Review Scientific Article

Systems Thinking on Complex Tourism Systems

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The complexity of tourism systems requires holistic and accurate decision-making. Systems thinking became a mode of thinking in the last century; it is a point of view that approaches tourism and its challenges as a whole. Through systems methodology, methods of modeling and simulation, we present a survey of tourism systems as a very important branch of welfare through feedback loops and a simulation model. Such a model usually consists of a causal loop diagram. Simulation becomes a multidisciplinary approach to solving problems of complex systems. This paper demonstrates that simulation results are evaluated with the group decision-making support system and with expert systems. Conclusions derived from a model understanding and model simulation give optimal results to the decision-makers. Thus, systems thinking principles lead towards thinking of cooperation and co-creation in tourism and life in general.

Key words: systems thinking, tourism, complex systems, MODSIM, modelling, simulation

Introduction

Let's face it, the universe is messy. It is nonlinear, turbulent, and chaotic. It is dynamic. It spends its time in transient behavior on its way to somewhere else, not in mathematically neat equilibria. It self-organizes and evolves. It creates diversity, not uniformity. That's what makes the world interesting, that's what makes it beautiful, and that's what makes it work." (Donella H. Meadows)

The rapidly growing service industry and turbulence in the global tourism market are requiring flexibility and fast reaction times from the entire service industry. It requires decisions that frequently reflecting opposing interests. There are principles, models and laws that apply to generalized systems or their subclasses, the nature of their component elements, and the relations or forces between them (Bertalanffy & Hoffkirchner, 2015). An excellent methodological approach to these "forces" or problems is urgently needed. We encounter the systems approach and the methods of systems dynamics and systems thinking, which became common management tools in the 1990s (Senge, 2006). Since system dynamics models are essentially simple, one must find a compromise between simplicity, limited usefulness, and complexity. According to Stroh (2015), conventional or linear thinking is the basis for how most of us were taught in school and still tend to divide the world into specific disciplines and problems into their components under the assumption that we can best address the whole by focusing on the parts. Conventional (linear) thinking is not suitable to address complex problems. The answer to solving the complex problems of complex systems lies in a shift in thinking: from conventional (linear) thinking to systems (integrative) thinking. Systems thinking is thinking in terms of relationships, patterns, and contexts, and presents

new concepts of life (Capra, 2014). It gives us a holistic perspective for viewing the world around us and seeing ourselves in the world (László, 2002)

Tourism as a Complex System

We do not know what was the first form of systematic knowledge our ancestors developed. Certainly the attempt to classify the plants and animals, to understand health and disease, must be one of the earliest. (Mihaly Csikszentmihalyi)

The world is a very complex system, and within it there is a subsystem of tourism, which itself is a complex system. A hierarchical organization is a feature of a complex system. (Simon, 1991) According to Ladyman et al. (2013), a complex system is a one that exhibits the following characteristics: feedback loops; some degree of spontaneous order; robustness of that order; and emergent organization. All systems have a purpose (Kim, 1999). They have common patterns, behaviours, and properties that can be understood and used to develop greater insight into the behaviour of complex phenomena and to move closer toward a unity of science (Laszlo, 2002). The characteristics of systems are connected to the purpose of each system: to seeking balance to serve specific purposes within larger systems, to combining the parts in a way for the system to carry out its purpose and to recognising the fact that every system has feedback (Anderson, Johnson, 1997). The last we represent graphically with feedback loops, which connect entities among themselves. Following Banathy's definitions, we recognize three types of systems: evolutionary (consciousness), soft and hard systems. Hard systems involve simulations and often use computers and the techniques of operation research. They are useful for problems that can be justifiably quantified. However, they cannot easily take into account unquantifiable variables (opinions, culture, politics, etc.), and may treat people as being passive, rather than having complex motivations. Soft systems cannot easily be quantified, especially those involving people holding multiple and conflicting frames of reference. They are useful for understanding motivations, viewpoints and interactions, and addressing qualitative as well as quantitative dimensions of problem situations. Evolutionary systems, similar to dynamic systems are understood as open, complex systems, but with the capacity to evolve over time. Banathy (2000) uniquely integrated the interdisciplinary perspectives of systems research (including chaos, complexity, and cybernetics), cultural anthropology, evolutionary theory, and the evolution of consciousness.

When we discuss tourism systems, we consider components (parts, elements) the co-dependency-interconnections among the components, the dynamics (change) and the environment. As an example, we can describe a hotel system: the components (tourists) of a system (hotel) are interconnected (check-in at the reception desk); they influence one another. They are dynamic (dialogue); this is a reason for the change. The system receives influences (guest's remark) from the environment and sends back influences (reactions) to the environment. From these elements, one can create a model that represents the basis of the systems approach and systems thinking, which is shown in Figure 1:

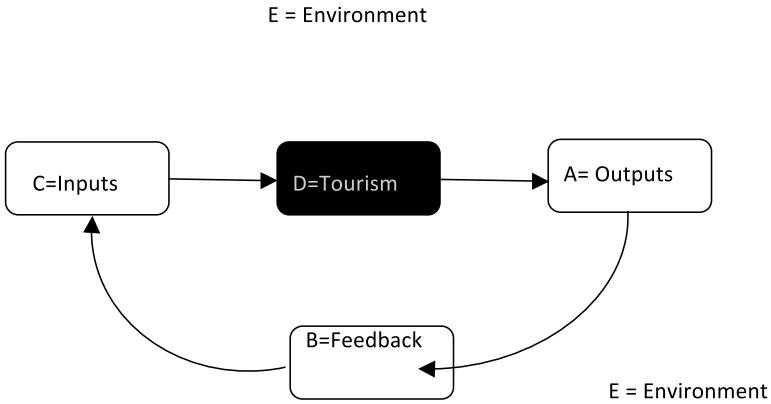

Figure 1 A cybernetic model of tourism system as a black box.

The primary step of the system decision-maker starts at A: the outputs of a tourism system. The decision-maker uses as his primary questions the questions about the influence of his vision or (outputs, A) to the environment (E, other people, nature, society), uses feedback information (B, what will my vision bring to the E) and asks himself what his vision (A, outputs) brings to the environment (E) and what the current situation is (C, inputs, ideas, teams, co-creation) for achieving the (A) and how he can help in the process (B) either with help or without any worries if he cannot influence the process. In order to avoid the trap of the simplicity of systems thinking, we can build a simulation model of effective decision-making in which we attempt to implement the optimal systems solutions.

Principal Model Simulation of a Tourism System

In concept, a feedback system is a closed system. Its dynamic behavior arises within its internal structure. Any action which is essential to the behavior of the mode being investigated must be included inside the system boundary (Jay W. Forrester)

The simulation was once simply referred to as 'simulation'; nowadays, it is more often called, 'modelling and simulation' (M&S or MODSIM), emphasizing the importance of first modelling the system of interest before developing a computational representation (Loper, 2014). Implementation of the simulation system enhances learning processes (Kljajić, Borštnar et al., 2011). The simulation model we discussed (Fig. 2) requires decision-making given by a group of experts, who cover different areas. The above-discussed methodology is implemented with the use of a simulation model, which is described below and shown in Fig. 2, which presents the principle scheme of simulation system for decision assessment in tourism. It also shows the interaction between the tourism business system and the people involved in it: the participants in a decision-making process and simulation model.

The participants in a decision-making process are a part of the tourism business process. The model can be used as a basis for accepting business decisions. Modelling and Scenario determination is a knowledge-capturing process in the form of the structure and behaviour of the model. Once the model is defined and validated, experimentation with different scenarios is possible. The tourism expert group determines the set of different scenarios, which represents possible future actions in the real system. The results gathered as the output of the model are evaluated with the multi-criterial evaluation function. At this stage, many different multi-criterial evaluation methods may be used such as agent-based modelling,

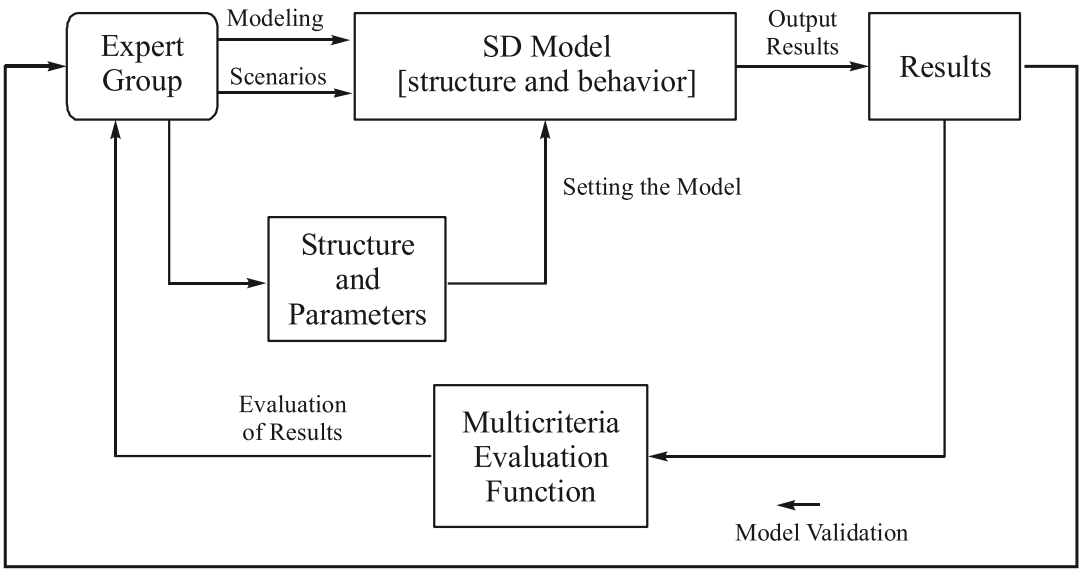

Figure 2 The principle scheme of simulation methodology for decision-making support in tourism enterprises (Jere Jakulin, Kljajić & Škraba, 2002)

weighted average (Vincke, 1992), and Expert Systems (ES) (Rajkovič and Bohanec, 1991). Information feedback provides the expert group with the possibility of creatively determining a new set of scenarios and multi-criterial evaluation functions relating to the given situation. Simulated and actual performances of the system are compared in order to adapt the strategy according to changes in the environment.

The systems thinking solving method with a simulation model follows standard steps: the stating of the analysis, the development of causal-loop diagrams, the writing of the model's equations and model implementation. Particular scenarios that form and determine a tourist market in a certain environment are tested on a simulation system. A simulator is connected to the GSS (Group Support System). The participants using GSS work directly with the system simulator. A system simulator is connected to a database, which is necessary for the activation of the simulation model. Simulation results are evaluated both with the group decision-making support system and with expert systems. In all of this, the understanding of the system increases. With the described model, the experimental loop on a simulation model has been finished with the help of the system simulator and scenario ranking. The elements of the decision-making support system are Powersim, a tool for the construction and use of a simulator; Ventana Group Systems, the Ventana group working support system; DEX, a shell of an expert system; and Expert Choice, evaluation with agent-based modelling.

Work with a group decision-making tool is anonymous, raises creative and co-creative thinking, which enables a greater flow of ideas and reduces unwanted influences. The participants become more relaxed since no one knows where the ideas come from, and creativity is thus released; this simply would not be the case in more conventional ways of working. The work time decreases and the efficiency of participants increases. The final result is better, as the decision becomes a group decision with which conflict between polaried groups is minimized, and a consensus is achieved for the development of further actions.

Present opportunities and future needs for this kind of decision-making system must be mentioned. Results are continuously mediated and co-created with the expert group, providing an informational feedback loop in the learning process, which has a significant impact on the decision process, as the preliminary analysis has indicated.

Conclusions

Tourism as a complex system includes many parts: a wide variety of people, institutions, and organizations. If we want tourism to be successful in all its aspects, its parts should connect and interact with them. If we wish to develop strategies in tourism without extra effort, we must shift our perceptions. Instead of fragmented and linear thinking, we use systems thinking, which requires respect for its key concepts: reinforcing feedback, balancing feedback, and delays. It also requires the consideration of the big picture point of view, regarding both quantitative and qualitative data, dynamics and the complexity of a system and short-term as well as long-term perspectives.

In this paper, we have presented the idea of co-creative decision making, which a group of decision-makers achieve when they use systems thinking. We showed a simple feedback diagram, which requires thinking in systems and using the feedback information. To avoid oversimplification, we presented the implementation of group decision-making by creating a simulation model. In this review paper, we present a systems (holistic) approach to tourism through its hierarchical structure and suggest contemporary technology for 'what if' tourism behaviour. Systems approach and systems principles present the 'big picture' point of view and result in optimal answers to complex tourism problems.

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