IMPLEMENTATION OF THE TOURISM AREA LIFE CYCLE MODEL AS AN ADVISORY DECISION SUPPORT SYSTEM

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Abstract

The Tourism Area Life Cycle (TALC) is a theory of tourism region evolution designed to assist destination managers and others in dealing with and understanding problems that seem to almost inevitably arise with concentrated tourism development (e.g. environmental despoliment, low visitor yield and social issues). Various heuristics are associated with the transformation from one life cycle stage to the next and these, together with an increasing body of cases dealing with the application of rejuvenation strategies, form the basis of the decision support system (DSS) described in this paper. Technically, the paper focuses on specific data abstraction techniques used to facilitate DSS development and maintenance.

Keywords: Tourism, Decision Support Systems.
1 INTRODUCTION

The Tourism Area Life Cycle (TALC) was first proposed by Butler (1980) as a means of explaining how many tourism destinations move through a cycle beginning with (almost) nil tourism, to massive development and boom times and, oftentimes, to eventual stagnation and decline. This cycle can be represented as an S-shaped curve as illustrated in Figure 1, where the Y-axis plots (against time) a key variable (such as visitor numbers, accommodation takings, visitor yield etc.) employed as a surrogate for overall tourism activity within a destination.

![Figure 1. The Tourism Area Life Cycle (Source: Butler, 1980: 8).](image)

Obviously, destinations are generally keen to avoid entering the stagnation and, especially, decline stages. Since Butler’s original exposition of his model, a number of Tourism and Hospitality (T&H) researchers have reported on instances of where different rejuvenation approaches have been tried (see e.g. Agarwal, 2006; Cooper, 2006) and they and others have also specified classification schemes and frameworks for the various types of rejuvenation strategies (see e.g. Choy, 1992; Cooper, 1995; Agarwal, 2002). This suggests that there may be benefit in implementing the TALC as an advisory expert system (Beemer and Gregg, 2008).

In the following section some background is provided and the research objectives are introduced. The architecture of our system is then described, with a focus on the benefits resulting from the particular data abstraction principles and methods employed. The paper concludes with a discussion of our project’s research contributions.

2 BACKGROUND AND RESEARCH OBJECTIVES

Following Butler’s original exposition of his model, many T&H researchers tested its validity and usefulness in a variety of destination settings. A considerable number (e.g. Cooper, 1994; Braunlich, 1996; and Tooman, 1997) found substantial support for the model, others (e.g. Choy, 1992; and Bianchi, 1994) found fault with it and a third group (e.g. Agarwal, 1994; and Knowles and Curtis, 1999) suggested various improvements. Thus, it is probably reasonable to say that the TALC model has proven to be fairly controversial. However, Berry (2001) has argued that deviations from the model do not detract from its usefulness. More specifically, he (Berry, 2001: 89) asserts:

*The identification of deviations from the model, or the intentional creation of such deviations, is the main purpose of the TALC model. To try to fit every situation into the model and then to discredit the model if there is not a perfect fit, is to misunderstand the utility of the model.*
Over the years, starting with Butler (1980) himself, various criteria have been associated with each stage of the TALC model: e.g., a destination may be entering the stagnation stage if accommodation takings have reached a peak, economic, environmental and social problems are beginning to cause substantial concern within the local community and the destination has a well-established image but is no longer fashionable. Furthermore, if it can be established that a destination is at a specific point in the life-cycle, various generic heuristics have been suggested as rules that might guide policy development: e.g., if a destination is in stagnation or decline, the use of previously-untapped natural resources, urban renewal and/or the introduction of (appropriate) man-made attractions might lead to rejuvenation (Butler, 1980).

As noted earlier, this suggests that much might be gained by implementing the TALC model as a computer-based, advisory expert decision support system (DSS) and this is the central aim of this research project. More precisely, the research aims are to:

1. Specify a formal model of the TALC employing well-established conceptual modelling formalisms and techniques drawn from the information systems (IS), software engineering (SE) and artificial intelligence (AI) domains. Specific formalisms to be used include entity-relationship (ER) modelling (Chen, 1976), formal 1st-order logic (Kowalski, 1979) and system dynamics (SD) (Maani and Cavana, 2000).

2. Implement the above model as an advisory DSS for use by parties involved in T&H in: i) determining where destinations might sit within the TALC; and ii) given the results of i), assessing what policy initiatives might be appropriate.

3. Validate the DSS implementation of the TALC model and assess its practical usefulness.

In implementing a computerised version of the TALC model, this research breaks new ground. This, perhaps, is surprising but as Berry (2001) points out, while it is the ‘vague’ nature of the TALC that makes it so useful, it is this very same feature that works against the precise formal specification demanded of most computer systems. In this research project, this apparent conundrum will be addressed in the following two ways:

1) By employing the data abstraction principles and methods promoted by Feldman and Miller (1986) and, more recently, by McGrath (2009). This allows a layered modelling approach whereby TALC features common to most destinations are specified in a fairly abstract (but meaningful) way at the higher levels of the model while destination-specific features are treated at lower levels. This both promotes model generalisation and reuse (across destinations) and reduces development effort.

2) By employing a case-based reasoning (CBR) approach (Kim, 2004) for the advisory component of the DSS. As argued by Beemer and Gregg (2008), this type of system, whereby users are gradually and iteratively guided towards a solution from a range of options (previous cases), has proven to be more effective than the more traditional, highly-prescriptive, rule-based expert system approach (Hayes-Roth et al., 1983).

Having introduced the research question and objectives, we now turn our attention to the architecture of our DSS.

3 TALC DSS ARCHITECTURE

In any information systems research project with a significant development component, the ‘conceptual framework’ is inherent to a large extent on the architecture and conceptual models used to specify the target system. A high-level view of the architecture of the TALC DSS is presented in Figure 2.

Both the KB schema and the KB itself were derived largely from the TALC literature. As noted earlier, data abstraction principles and methods (Feldman and Miller, 1986) were employed in describing the KB schema which, essentially, specifies the structure of the KB. The initial schema, in entity-relationship form (Chen, 1976), is illustrated in Figure 3 where an example of an entity type is
party, instances of which can be (among others individuals, enterprises and tourism authorities. Parties may be related to other parties in what are called party_party_involvements (ppis), examples of which are:

'John Smith owns_the 'Beachside Resort'; and
Locals are_antagonistic_to visitors.

Figure 2. The architecture of the TALC DSS.

Here, owns_the and are_antagonistic_to are ‘involvement roles’ and the reader might note that this general form of involvement construct is repeated a number of times throughout the diagram. A significant advantage of employing a limited number of construct types (combined with abstraction) is that coding effort may be substantially reduced (McGrath and Kuzic, 2010). For example, we could specify the constraint rule:

\[
\text{if } \text{Party}_X \text{ is_part_of party_hierarchy} \\
\text{then } \text{Party}_X \text{ must_have_a unique_identifier} \\
\text{and } \text{Party}_X \text{ must_have_a valid_name.}
\]

Next, with the addition of isa hierarchies such as:

visitor_group isa party;
athletics_team isa sporting_team; and
'VU Track&Field Team' isa athletics_team

and the recursive rules:

\[
\text{Party}_X \text{ is_part_of Party_hierarchy}_Y \text{ if}  \\
\text{Party}_X \text{ isa Party_hierarchy}_Y
\]

\[
\text{Party}_X \text{ is_part_of Party_hierarchy}_Y \text{ if}  \\
\text{Party}_X \text{ is_part_of Party_hierarchy}_Z \text{ and}  \\
\text{Party}_Z \text{ is_part_of Party_hierarchy}_Y
\]
then these can be employed to derive all party instances and the single constraint rule above can be employed to check for the existence of valid identifiers and names. The alternative (and more conventional) approach would be to develop separate code for each level of the isa hierarchy. The above has been described in some detail because it provides an indication of the novel DSS development approach employed. This was an important component of the research project.

The TALC KB contains instances of TALC applications taken from the literature, with particular emphasis on instances of destinations in stagnation/decline where rejuvenation strategies have been applied (see e.g. Butler, 2006a). Returning to Figure 2, users (e.g. destination managers) enter details as search parameters and the CBR component retrieves those KB cases that most closely match the new case as a ‘Best Match Report’. The user may then review these cases to ascertain whether they provide pointers to actions, strategies or policies that might assist the destination with its current (or potential) problems. An example might be the Waikiki environmental quality enhancement initiatives adopted by the City and County of Honolulu during the 1990s (Patoskie, 1992).

If adoption of a particular initiative is under serious consideration, the user may then perform some ‘what if’ analysis through the SD component. The tourism domain is extremely complex with key variables connected to other variables in myriad ways and many feedback loops. In this type of convoluted domain, unintended consequences often result from policy decisions. SD is extremely well-suited (as a modelling and simulation tool) to this type of domain (Maani and Cavana, 2000) and, among other options, users may test the sensitivity of key-performance indicators (KPIs) to changes in combinations of variables. Part of the SD user interface is presented in Figure 4. Here, the user may vary visitor and local goodwill (to the destination and tourists respectively) and test the impact of this on hotel energy usage (assuming, in this case, that energy reduction is a major destination objective).
In this instance, the destination has decided to go ‘green’ as part of its rejuvenation strategy and, consequently, is interested in possible impacts. Looking at the top-left of Figure 4, hotels\(^1\) within this particular destination were divided into three categories: i) non-green – where almost no energy reduction initiatives have been implemented; ii) moderate-green - where most of the relatively easy (and cheap) initiatives have been implemented; and iii) total-green – where a significant number of capital-intensive initiatives have been implemented. The DSS user is required to specify desired transformation rates which, in this instance, are: 80% of hotels will be moderate-green within 5 years and 50% will be total-green within 8 years.

Next, referring to the right of Figure 4, the user may test some social impacts of the energy reduction strategy; specifically, the impacts of visitor and local goodwill. Visitor goodwill may be generated because there is some evidence that tourists (western tourists in particular) are tending to favour destinations that appear to be serious about environmental improvement (Booz, 2009), while local goodwill may occur as a result of environmental improvement and improved infrastructure and facilities that might result from more, higher-yielding visitors. In our example, visitor goodwill has been set at 10 and local goodwill at 5.

Part of the output from a simulation run (with these parameter settings) is illustrated at the bottom-left of Figure 4. It indicates a very substantial, projected energy reduction over the simulation period (in this case, 10 years). In addition, the underlying SD model links key elements of each of the three major tourism destination dimensions; economic, environmental and social (Adams et al., 2004) and, as a consequence, the DSS (where possible) attempts to identify economic impacts of events within the environmental and social domains. An example of an additional output from our simulation run is presented in Figure 5. Here, it can be seen that the proposed energy reduction strategy is not projected to have a major impact on occupancy rates over the 10-year simulation period but it may allow hotels to substantially increase their room rates (largely a consequence of visitor goodwill).

\(^1\) It was established that hotels within the destination were responsible for over 70% of tourism-related energy usage and CO2 emissions, exclusive of energy used in travel to and from the destination – hence the accommodation focus.
4 CONCLUSION: RESEARCH CONTRIBUTIONS

The most significant feature of this research, particularly in a practical sense, is that it adds to the increasing body of applied research concerned with using the TALC as an aid to the more effective management of tourism destinations (Butler, 1980; Butler, 2006). Perhaps the most succinct summary of just how this might be realized has been provided by Cooper (1994: 342), who states that it (i.e. the TALC) has “intuitive appeal” and that it provides:

a useful framework for analysis of the growth of destinations, the interplay between markets and physical development and allows for historical examination of factors that lead to turning points in a destination’s development and the characteristics and leadership styles at each particular stage of the destination’s evolution.

Berry (2001) notes that, with every TALC study, our knowledge of tourism destinations, key stakeholders, attractions, tourism enterprises and the interactions between all of these increases and that, as a result of this, our knowledge of “the use of TALC theory as a framework for understanding what is going on is enhanced, thus improving our capacity for strategic decision making” (p.89).

Berry’s argument (op. cit) appears to be sound but, at present, major findings, lessons learned etc. from the various TALC studies are scattered throughout the literature and nigh on totally inaccessible to practitioners. In developing our DSS, relevant knowledge has been located, abstracted, structured, indexed and made available to interested parties through a user-friendly graphical user interface (GUI). This represents the major practical contribution of the research project. Perhaps the major academic contribution of this work is that it adds to an important body of research concerned with the representation and specification of organisation and management theory (OMT) using formal conceptual modelling techniques.

References


Figure 5. Projected occupancy and room rates resulting from energy reduction.


