers/dealers who need partners so that might become an opportunity for the company. The threats are privilege gained from low to middle-income manufacturers (terms of payment, technical support).

While, for the service, in order to have the same strengths and opportunities as trade jobs, there are several threats encountered in the form of service companies are still run in a conservative way and communication & coordination is not well organized.

Inline the analysis of BMC elements that has been done previously. In this element also identified important issues related to cost based on the type of job, which are trading or service. On trading, the issues which should be the attention of the company are the costs that follow the cost of the purchase price of the goods themselves, including the cost of

shipping, handling fees, insurance, inventory costs, taxes. Especially regarding the cost of inventory, TMR is always trying to apply zero inventory, which TMR will buy or bring in new goods when the customer has issued a purchase order. No warehouse required, no storage fees and no 'idle' corporate funds.

This is effective to reduce costs, yet considered not to reduce the value received by the customer. For service job, especially projects with the high budget (more than 1 billion) and long duration (more than 1 month), the company has the maturity of planning and implementation of excellent project management becomes the key to the success of the service work. The Company has the strength to earn trust by several banks as a debtor to obtain loan facilities in the form of working capital, business capital and others.

General Design of Decision Support System. Model of the proposed DSS in the form of logical model. This model is made to explain to the user how the functions in the DSS will logically work. The logic model is designed using data flow diagrams (abbreviated DAD). And since the proposed DSS design is a new system (no previous system existed), so the appropriate DAD form is DAD logic (DADL). DADL emphasizes the logic of system requirements, ie what processes are logically required by the system. No emphasis on how the system is applied. DSS designed for TMR is a human-based DSS. This means that inputs entered into the system rest on the information from its users. For data processing methods that will be used in this DSS is distributed data processing method and method of processing data directly (online processing method). Distributed data processing methods allow each function to enter its own data, process and generate its own report, with limits in accordance with their respective authorities. While the direct processing method allows all inputs to enter directly used to update the master file, resulting in the latest information. Data processing methods are scattered and direct data processing is chosen with consideration because it is expected that this DSS can help the process of analysis and decision making. Here is a data flow diagram (DAD) Level 0 or overview diagram:

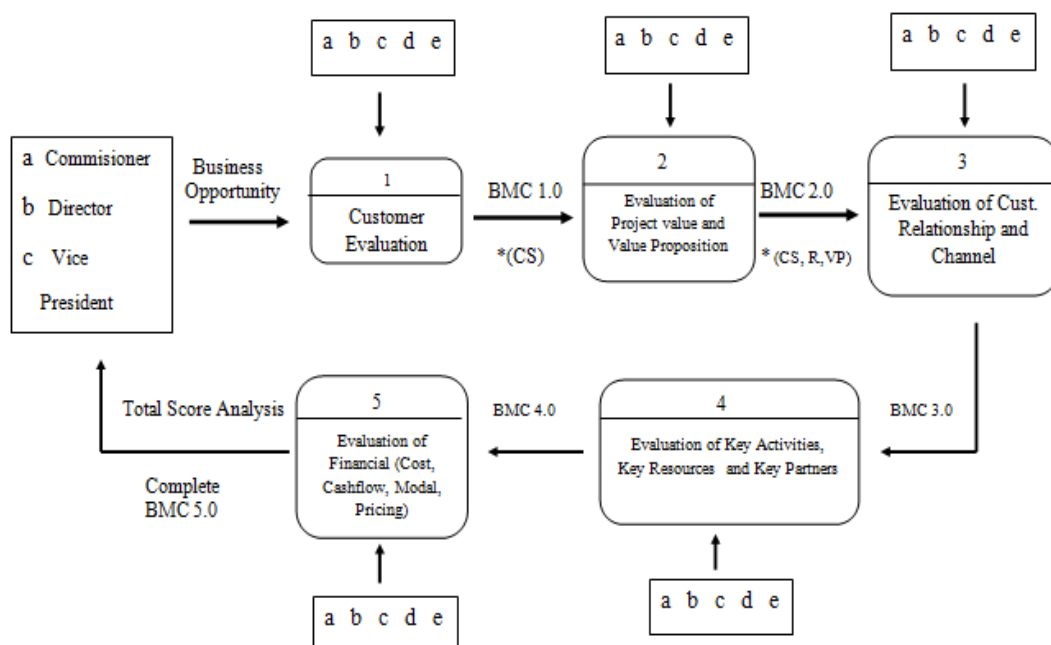


Figure 1 – Data flow diagram (DAD) Level 0 or overview diagram: a. Commisioner, b. Director, c. Vice President, d. Operational Manager, e. Support Manager, BMC (Business Model Canvas), CS (Customer Segment), R (Revenue), VP (Value Proposition).

From the side decision, based on the classification of decisions that have been described, the type of decision taken based on information output produced by this DSS is the type of unstructured and unprogrammed decisions. Every business opportunity analyzed

requires different information and it is possible to identify different business models. Therefore decisions are taken including unstructured and unprogrammed decisions.

DAD described above, either DAD top level (context diagram), DAD level 0 (overview diagram) or DAD hierarchy will be a reference for design the next system components, i.e output, input, database, technology and control.

CONCLUSION

As a result of general DSS design to support business agility in this research, it is known that company still use standard method in applying business agility strategy. Still rely on the competence of each management and have not utilized the existing organization and resources. Companies need Decision Support System (DSS) to support the implementation of business agility strategy. Precisely on the process of conformity analysis between the company's business model and business model of opportunity. DSS business agility will make the analysis process faster and more accurate. Until it generates the preferred priority of the solution scheme from the company to the customer. DSS business agility also provides other benefits of providing a track record of the analysis and decision-making process of all business opportunities that have been encountered with all the information that accompanies it. This is very beneficial for the progress of the company's business in the future. Through business model analysis using Business Model Canvas (BMC) and SWOT can be identified business model in accordance with business agility strategy. The suitability of the elements between the business model that has been identified, and the business opportunity model encountered, determines the potential to win it.

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