

## Business plan simulation as an experiential learning to enhance business plan understanding among engineering student



Mohd Guzairy\*, Norhidayah Mohamad, Ahmad Rozelan Yunus

Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia Melaka, Melaka, Malaysia

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### ABSTRACT

The engineering student of Universiti Teknikal Malaysia Melaka required writing business plan as one of the outcome of Technology Entrepreneurship course. This paper objective is to identify the factors that enable business plan simulation to help the student understanding on writing business plan especially in business process. We collected data by pre-and posttest questionnaire during the business plan simulation that run for 108 engineering students whose take the Technology Entrepreneurship course. The result showed that the experiential learning is the most significant factor followed by the perception by the student and the infrastructure provided. The other two factor (educator role and the content of the simulation) record no significant, but they needed as an input to run the business simulation.

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### 1. Introduction

The entrepreneurship courses are now one of the compulsory courses that compulsory to every program in the university. This is because to support the Malaysian government campaign as to produce entrepreneurial graduate, on the other hand to make the entrepreneurship field as one of the favorite career option. The entrepreneurship and writing business plan are now become synonym among university student, where the course itself teach them how to build and manage a business. The traditional method in class has the limitation to cater on test the student's skill in managing business, solving problem and decision making. Although if in class the lecturer are allowing two communication to gain student feedback of topic interest, however they still unable to experience how the business process working. The traditional method use in the most of the entrepreneurship training and education, unfortunately unable to meet the increasing of current challenges in the complex business world (Keshodarah, 2013).

The need of writing business plan is to prepare the entrepreneur as a guideline for them to know the business process and how to allocate the sources. Business plan can be categories as a part of most important factor that can determine the business

process growth and sustainability (Chwolka and Raith, 2012; Brinckmann et al., 2010; Honig, 2004). Honig and Karlsson (2013) stated that the business plan is the first criteria to be present by the entrepreneur to get financial assistant from funders. In Malaysia, to obtain the amount of business funds, most of the funders will ask for the business plan to look on future of the business and can they make the pay back.

### 2. Entrepreneurship course for engineering student

According to Duval et al. (2016), the entrepreneurship course that target engineering student known as technology entrepreneurship. The content is the same as regular entrepreneurship course, but it focusing on technological business and product. Technology entrepreneurship prepares the engineering student, which after graduate select to start-up their own technological based business. Educator in this part play crucial role to embed the interest and perception the importance of entrepreneurial mindset among the engineering student (Teerijoki and Murdock, 2014). The effort to foster the entrepreneurship knowledge and skill will not success if we still use traditional teaching method to deliver the course. The effectiveness of an entrepreneurship education courses relies mostly on educator's skills and knowledge of different pedagogy especially entrepreneurship teaching method (Arasti et al., 2012). The need of new pedagogy that use experiential learning will allow the student to deeply understanding all the process

\* Corresponding Author.

Email Address: [ryzugai@gmail.com](mailto:ryzugai@gmail.com) (M. Guzairy)

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by manage it themselves either run real business or just take role-play and run the simulation. It is support by [Ismail and Ahmad \(2013\)](#) that in inculcating the entrepreneurial spirit for enterprises education require several innovations in the content, exposure to real work life, assessment method towards more practical and teaching mode. The same approach apply by business student will bring same result by expose the experiential learning to the engineering student.

### 2.1. Business plan as experiential learning

Business plan can offer a roadmap for the future and advantage potential investors to invest the growing business. Business plan is one of the major courses provide in entrepreneurship education ([Arasti et al., 2012](#)). [Chwolka and Raith \(2012\)](#) defined business plan as planning process outcome. Writing business plan enable to prepare organizations and to predict well for future challenges ([Brinckmann et al., 2010](#)).

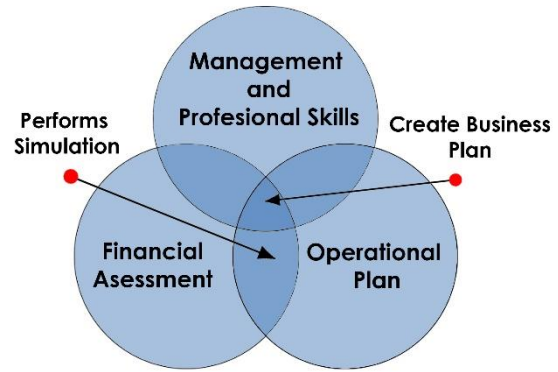
Preparing business plan require the student to understand the process of the business itself. As state by [Honig \(2004\)](#), the business environment is most important part of the effective implementation of any business plan. [Cook et al. \(2004\)](#) agreed that a proper written business plan should be simple to explain and pitching session will give the student higher score.

Business plan itself is an experiential learning, as [Malik et al. \(1997\)](#) stated that business plan is an experiential technique created to give students with a chance to build their integration, analytical and decision making skills. While [Vincett and Farlow \(2008\)](#) found that general experiential entrepreneurship education uses the term new venture creation for project-based courses, purposely to simulate the entrepreneurial process. Teaching methods should be created that focus on implementing hands-on activities where can create outcome in experiential learning ([Honig, 2004](#)). [Fig. 1](#) shows two example of experiential learning in Entrepreneurship Education that is perform Simulation and create Business Plan.

### 2.2. Business plan simulation

As recommend by [Malik et al. \(1997\)](#), business plan simulation need to be apply since student project consist of large component of process application as business plan as integrative tool. We select to integrate business plan with simulation as both method is an experiential learning that capable to expose real business world. According to [Wheadon and Couetil, \(2014\)](#), business plan act as a process simulation to create business that include 1) product or service validity, 2) the analysis of financial need, potential return and source of funding, 3) validation of distribution and marketing plan and 4) substantiation of team with necessary talent to implement the plan. Writing exercise of a

business plan is a common pedagogy for entrepreneurship course ([Fregetto, 2005](#)).



**Fig. 1:** Business plan and simulation as experiential learning in entrepreneurship education ([Wheadon and Couetil, 2014](#))

However, when the size of class increase the value of the exercise will diminishes. The number of student and lack of time to examine the business plan lead us to implement business plan simulation that can overcome the problem. As an experiential learning business plan simulation that design with problem-based course enable student to exit current reality as student to a new reality of starting business for real ([Pittaway, 2004](#)). [Fregetto \(2005\)](#) list the advantage of business simulation as follow:

- 1) All decisions are interconnected in real business decision.
- 2) The student undergoes the maturity and growth of an industry.
- 3) The student acquaints the market research value.
- 4) The student is emotionally engaged at the beginning of the simulation, and then more passionate about their business.

### 3. Methodology

We developed business plan simulation to measure the factor of input that contributes most on the process of learning. The simulation design using the spreadsheet as applied by previous research ([Evans, 2000](#); [Sezen and Kitapci, 2007](#); [Freimer et al., 2004](#); [Völkner and Werners, 2002](#); [Guerrero, 2010](#); [Jordan, 2010](#)). It is also build using Visual Basic Application ([Saltzman and Roeder, 2013](#); [Guerrero, 2010](#); [Williams and Klass, 2007](#)) to make the simulation interactive. The model of the simulation consist of simulation input, process and output that adapt from logic model that previously use by [Sorensen \(2011\)](#) and [Kriz and Auchter \(2016\)](#). While [Garris et al. \(2002\)](#) have improvise the model to suit the need of game cycle as shown in [Fig. 2.](#), because the element in the simulation will use game model process.

The process of the simulation will apply the Kolb experiential learning theory. The learning theory also apply by [Chen et al. \(2011\)](#), [Canto \(2014\)](#), and [Bamidis et al. \(2014\)](#). This process is based on four

elements that allowing student to access their skill in experiencing the learning as shown on Fig. 3.

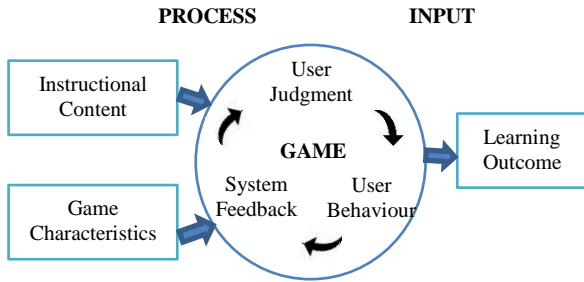


Fig. 2: Input-process-outcome game model (Garris et al., 2002)

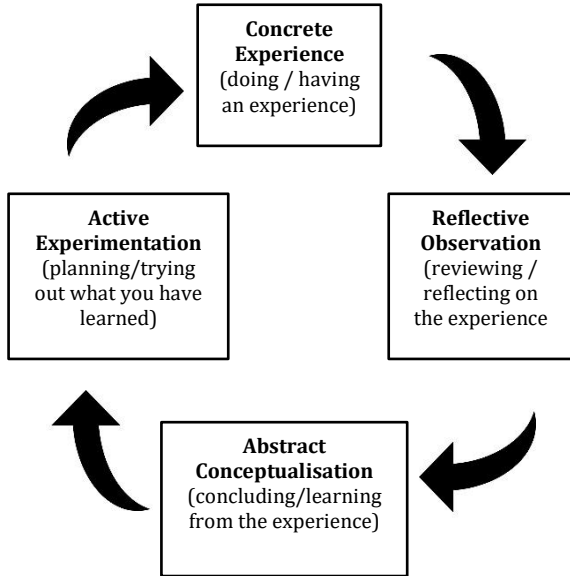


Fig. 3: The experiential learning theory model (Kolb, 2014)

According to Sorensen (2011), gaining experience can happen through concrete experience (change of behavior) and/or abstract conceptualization (the change thought resulting from cognition); and transforming experience can happen through reflective observation (process of questioning and discovery) and/or active experimentation (the process of transforming and acquiring new experiences). Other theory use to determine the process is by constructivist learning theory that related to the cognitive outcome (Bruhn and Mozgira, 2007). The outcome of cognitive and affective use bloom taxonomy (Bloom et al., 1956).

### 3.1. Business plan simulation logic model

The combination of Experiential Learning Theory, Constructivist Learning Theory, QAIT (Quality Level of Instruction, Appropriate Level of Instruction, Incentive, Time) Model (that use by Sorensen (2011) in his hotel simulation) and Bloom's Taxonomy of Learning make the business plan simulation Logic Model as shown on Fig. 4. This simulation has been run by the engineering student in classroom by group and individual. The simulation consists of four business function which is managing Human

Resource, Administrative, Operation, Marketing and Financial. The flowchart of the simulation was shown on Fig. 5.

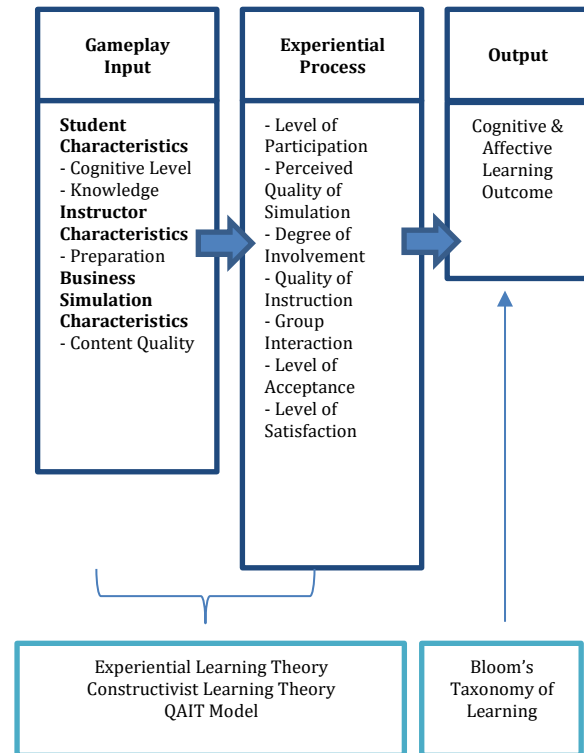


Fig. 4: Business plan simulation logic model

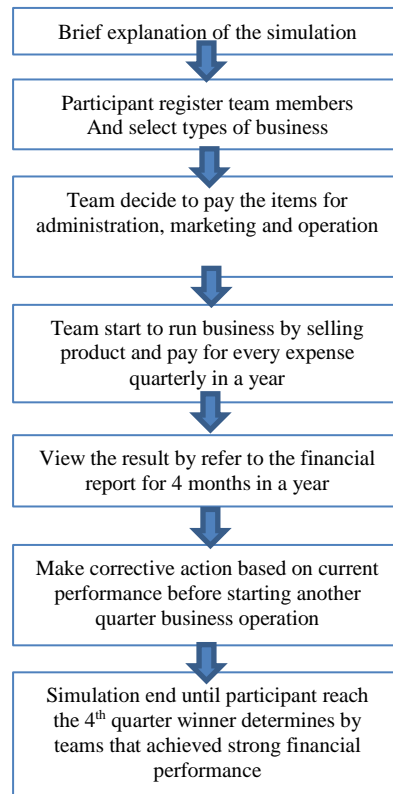


Fig. 5: Business simulation plan flowchart

### 3.2. Research design and data collection

Quantitative designs (Vos and Brennan, 2010; Abdullah et al., 2013) were used to find, which of the element of business simulation that facilitate of

business plan preparation and the relationship among them. Students of engineering courses (108 students) were selected to run business simulation play testing. Students were instructed to play business simulation using computer-based simulation. Before they run the business simulation, they need to answer questionnaire of pre-session after playing the business simulation they need to answer a post-session of questionnaire. The objective of the questionnaire was to evaluate the perceptions of the students (Russ and Drury, 2013; Tao et al., 2012) towards business simulation games to facilitate business plan learning, and its impact between traditional method and after using simulation.

Students were needed to answer a set of pre-test and post-test questionnaire. The measurements were adapted from the previous works (Bodea et al., 2015; Wellington et al., 2011; Shane et al., 2003). The questionnaire is divided into 3 sections. Section 1 comprises background and sosio-demographic of student's education and experiences, section 2 is to assess the traditional method of learning business plan. Section 3 is to test the factor of simulation that facilitates business plan learning. Measurements in section 2 and 3 were based on 5 point Likert scale from highly ineffective/strongly disagree to highly effective/strongly agree.

#### 4. Results and discussion

The frequencies analysis shows that most of the engineering student was male 73.1%, instead of female only 26.9% and most of them were 20-25 years old. From the analysis, there are 76% of the student gain CGPA 3.0 and above. 106 participants agree that the business plan is a crucial part in entrepreneurship education. 98.1% of the participant state that lecture is the traditional way to learn business plan. Before the simulation sessions begin, 44.4% of them decide that the traditional method is effective of learning business plan. However, 72.2% of them interested of using business simulation method in learning business plan. As they are engineering students, they are familiar with simulation process in learning for other cost there are 89.8% of them have use the simulation before.

##### 4.1. Student's characteristic

Student characteristics is one of the factor that can facilitate business plan learning through playing simulation (Baruah and Ward, 2014; Wellington et al., 2012). It shows that how can the characteristic of the student give impact to the learning and how they can shift or upgrade their skill and knowledge from experiencing the business simulation. It is including writing skills, decision making, problem solving etc. Gain new knowledge and learn to make decision from various sources show high score of percentage that the participant agreed. Table 1 lists the feedback from questionnaire that show student characteristic

gain from simulation towards effective business plan.

**Table 1:** Characteristic of student (skills and knowledge)

	Agree %
Help to increase ability to write business plan	75.93
Increase ability to seek for information	87.04
Learn of make decision from various sources	88.89
Gain more knowledge of business plan	88.89
Increase ability to make business decision	86.11
Increase ability to recognize business problem	84.26
Increase skills and knowledge of real business	82.41
Increase potential of planning business competencies	79.63
Increase problem solving skills	85.19
Gain new business knowledge	83.33
Integrating various functional business knowledge	86.11

##### 4.2. Educator's roles

Educator like teacher, instructor and lecturer are involving in delivering the knowledge (Moizer et al., 2006; Anderson and Lawton, 2008). The simulation itself might be not complete enough if the educator not involve. The human capital of delivering knowledge still relevant enough this day even though we are surrounding by the technologies. In this result show that student need the assistant from the educator even though they choose to have own group and read the simulation manual. Student need to give their freedom on running the simulation without the lecturer assistance show high score of percentage level of agree from the student. Table 2 lists the feedback from questionnaire that show educator roles that take part of simulation towards effective business plan.

**Table 2:** Educator's roles

	Agree %
It's hard to run the simulation without clear explanation from the lecturer	81.48
Information given from the lecturer not enough to run the simulation	75.93
The simulation's manual need to be distribute before beginning the simulation	47.22
The student need more times to read the manuals	76.85
The group must be selected by the lecturer	67.59
Student need to have a right to choose their own teams members	41.67
Lecturer need to be always monitoring and give response every single time	77.78
Student need to give their freedom on running the simulation without the lecturer assistance	84.26
Lecturer must be explaining the simulation with related examples	54.63

##### 4.3. Simulation game characteristics

Previous analysis shows the side factor that affecting the simulation process. However, the simulation itself is the most important thing that will prove either the simulation working or not to facilitate the business plan learning (Vom and Rosemann, 2014). The element that contain in the simulation need to be in the right place time and for the right person. As show on the analysis below, student agree that the simulation meet the



requirement of business plan preparation and give them the real business experiences. However, most of them not really understand the term and condition of the simulation, they also agree that the time given is not enough and hard to work in group due to that issue. Table 3 lists the feedback from questionnaire that shows simulation game characteristic towards facilitating effective business plan.

**Table 3: Simulation game's characteristics**

	Agree %
It's hard to understand the simulation term and condition	82.41
The information on the manual not help enough	50.00
I don't familiar with the default business in this simulation	39.81
The turnover time of this simulation take too much longer	62.04
The default business in this simulation is meet the business plan requirement	35.19
The simulation gives us the real business experiences	64.81
The time given to run this simulation is not enough	73.15
This business simulation is design for individual not for the group	56.48
It's hard to work within the group due to lack of time and sources	41.67
Student need to have one-week preparation before run the simulation	43.52
The rating and marks of the simulation distribute properly	56.48

#### 4.4. Infrastructures

The infrastructure provide in the classroom are also one of the element that will affect the process of the simulation. The infrastructures referring on the facilities that provides to ensure the process of the business simulation to run smooth. Almost all the student agrees that computer aid simulation make their work in group easy and able to search for extra information before make any decision. Table 4 lists the feedback from questionnaire that shows the importance of classroom infrastructure towards preparing effective business plan:

**Table 4: Infrastructures**

	Agree %
In class group table layout assist the process of the simulation	55.56
Internet access in classroom assist the process of gathering information	75.93
Computer slide presentation help to deliver simulation information	73.15
Ease of extension socket that enable the use of laptop	70.37
Computerize simulation helped students	76.85

#### 4.5. Experiential learning

Experiential Learning is the core that determines the value of the simulation. Most of the simulations in various industrial types are design to simulate the experiential learning that assist the participant to really understand the process of something using simulative environment before entering the real situation. The result of the analysis shows that the

business simulation allows the transfer of knowledge from theory to practical, challenge and test knowledge and skills. Table 5 lists the feedback from questionnaire that shows the experiential learning of student towards preparing effective business plan.

**Table 5: The experiential learning**

	Agree %
The business simulation facilitates in preparing business plan	69.44
This business simulation is user-friendly	78.70
This business simulation allows the transfer of knowledge from theory to practical	80.56
This simulation challenge and test knowledge and skills	80.56
This simulation is interesting and impressive	70.37
This simulation is relevant and useful for student	74.07
This simulation is meaningful to the learning process	79.63
This simulation run with organize order	75.93
This business simulation gives the real business experiences	78.70
Simulation is important to the business process	70.37
The simulation provides enjoyable experience	76.85
This simulation clear and easy to understand	75.00
This simulation is difficult and bored	37.96
This simulation brings real business problem in classroom	51.85
The simulation helps to understand difficult business concept	71.30

#### 4.6. Impact of the simulation

The impact of the simulation shows how the simulation facilitates of business plan learning. It is also known as the complete structure of the simulation that contain the elements:

- 1) to test student characteristic,
- 2) to determine the role of the educator,
- 3) of the mechanic for game characteristic,
- 4) that need facilities that provide ease of usage and
- 5) of experiential learning that can be found during and after playing simulation.

The high score of percentage from the analysis show that the simulation facilitates the student to make business decision, and they able to integrate all off-business function.

Table 6 lists the feedback from questionnaire that shows the impact of business simulation in preparing effective business plan.

#### 4.7. The importance of business simulation

This analysis also tries to find the most important aspect in business simulation. From below data shows that the first important thing is educational value, followed by encourage of cooperation, realistic content of business world, joy and excitement and then the less importance is individual interaction. Table 7 lists the feedback from questionnaire that shows the importance of business simulation in preparing effective business plan.

**Table 6:** The impact of business simulation

	Agree %
The simulation facilitates the student about understanding business process	74.07
The simulation enable student to integrate all of business function	70.37
The simulation facilitates the student how to make business forecasting	76.85
The simulation facilitates the student to make properly business decision	75.00
The simulation facilitates the student to distribute resource according to the priorities	81.48
The simulation facilitates the student in preparing financial reporting	80.56
The simulation facilitates the student on how to implement marketing strategies	79.63
The simulation facilitates the student to explore operational aspect in business	73.15
The simulation facilitates the student on how to evaluate the elements of cost saving.	84.26

**Table 7:** The importance of business simulation

	Important %
Individual Interaction	71.30
Realistic content of business world	75.00
Encourage of cooperation	76.85
Joy and excitement	72.22
Educational Value	79.63

#### 4.8. The simulation's factor that facilitate business plan learning

The student also gives responses to factor that facilitate the business plan learning. The four factor of developing business plan are (1) student acceptance (student characteristic on cognitive and affective domain), (2) the simulation's content (simulation game mechanic and characteristic) (3) lecturer role (delivering and facilitating) (4) infrastructure and technical aid. From the simulation factor the lecturer roles show 84.26% influence to facilitate business plan learning. Table 8 lists the feedback from questionnaire that shows the impact of business simulation in preparing effective business plan.

**Table 8:** The Influence of Simulation factor to facilitate business plan learning

	Influence %
Student Acceptance	27.78
The content of Simulation	27.78
Educator's Role	84.26
Infrastructure and technical aid	82.41

#### 4.9. Statistical result of regression analysis

The statistical measure using regression analysis show that the R Square from the model summary is 0.767 is close to 1. This indicate that the value of the variance to the score of Business Simulation (DV) that is associated with the independence variable (infrastructure, educator's roles, student characteristic, the content of the game and experiential learning) is 76.7% as showed in Table 9. The value in Table 10 ANOVA show that this model with R square 76.7% is significant, when  $p < 0.05$ .

As refer to the Table 11, the beta value indicates that small contribution of 0.049 (4.9%) from educator. Meanwhile, the highest contribution of

0.506 (50.6%) si from the score of experiential learning as significantly influence the score of business simulation after the others contribution in the control model.

**Table 9:** Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.876 <sup>a</sup>	0.767	0.756	2.52737

a. Predictors: (Constant), infrastructure, educator, student, game, experiential

**Table 10:** ANOVA<sup>a</sup>

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	2148.427	5	406.888	67.2690	0.000 <sup>b</sup>
Residual	651.536	102	6.388		
Total	2799.963	107			

a. Dependent variable: Business simulation

**Table 11:** Coefficients<sup>a</sup>

Model	Unstandardized Coefficients		Standardized Coefficients		t	Sig.
	B	Std. Error	Beta			
1 (Constant)	-3.517	2.327			-1.511	0.134
Game	-0.059	0.055	-0.082		-1.069	0.288
Student	0.306	0.071	0.300		4.309	0.000
Educator	0.053	0.084	0.049		0.624	0.534
Infrastructure	0.348	0.102	0.215		3.407	0.001
Experiential	0.400	0.060	0.506		6.672	0.000

a. Dependent variable: Business simulation

This regression equation carry the meaning of the business simulation predict base on following equation.

$$\text{Business simulation score} = -0.082(\text{game}) + 0.300(\text{student}) + 0.049(\text{educator}) + 0.215(\text{infrastructure}) + 0.506(\text{experiential}) + 6.780$$

Experiential learning score (Beta = 0.506,  $p, 0.05$ ) are the best predictor that significant, as compared to another score with the overall of R square 0.767.

#### 4.10. Findings and discussion

This study finds the factor that enables business plan simulation to assist engineering student to understand how to write business plan is the experiential learning followed by student characteristic. Cadotte (2014) discovered that the simulation allow student to test their current knowledge and make decision based on the resource that been distribute in the simulation. It shows that the experiential learning by running simulation to facilitate the learning of business plan is helpful to the student while they apply and their knowledge from theory knowledge to be implement in the simulate real business world. Student take decisions across business functional areas when they compete each other to run the firm and defined the decision cycles (Kulkarni and Sivaraman, 2013). They by themselves for the same time will increase their motivation to take care of the business by carefully made decision and motivate them to be the best with proper management. Because every simulation is the same that need input from student to process information and face other participants with certain outcome of decision (Keshodarah, 2013). This

knowledge and skills that gain from playing the simulation make them ready to write the business plan properly with considering the element of integrate business function and understanding the basic business process.

Even the element of experiential learning and student characteristic are the most facilitating factor, this study also agrees that the educator's role somehow contribute to the successful of business plan simulation. While for the infrastructure that provide by the trainer is known as the element of assisting the progress of the simulation that depend on the present facilities and physical ease. Respond on the element that less contribute to the simulation, it is need some improvement to the content that in other word is try to match the current situation and be more user friendly and put extra mechanic of the simulation. Business plan simulation prove to be effective factor that help student to prepare well before writing the business plan because after playing they have gain to improvise and increase their knowledge, skill and confident level to understanding the way how business will be set up.

## 5. Conclusion

The experiential learning factor contribute most of the simulation learning process by the engineering student is because they had been exposed to many types of simulation in their field. For them, the extent of simulation that covers business and entrepreneurship area is an effort for them to increase their knowledge and skills. 91.9% of them agree to use business simulation in the future. Technology entrepreneurship course will help them in the future if they decide to start a business especially in preparing business plan. Preparing effective business plan are the key to gain financial assistant for graduate to start a business as their career. To make it effective, student need to know better the process of business, to understand the process they need to run the business. Running business in simulated environment minimizing risk and can restart over to analyze the problem. However, we suggest that in future research to create a business simulation that enable student to run business with real product and real market approach.

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