A Destination Management Game Simulation for Novice Tourism and Hospitality Students

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ABSTRACT

A business game simulation designed for students at the introductory level of a Tourism and Hospitality degree is detailed. The game focuses on the balanced nature of the three primary dimensions of the sustainable tourism system: the economy, the environment and the social system. Emphasis is placed on validation of the simulation model and evaluation of the game's effectiveness as a learning aid.

Keywords: business games, simulation, tourism destinations, system dynamics

INTRODUCTION

Simulation games have long been used as learning aids in business education (see e.g. Gosen and Washburn, 2004). It is perhaps surprising though, that there is only a limited amount of off-the-shelf pedagogical software available. The more popular, e.g. Markstrat (Larreche, Gatignon, and Trioilet, 2010) and The Business Policy Game (Cotter and Fritzsche, 2010), tend to be designed predominately for experienced managers and final-year postgraduate business degree students, and certainly not for introductory-level units designed for 1st-year Tourism and Hospitality (T&H) students.

In this paper we outline the development and planned use of one such introductory business game simulation. The simulation is being developed for William Angliss Institute, Melbourne, and the intended, initial users are 1st-year T&H students taking a ‘Destination and Attractions’ unit. Students play the part of destination managers and success is determined largely by the extent to which to which they are able to balance economic, environmental and social perspectives: an equilibrium that underpins the sustainable and ‘green’ tourism strategies currently being pursued by an increasing number of regions (see e.g. Law et al., 2011). A feature of the project’s evaluation approach is that it employs the comprehensive, recently-developed ‘Simulation Learning Barometer’ (Benckendorff et al., 2015). From a technical, Information Systems (IS) perspective, a feature of the game is the multi-method modelling approach employed in simulation model development: specifically, methods used are system dynamics (SD) (Maani and Cavana, 2000) and agent-based modelling (Borschev and Filippov, 2004).
The paper is organized as follows: first, learning objectives are detailed in the following section and this is followed by a treatment of the conduct of the game and its technical underpinnings. Validation and evaluation are discussed next and the paper ends with concluding comments.

**LEARNING OBJECTIVES**

The simulation game was designed to be employed (initially) within a ‘Destination and Attractions’ subject, a 1st-year introductory unit within a Bachelor of Tourism and Hospitality Management degree course at William Angliss Institute, Melbourne. The overall objective of this subject is to provide students with an understanding of tourism as a system and how that system applies to destinations by providing students with fundamental theoretical underpinnings. The focus is on how the componentry of the tourism system interrelates at a global, national, regional and local level and the role of stakeholders - including governments, enterprises, associations, visitors and hosts. There is considerable emphasis on sustainable tourism and the adoption of ‘green’ strategies as a means of addressing a number of critical issues – many of which are driven directly by climate change concerns (Simpson et al., 2008; Scott et al., 2008).

The learning objectives of the game cut across all formally-specified unit learning outcomes (as currently defined) but the activity is especially relevant to objective No. 4: *Examine current economic, environmental and socio-cultural issues that impact national and international tourism destination and attraction markets*. In addition, the game aims to instil:

- basic familiarity with system SD, messy problems, impediments to clear and logical thinking etc. in planning and policy development;
- basic competence with causal-loop diagrams (CLDs) (Maani and Cavana, 2000) and use of the classic SD archetypes (Wolstenholme, 2003) (students are required to specify their own solutions to reasonably complex descriptions of closed problem domains);
- an introductory understanding of how computer-based simulations can be used to assist with destination planning and policy development;
- basic familiarity with the SD tools, *Vensim* and *Powersim*;
- the ability to specify SD CLD models in *Vensim*;
• the ability to specify and run simple stock-flow simulation models in *Powersim*;
• an appreciation of the importance of sound research and good data in simulation model development.
• an appreciation of how system thinking (and its tools) might be employed in business and daily life; and
• an understanding of how the sustainable tourism domain can be modelled using systems thinking methods and tools.

Precisely how these learning objectives are realized should become clearer in the next two sections, where the model specification and the conduct of the game are discussed.

**THE GAME**

Students are divided into syndicates and play the part of ‘destination management organizations’ (DMOs). They are required to manage green economy and tourism development investment decisions ¹, plus decide on how much land should be rezoned from protected/rural to industrial/business/residential. The total simulated game time is 20 years, with each simulation period equivalent to one year and divided into 4x5-year segments. They receive reports on performance at the end of each segment and then make decisions on investment and land rezoning for the next 5-year simulation period ². Performance is determined by net profit and other key indicators (e.g. environmental health and overall region attractiveness at game’s end).

A snapshot of the game’s user interface is presented in Figure 1. At each decision point, players enter their decisions for the coming segment by manipulating the three ‘sliders’ at the top of the screen. An overview of performance in just-completed periods is provided by the graphs but these are complemented by a much more detailed collection of Excel tables. Finally, at game’s end, a link to a tutorial is supplied (top right-hand corner of the user interface). The tutorial provides detailed information on the dynamics of the game along with a presentation of the underlying CLD models.

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¹ The assumption is that the DMO is a government authority and can heavily influence these.

² They also make these decisions at the beginning of the game.
**Figure 1:** Game user interface – end-of-game snapshot.
Figures 2 and 3 contain representations of the two, key underlying CLD models. The first (see Figure 2) is, basically, a variant of the limits to growth SD archetype, whereby more visitors lead to increased tourism development and this, in turn, results in more visitors. However, more visitors means that, at some future date, a tipping point will be reached with environment despoilment reaching a stage where visitors will be turned off. This is a balancing loop and means, as far as game players are concerned, that they need to ensure that adequate ‘green economy’ (GE) investments are made from early in the game – even though no apparent benefits from this will be obvious until much later.

**Figure 2:** Game CLD model 1 – ‘limits to growth’ SD archetype.

The second (see Figure 3) is a variant of the tragedy of the commons SD archetype, whereby land within a tourism destination is the ‘common’ resource and there is tension between tourism development activity (top loop) and land development for locals (bottom loop). As tourism profits increase, this prompts more tourism development in a reinforcing loop (R1). Similarly land development for locals leads to affordable housing and this leads to further housing development in another reinforcing loop (R2). However, both tourism and local land development lead to less land available for development and, unless there is sufficient land rezoning early on in the game tourism profits and land affordability will both suffer eventually. However, if too much protected and rural land is rezoned, this will have a (medium-to-long) term, negative impact on destination attractiveness and this, in turn, will have consequential, negative impacts on visitors and profits.
In many respects, the ‘tragedy of the commons’ is a classic example of reductionist thinking; by remaining unaware of the effect of the individual parts on the whole, people continue to behave and think as though there are no connections between their concerns and goals and the remainder of the system. This is particularly evident in the sustainable tourism system, where a focus on any one dimension to the exclusion of others may eventually destroy the entire system.

The game is played during tutorials in Weeks 9 and 10 of the unit, allowing students enough time to become familiar with the basics of the sustainable tourism system (essential background for game players). At the beginning of Week 9, students are provided with an introduction to systems thinking, SD, CLDs, messy problems and impediments to clear thinking and policy development.

The next stage involves an introduction to CLD modelling of GE tourism domain. They are guided through this process gently; first they are presented with simple models and then develop more and more complex models in syndicates. This also involves an introduction to CLD modelling in Vensim. Next comes the game and, as described earlier in this section, it is divided into 4x5 year segments. A balance sheet is returned at the end of each period of play and at game’s end. Syndicates are under considerable time pressure but they do have sufficient time to analyse their results and plan.

**Figure 3: Game CLD model 2 – ‘tragedy of the commons’ SD archetype.**
The game concludes with a debriefing and presentation of full underlying CLD model details. Assessment is discussed in the following section. Note that, at present, syndicates do not compete against each other, so consequences of their decisions are not impacted by the choices of other syndicates. We do, however, intend to extend the game to allow for this extra level of competition.

In the 2nd week, the class moves on to Powersim, an introduction to stock-flow models and the establishment of a simple simulation using part of the CLD model developed in the 1st week. Ideally, they should have completed the online Powersim tutorials prior to class. It is emphasized that model behaviour at simulation time depends very much on the quality of the base data: as such, they are asked to undertake some research and specify key model relationships such as IofVNonTP (Impact of Visitor Numbers on Tourism Prices).

MODEL VALIDATION AND EVALUATION

Model Validation

The fundamental motive underpinning the development of the simulation model employed in this game was to attempt to encourage T&H students to think more strategically and to take a wider and longer, systemic view of a tourism destination of interest. Consequently, in interacting with the game model at simulation time, they receive feedback on the realities of inherent system features and constraints: such as the delicate development-environmental balance, limits to growth, unintended consequences and side-effects, and the folly of concentrating on quick fixes at the expense of more fundamental solutions. This was illustrated in the previous section and if we are, indeed, able to reach a critical mass of our intended users, then our software tool may contribute towards tourism destinations evolving towards the type of ‘learning organization’ described by Senge (1990).

Thus, this educational aspect has probably been the primary inspiration for our work. Nevertheless, the fact that our simulator is capable of producing graphs of projected tourism revenue, types of land use and more is intended to act as the trigger that might prompt our targeted students to interact with the model in a deeper exploratory, rigorous and analytical way. Thus, it seems essential that our principal outputs should be ‘sensible’ – to the extent that we must be able to convince the
average user that our projections are reasonable. Consequently, the model and its implementation must be validated and this is being accomplished via a 2-stage approach: desk checking and field-testing.

SD models are notoriously difficult to validate (Richardson and Pugh, 1981). As noted by Forrester and Senge (1980: 209-210), there is no single test which might be employed to validate a SD model but, rather, confidence in the model accumulates gradually as it passes more tests and as new points of correspondence between the model and empirical reality are identified. Maani and Cavana (2000: 69-70), drawing on the work of Coyle (1983: 362), describe this process as consisting of:

- Verification tests – which focus on the equivalence between the structure and parameters of the real system and the model;
- Validation tests – which are concerned with demonstrating the correspondence between the behaviour of the real system and the model; and
- Legitimation tests – which determine whether the model is in accord with any generally-accepted system rules.

Essentially, the aim of validation is to “show that there is nothing in the model that is not in the real system and nothing significant in the real system that is not in the model” (Maani and Cavana, 2000: 69). An excellent example of how much of this can be accomplished through desk checking has been provided by Georgantzas (2003) where statistical measures, such as coefficient of determination and Theil’s Inequality Statistics (TIS) (Theil, 1966), were employed to compare the predictive results of a SD model focused on various key measures of the performance of Cyprus hotels against actual data (over a 40 year period). We have subjected our own model to similar tests, concentrating on measures such as occupancy, room nights occupied (RNO) and average revenue per room night occupied (AvRevPerRNO). An example of one of our desk checking outputs is presented in Figure 4. This shows actual versus predicted AvRevPerRNO for the region on which we based our game.

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3 Note that, while these are all accommodation enterprise-level variables, accommodation earnings are a major contributor to Annual Tourism Revenue for destinations (see Figure 1).
Figure 4: Model validation – actual versus game results for AvRevPerRNO.

The basis of Theil’s approach is that the mean square error (MSE) is divided into three components: i) bias ($U_m$); ii) unequal variation ($U_s$); and iii) unequal co-variation ($U_c$). The sum of all three components equals one and, briefly, a large $U_m$ indicates a potentially serious systemic error and, to a somewhat lesser extent, this applies to $U_s$ as well. If $U_c$ is large though, most of the error is unsystematic and, as noted by Sterman (2000: 877): “a model should not be faulted for failing to match the random component of the data”. The TIS results for our example are presented in Figure 5 and, while they indicate that the game model’s behaviour provides a reasonable approximation to reality (in this case anyway), there is significant room for improvement: specifically, the variance in our model is considerably greater than that of the actual data. In fact, this can be readily observed through a visual examination of the trend lines in Figure 4. The TIS results, however, are useful in that they quantify the extent of the various error types.

Figure 5: TIS breakdown of the Figure 4 AvRevPerRNO trend lines.
At the time this paper was being prepared, much of the preliminary desk checking phase had been completed and, while some fine-tuning was still required, the model was judged as being sufficiently mature that it was suitable for use in a real production environment: in this case, an actual pedagogical setting. Nevertheless, validation activity will continue in parallel with further model and game development.

**Model Evaluation**

At the risk of stating the obvious, evaluating the effectiveness of a simulation simply involves answering the question: *To what extent have students met learning objectives?* This, however, is not as simple as it might at first appear.

Some early research into simulation learning suggested a good correlation between game performance and actual learning but others have disputed this (see e.g. Batista and Cornachione, 2005). Intuitively though, we would argue that, if a simulation model reflects reality (i.e. it is valid – see above), performance and learning must be positively related to some extent. Game performance, however, is only one measure and, as argued by Gosen and Washburn (2004), a thorough simulation model evaluation should encompass the following three areas: correlates of performance, simulation validity and the nature of the instruments used to evaluate simulation effectiveness. In addition, evaluation should also take into account both subjective and objective measures (Cronan et al., 2012). Consequently, following a review of the more popular approaches, we decided to employ the *Simulation Learning Barometer*, a recently-developed, holistic simulation evaluation tool developed as part of the ‘Online Business Simulation’ project (Benckendorff et al., 2015).

The *Simulation Learning Barometer* was developed as a benchmarking and monitoring tool for measuring the impact of simulation games in business-related education. It consists of pre-simulation and post-simulation surveys and is based on the idea that impact can be measured by monitoring relevant variables before, during and after the simulation. These variables include attitudes, self efficacy and cognition (pre-simulation), individual engagement, team dynamics/interaction and behavioural learning (during simulation) and subjective outcomes, teamwork and objective outcomes (post-simulation). Thus, both subjective and objective measures are captured and a problem-based
scenario is employed as one significant objective measure of the extent to which students have developed a better understanding of key concepts and processes: first, in the pre-simulation survey and again in the post-simulation survey. This section of our survey is presented in Figure 6. At the time of preparing this paper, surveys have been designed but not yet distributed.

Bloom’s taxonomy (Bloom, 1994) was drawn on significantly in developing survey instruments.
CONCLUSION

A business game simulation aimed primarily at introducing T&H students to the sustainable tourism system was detailed. The simulation addresses an important gap, in that it is one of the few automated, pedagogical games directed at introductory-level business students. A further important learning objective was to instil in students an understanding of the power of systems thinking tools and techniques in problem solving and decision support. Simulation model validation conducted to date is promising, in that key simulation outputs match what might be expected in an actual tourism destination setting. Initial game evaluation (i.e. an assessment of its effectiveness as a learning aid) will be undertaken during the latter half of 2016.

REFERENCES


