November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

Generating Business Modelling and Simulation from Evaluation Report

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Abstract:
Business modelling and simulation involve a lot of analysis on market trends, economic conditions, and other factors such as technology trends, cultural trends, competitors and so on. The sources of business modelling and simulation are derived from various sources such asbusiness plans. Can we produce the business modelling and simulation from survey reports? This paper presents a systematic manner to produce business modelling and simulation from the survey reports. A walkthrough example of how agent models are used to understand the business setting and feedback from the domain experts reveals the potential usage of AOMfor business modelling and simulation.

Keywords: *agent modelling, simulation, methodology*

1. INTRODUCTION

The term "business model" often misinterpreted and misunderstood with other terms such as revenue model and business strategy by practitioners Magretta, J. (2002), Osterwalder, A.,(2005), Ovans, A., (2015). Starts to popular from 1990s, business model is defined as a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm Osterwalder, A.,(2015).The aim of the business modelling and simulation is to address the operational aspects of the company in generating revenues and making profits. It has the benefits onbusiness owner as it can address operational issues related with what, when, where and how the task is performedSiriram, R., (2017).

To date, most of the business modelling and simulation starts with building the business model and conduct various what if scenario through simulation. How to build the business model based on the survey report? What are the requirements in business modelling and simulation? are still worth to explore.

From our experience, lots of survey reports have been produced from the consultation projects. Those reports are publicly available, useful and very informative. However, there is always missing details information like instrument due to the confidentiality of the study. Can we reconstruct the business models from the reports so that it is useful for research study? This paper presents a systematic manner to produce business modelling and simulation from the survey reports. A walkthrough example of how agent models are used to understand the business setting and feedback from the domain experts reveals the potential usage of AOMfor business modelling and simulation.

Section 2 presents the case study which

November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

further describe the motivation of this research. Section 3 presents the proposed methodology to transform the survey reports into agent modelling and then simulation. The details of the simulation is presented in Section 4 and Section 5. The paper is concluded in Section 6.

2. CASE STUDY

Bintulu International Kite Festival 2015 report is studied and published. The Bintulu International Kite Festival (BIKF) held annually at the old Bintulu airport which faces the sea. It often organized on the month of September. In brief, participants for the study consists of industry players coming from various background primarily hawkers and peddlers, followed by food and beverages operator, merchant, trader, entertainer, taxi operator, hotelier as well as government agencies. From the study, the respondents provide feedback on the satisfaction on the rental fees set by the organizer. Various rentals have been charged to the industry player during BIKF. They are the charge to rent the furniture like tables and fan and renting the places. Overall, the BIKF received good feedback by the industry players. However, rental is one of the feedbacks given by the industry players.

From this finding, we would like to study the impact of rental fees changes on the business satisfaction at BIKF. We argue that a higher rental fee may deter potential business to sell at the event, while a lower rental may see over applicants. In general, setting the right fees could bring interest to the right number of business and the organizer could choose between varieties of the business to be approved. In other words, we would like to know what happens to business satisfaction if the organizer increased the rental fees and at the same time determine the optimal rental charges for this particular situation.

3. AGENT MODELS

AOM is a combination of two agent methodologies, ROADMAP and RAP/AOR. It was introduced bySterling, L. & Taveter, K., (2009). AOM is useful to model Socio-Technical System or complex system. Socio-Technical system here refers to social and technical part of a system interacting with each other. The AOM methodology establishes a more cohesive approach to develop a socio-technical system from analysis, design and implementation. The AOM has been adopted in various domain like sustainability study, security, collaborative learning, mathematical modelling and simulationCheeWyai L. et al. (2015), WaiShiang C. et al. (2013), WaiShiang C. et al. (2016).

AOM modeling process consists of a few steps such as modeling goal, modeling agent roles and modeling agent behavior. Reader can refer toSterling, L. & Taveter, K., (2009) to know more details of various agent models under agent oriented modelling.

Based on the survey reports, they are various parties that are involved in BIKF. We classified the industry players into the role of ‘business operator’. On the other hand, the BIKF received crowd from buyers, visitor and the host is the organizer for BIKF.Our process to generate the business modelling and simulation is as following.

1) HOMER is used to contextualize the survey report into agent context. HOMER (which stands for Human Oriented Method for Eliciting Requirements) is an elicitation technique that is explicitly agent oriented. HOMER uses organization as its guiding metaphor for eliciting requirements where a problem area is perceived in terms of "who" will be "tasked" to solve (or partially solve) their problem Wilmann and Sterling, (2005).

November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

2) Transforming the elicited answers from HOMER into agent models.
3) Transforming the agent models into netlogo models.

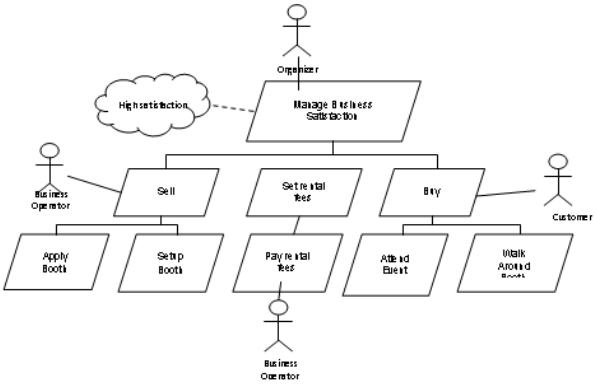

Figure 1Goal model for managing business satisfaction during BIKF event

Two scenario are developed in this research. The first scenario involve the study of the relationship between the rental increment vs business satisfaction. The second scenario explore on how profit can be affected by crowd attendance during the event. Large number of people attending the event means good business for them especially in term of potential customer and business exposure. In order to gain significant number of attendants, the organizer needs to put efforts in marketing the event. Though, it is also important to manage cost of the marketing to avoid overspending while reaching as many people as possible.Due to the space limit, we only present goal model, behaviour model for the scenario one. Figure 1 presents the goal model for BIKF. Figure 2 presents the behaviour model for BIKF. Agent purposes can be defined in the goal model. The model can show agent motives in the environment so that the agent knows something should be done to achieve the goals. The goals also help agent to equip themselves with certain properties or interaction in direction of achieving the goals. For example, a footballer agent goal is to put the ball in the net to get point for their team. The footballer knows he must have equipped himself with necessary skills and communicate well with his team to realize a strategy to score goal.

The overall goal model for BIKF event is shown in Figure 1. The goal model shows main goal of the system is to manage business satisfaction BIKF event. This goal is corresponds to high satisfaction goal as quality goal needed to achieve with the main goal. In order to achieve the main goal, three sub-goals are defined. First sub-goal is *set rental fees*to be achieved by organizer role. This goal is about setting the right rental fees in order to attain high satisfaction from business owner. Business operator role will realize 2nd level sub-goal *pay rent* in order to operate their businesses at BIKF. Second sub-goal, *sell* will realize by business operators. This sub-goal is supported by two 2nd level sub-goals which are *apply booth* and *setup booth*. Third, *buy* sub-goal will be realized by buyer and supported by two 2nd level sub-goals, *attend event* and *walk around booth.*All the sub goals noted here are contributing to the success to attain the main goal.

November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

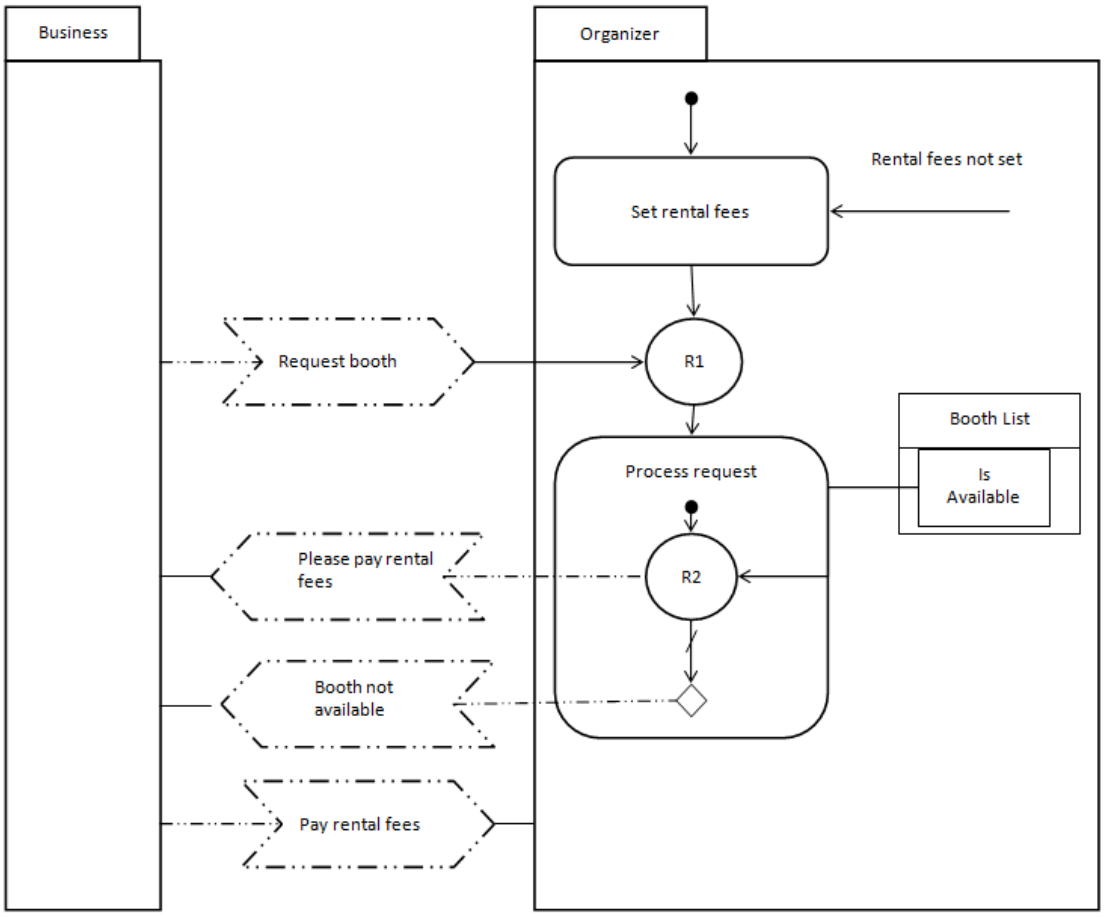

Figure 2 Behaviour Model for business operator and organizer

Figure 2 shows the behavior model for the case study. The behavior model models the behavior of individual agent to concentrate on what certain agent can do in the environment given to them. Behaviors are related to scenario models and interaction models, hence inhibits same terms but different in modeling. Reactive ability and proactive ability of a certain agent can be modeled here. Reactive ability refers to behavior of an agent that responds to changes in the environment or responds to certain messages given to them. Proactive ability otherwise is the ability of an agent to act by its own will. Essential component of behavior model is the description of the flow of activities. These activities can be modeled to flow by the sequence of rule which triggered by message from external agents, start events or realization of a condition.

4. SIMULATION SETUP

The case study of scenario 1 is simulated in NetLogo in order to visualize the event and to collect data as shown in Figure 3. The NetLogo model will consists of two main actors which are buyer and seller. Buyer will be generated randomly across the venue while sellers will be generated inside the selling area. Buyer is denoted by cyan color and selling area is denoted by green color. While sellers are denoted initially by orange color with neutral face and will be replaced by blue color with smiley face once satisfaction threshold is achieved.

November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

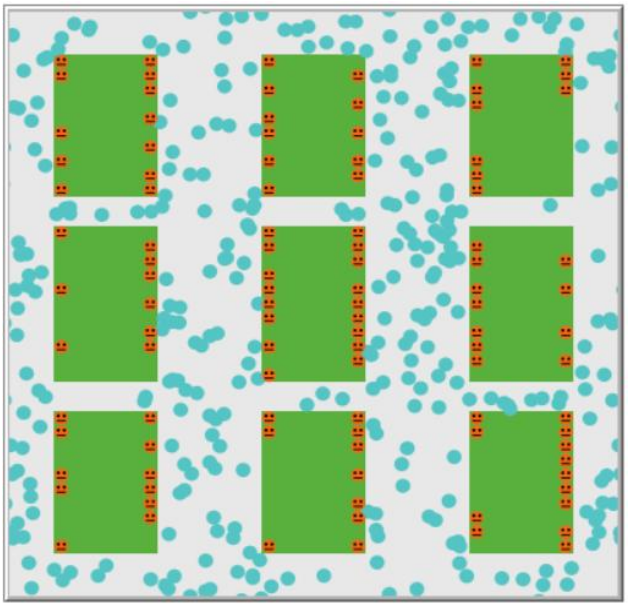

Figure 3. Netlogo Canvas for Case Study 1

The following shows the percentage of the rental satisfaction among the business:

Excluding the 10 participants whom are not applicable to the survey, we can adjust the percentage between satisfied and not satisfied answer only. The adjusted percentage would be 49.59 % satisfied and 50.41% not satisfied.The adjusted percentage is essential to measure the relationship between rental changes to business satisfaction whereby we will be using this as our base satisfaction level versus current rental changes. However, in the BIKF study we obtained from FEB Unimas, there is no mentioned of current rental charges to the business in BIKF. For this, we will use average rental rate of RM 400 daily per business and RM 2000 for five days event. This rate is based on rental fees charge by similar event in the area such as Bike Week Festival which charges RM1000 for 3 days.

By default the satisfaction threshold is set to the expected total sales must be two times greater than the rental fees. This setting is based on comparison between the adjusted satisfaction percentages with the expected total sales based on the survey results. The default threshold will act as a base for this case study with the purpose of recreating the event at BIKF. Nevertheless, the threshold can be adjusted for analysis purposes.

The modeled configuration file defines a dimension region as 40 x 40 cells. The simulation will end if the business satisfaction reaches or over 49.59% (as per adjusted business satisfaction describe above). There are four main sliders used to set up number of attendance, number of businesses, rental fees and average amount of money people bring to the event.Although the simulation allows changes to booth master layout design, it is not relevant for this case study.It is also important for the simulation to follow real world time value in order to get a more accurate insight of this case study. Based on the BIKF event, the duration of the event is five days and business activities will be run for approximately 8 hours a day.

5. RESULTS AND ANALYSIS

Table 1 shows the average simulation results for case study 1. From the table, simulation is run for five times for each fee. The average customer attendance is calculated from averaging attendance from 5 iteration of the simulation. The process is repeated to calculate the average business satisfaction.Naturally, when fees get higher, satisfaction will decrease. In the table 1, we can see the simulation proves the statement. The average satisfaction is decreasing as the fees increases thus answer the validation question for case study 1. Moreover, we can see the gap between the satisfaction decrement is high initially but became lower. The satisfaction gap between for RM400 fees and RM450 fees is 20% then gradually became lower to 7.18, 6.02, 4.66 and finally 3.11.

November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

Fees (RM)	No. of Run	Avg CustomerAttendance	Avg Business Satisfaction %
400	5	1337	50.87
450	5	1336	30.87
500	5	1335	23.69
550	5	1337	17.67
600	5	1337	13.01
650	5	1337	9.90

Table 1 Simulation Result for Case Study 1

The satisfaction gap is conformed to the economic utility function theory. Utility function theory assesses preference over a set of goods or service. In this case study the preference to the rental fees is assesses in the form of satisfaction. The theory can be applied in the case study because if we keep increasing the fees, the satisfaction gap between each increment of the fees became less and at certain point, it will be almost the same.The example of the theory can be described in a scenario when buyer buys goods. If the buyer buys a good for the first time, the satisfaction would be high. Compare to when the buyer is buying the goods for a second time, the satisfaction will be increase but the increment would be less compare to the first time. This will happen for the third time, fourth time and eventually the satisfaction increment would be stagnant.

6. CONCLUSION AND LESSON LEARNT

We conducted an informal interview with the subject matter expert from FEB, Dr Shirley, the researcher of the BIKF event study. We started the interview by showing the models and the simulation that we have created from data presented in her research. From the interview conducted, we can see positive reviews from the domain expert. The domain expert validation shows that the modeling and simulation can be used in the business domain. The use of AOM to model prior to developing the simulation has helped to establish the logical concept and thus the simulation can achieve higher similarity to the case study in real world. This was also helping to speed up the process of developing the simulation. On the other hand, two discussions on the abilities of AOM to model economics study and uncertainty are discussed as following. 1) **Ability to Model Economics Study**

The subject matter expert confirms that AOM can model real world scenario such as our cases studies. The model and simulation can reproduce events such as buy and sell transaction, person walking in between the booth and people come and go to the event. This is useful for modeling events such as BIKF which involve human interactions, movements and making decisions. These events can even be modeled in detail depending on the case study. From economics perspective, the events stated above can be use in microeconomics study given enough information on the human behavior and scenario which has been proved by the case studies discussed earlier. 2) **Ability to model uncertainty**Another validation viewpoint is the ability of the model uncertainty. The AOM model and the simulation are able to model uncertainty based on the requirement of the case studies. In this simulation we include uncertainty for a buyer to buy from the sellers with 50 – 50 probability. With the uncertainty the simulations become dynamic and researchers can make complex analysis based on the uncertain behavior or event, which uncertainties are common in real world scenario. Provided validation from subject matter expert, we can conclude that the AOM model and the simulation able to model uncertain event based on the economic research needs.

November-December 2019
ISSN: 0193-4120 Page No. 2957 - 2963

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