Deploying Tourism Destination Intelligences

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Abstract: *Tourist destination managers interpret their business knowledge in response to specific tourist/customer requests. These interpretations can be optimized by gathering and analyzing the business intelligence concerning each tourist-specific destination. Appropriate tourism intelligence software systems can be set to capture such particular tourism stakeholder requirements. Smaller tourism destination managers may opt for less complicated lower cost software solutions, yet still meet their needs.*

Keywords: Business intelligence, tourism, customer targeting, multi-agent, competitive, self organizing map

1. Introduction

Technology-driven business intelligence systems can support the needs of tourism destination managers (TDMs) and their tourist stakeholders. Sustainable tourism development, climate change, target marketing, risk management, and education-related information are included in Dwyer et al's (2009) intelligences. These technology-driven information extraction systems tap existing internal and/or external software-stored business destination sources and assess a broad range of tourism destination intelligences (Cornish, 1997).

Data mining of technology-driven intelligences can deliver micro assessments at the destination, or individual task level (Hamilton & Selen, 2008), or at the macro business level can create new value propositions and unique marketspaces (Kim & Mauborgne, 2005). Such intelligence-based solution opportunities can enhance standard pre-programmed tourism destination business responses, and can be developed into value-adding responses (Barnes & Mattsson, 2008).

2. Business Intelligence Tourism Destination Measures

From a tourism destination intelligence perspective, customer relationship management (Lai, Griffin, & Babin 2009), yield (Klophaus & Polt, 2007), overbooking management (Lieberman, 1993), and employee scheduling (Schaefer et al., 2005) are three value-adding service delivery experiences available to the TDM, whilst y*ield management* (Badinelli, 2000), o*verbooking,* and e*mployee scheduling* (Hamilton & Selen, 2008) offer more complex intelligences. Along with constraints (such as time, costs, special health issues, and destination hazards) such information approaches can intelligently assist the TDM to plan, schedule, and adapt to changeable tourist/destination demands. These intelligence approaches are now discussed.

2.1 Customer relationship management (CRM) and Market intelligence

In tourism, customer relationship management matches tourism products and/or services with the customer-perceived requests (Hamilton, 2010). Questionnaires, emails and other data-capture communications build the extent of these *market intelligence* systems as location, activity, and/or customer-specific point-in-time intelligence solutions. These market intelligences may be broadened to capture external factors (Hamilton, 2008), and mapped against sales, value and satisfaction levels (Ozgener & Iraz, 2006) to deliver potential business efficiencies.

2.2 Yield intelligence

Tourism yield management maps capacity against pricing variations, and revenue channels (Kimes, 2000), and within the market segment earns towards five per cent in additional revenue (Belobaba & Wilson, 1997)

2.3 Overbooking intelligence

Overbooking of accommodation and other facilities/resources (Hamilton & Selen, 2008) strategically over-commits bookings against 'no show' tourists.

2.4 Employee scheduling and Security/safety intelligence

Employee scheduling (Hamilton & Selen, 2008) links employees to daily rosters, times, workplace tasks and/or other activities. Security and safety link to tourist, destination security, and to other legislative requirements and to safety zones.

This small array of separate intelligences typifies small to medium tourism destination businesses, and each is programmable, interpretable, and capable of being intelligently data-mined. Hence, in various combinations, intelligent decision support systems (Luhn (1958) may be developed that can assist the TDM to strategically positioning the business (Hamilton & Selen, 2004). Simplest intelligences (2.2 & 2.3) are the cheapest to program, yet may be plotted to deliver different intelligence mixes. The four main computer programmed software approaches available to capture and interpret such tourism destination intelligences are now discussed.

3. Business Intelligence Software Approaches

Basic artificial sorting approaches deploy *agent*-level intelligences (Weng & Tran, 2007). Here, autonomous action(s) occur in response to specifically programmed targets (Hamilton, 2009) such as an agent-based TDM inquiry considering a tour price reduction delivers simple-task solutions (Weng and Tran, 2007).

Intelligent agents add reasoning capabilities to the agent-based approach and proactively respond to user-generated changes (Tarokh & Soroor, 2006). Here, intelligent agents optimize the tour design requirements by recognizing (and collating) multiple, internal (and external), unstructured data sources into structured data.

Intelligent multi-agent approaches (Hamilton & Selen, 2008) collect/integrate information from heterogeneous sources, and then offer higher-level responses to the TDM's (or tourist's) requests (Camacho et al., 2006). They deploy multi-dimensional software algorithms to jointly optimize combined selections of information (or resource) components (Beausoleil, Baldoquin & Montejo, 2008). Combinations of intelligent multi-agents can be programmed to jointly deliver an overall destination-optimized TDM (or tourist-specific) solution.

Linked with above approaches and their intelligence networks, *web-based* business intelligence software approaches can also website-distribute such specific tourist information (Chung, Chen, & Nunamaker, 2005), and so broaden the TDM's customer reach.

Multi-dimensional *self organizing maps (SOM)* (Kohonen 1982) offer more comprehensive software intelligence systems. For example, the simple two-dimensional SOM (Figure 1) shows 16 circles (or node). Each houses a piece (or block) of unique information, and each has a limited number of closest-related nodes. Hence, the node 3 has eight closest neighbours representing (4, 5, 6, 8, 11, 14, 16, and 17), with less closely relating neighbours residing beyond this immediate closeness zone.

The SOM prioritizes its two dimensional input array and highest related data is plotted at specific nodal input accession points, Here, new input bundles of connected data components then pursue a matching item set of existing unique information blocks. Where the input bundle 13 overfits the existing input array point 12 both then consolidate as one stronger nodal position. When no exact 'best' solution is available, and the closest node is 15, this then becomes the SOM solution node for the tourist's request. It is reached by like-clustering, visualization and node data abstraction (Kiang & Chi, 2008).

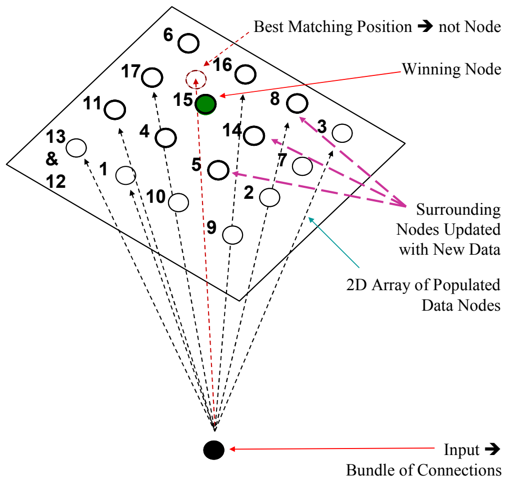

Figure 1: Two Dimensional Self Organising Map

More complex *growing self organizing maps (GSOMs)* operate in three dimensions and across multi-layers. They grow by adding/combining/influencing new data (knowledge) blocks, and build intelligences within and between layers

Geospatial mapping intelligences solve destination requests in a similar manner to geographical contour maps, but this approach adds new intelligences by cross-mapping different knowledge sets - such as jointly assessing: weather, terrain, drinking-water, emergency-phone, hospital, walking tracks, camp-build-time, compass/distance-directions into a 'best' campsite location.

The geospatial mapping of Figure 2 shows dark central dark polygon represents an area of maximum density of fish around in a lake, and also maps the diversity of resident fish species. The embedded dot is the best fishing anchorage). The next most closely relating suite of polygons (each directly touching this central polygon) individually relates to the next-best set of anchorage points (but these sites represent lesser fish). The weakest fishing sites are the outer rim of polygons. All data is built on past data and then jointly averaged into high, medium, and low intensity 'spheres of influence' visual overlays.

Under voronoi mapping (Lee & Lee, 2009) procedures such geospatial overlays build solutions that can also link into other data sources such as: tourist, location, day-specific conditions (Snavely, Seitz, & Szeliski, 2008).

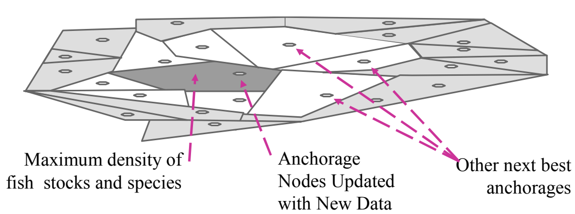

Figure 2: Three Level Voronoi Geospatial Map

4. Combined Business Intelligence Selections

Figure 3 provides the TDM with a selector of intelligence solutions. The seven common tourism 'destination intelligence of business' fields discussed are mapped across the virtual/physical interface, from the data measurement side, to the software analysis side (six 'programming intelligence approaches'). At the top of Figure 3 the first business destination intelligence segments (market intelligence and CRM) are low-cost, simple intelligence tools (agents and intelligence agents) that work with uncomplicated data. Down the groups intelligence-complexity, and software development costs both increase.

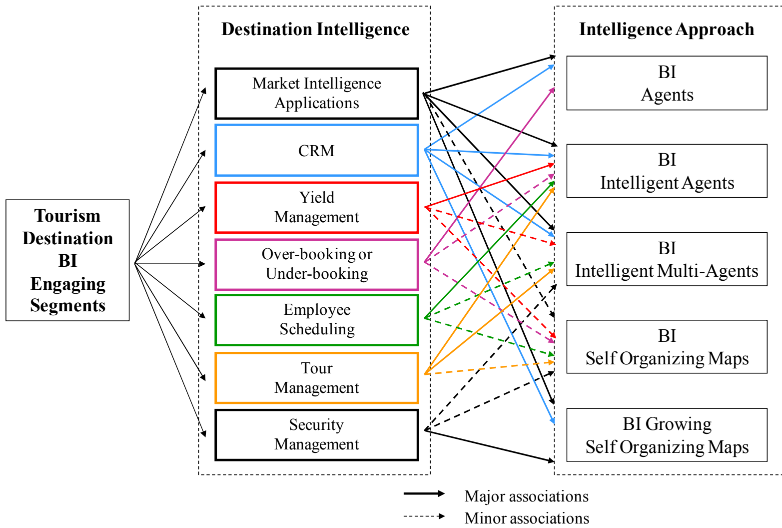

Figure 3: Business Intelligence Selection

Hence, the TDM can now scope, and select, which programming intelligence approaches offer both the degree, and the type of destination responses most likely required by their tourist clientele. At higher levels of the destination intelligence of business (tour and yield management), higher-cost programmed intelligence approaches (intelligent multi-agents) are of value. Under the highest intelligence capture levels (SOMs and voronoi geospatial maps), the TDM can even attempt to align management expectation provisions - such as security and safety, with the desired outcomes from each tourist (Hamilton & Tee, 2009). Thus Figure3 is a useful TDM guide when planning the future intelligence requirements of the business, and where minimal intelligences are needed the TDM should use cheapest solutions. Where growth and competition are likely to prevail - higher (and more expensive) levels of intelligence may be required

5. Conclusion

Business intelligence holds growing importance to a TDM seeking a 'best' answer to a tourist destination inquiry. The TDM can selectively include tourism destination intelligence gathering approaches into their business-offered tourist-specific destination solution. Adding such intelligence gathering capabilities exerts additional business cost commitments, but also provides greater deliverance complexity possibilities – possibly better aligned to the specific tourist's request. Hence, if correctly targeted, such additional intelligence expense may be justified.

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