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Developing an Ontology for Knowledge Management in Event Safety and Security



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Preface

Tourism has grown to be one of the world's leading industries, providing the foundation for economic and social development worldwide. Information technology has played a crucial role in this growth as travelers seek to experience the world near and far. From the industry perspective information technology has enabled destination marketing organizations to reach out and communicate with unknown visitors. This technology has also created a new "world" where the focus is on change, adaptation, experimentation and on knowledge of individuals and communities. Travelers have begun to use this technology to explore the world and in doing so they learn, communicate, and build a more personalized environment. This rich, new, and interactive computer-mediated environment offers travelers the potential to expand their world well beyond what can be imagined today.

The profound effect information technology has had on travel provides the *raison d'être* for the National Laboratory for Tourism & eCommerce, Temple University. Specifically, NLT ϵ C was established to provide a unique multi-disciplinary, multi-department, and multi-university environment in order to explore the nature and impact of technology as well as to evaluate and develop technology that can be used to provide and/or extend the travel experience. Situated in the School of Tourism and Hospitality Management, its interdisciplinary and collaborative framework is vital to successful research in the emerging and quickly changing areas related to tourism, communication, computer science, marketing, management, and technology. Thus, NLT ϵ C offers a place for research to "stand" and provides many of the "levers" through a laboratory setting and, perhaps more importantly, a space for conversations that nurtures creativity and innovation.

Communication lies at the center of the collaborative approach and forms the basis for research that can initiate and sustain progress in both tourism and technology related fields. The whitepaper series titled *Perspectives on Tourism & Technology* was established to extend the ideas and findings of those associated with NLT ϵ C and initiate conversations among and between researchers and industry professionals. The series presents emerging ideas focusing on current issues and future developments in tourism and technology. By communicating results and ideas, we seek to extend our understanding of tourism and technology, challenge existing mindsets and stimulate further consideration of the role of tourism and technology in our society.

In light of the above goals, the current issue discusses how the concept of knowledge management can be incorporated into individual and organizational learning to facilitate better safety and security management in the event industry. It outlines the design of the knowledge-based system and describes three major components by which event professionals can benefit from new tools and technologies that deliver practical outcomes and sustain continuous knowledge learning for future safe and secure events/festivals.

On behalf of all who have contributed to the many NLT ϵ C activities and the authors of this issue, in particular, I hope that you are stimulated by the ideas presented here and invite you to contribute to future issues.

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Developing an Ontology for Knowledge Management in Event Safety and Security

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What is Ontology?

According to Gruber, 1993, Ontology is a “**formal and explicit specification of a shared conceptualization**”. It is a shared and common understanding of a subject matter that can be communicated in a similar language across people and machines. ‘*Explicit*’ refers to the types of concepts used. ‘*Formal*’ refers to the ontology being machine readable. ‘*Conceptualization*’ refers to building an abstract structure of the subject after identifying relevant concepts of that field of study.

The ontology provides a generic model of concepts, which encompass the entire subject matter under study. This ontology provides a vocabulary for a range of knowledge models in the domain. Ultimately, ontologies pave way to move from a document oriented approach to a content oriented approach to knowledge.

Why is Ontology used?

In the past, knowledge management systems typically produced a collection of documents focused on a particular field of knowledge. Even though they were useful, these document based systems were not upgradeable and thus, would be worthless unless new content is added to them on a continuous basis. The problem becomes acute when most of the knowledge sources like websites and books are not in the control of the content manager. Hence, it is important to have a basic structure representing the field that would help in

intelligent retrieval of relevant knowledge from vast sources of data.

As mentioned above, Ontologies provide a common vocabulary and understanding of a subject matter which can be easily shared and utilized by both humans and machines. This is essential in order to make the knowledge reusable.

Knowledge Based Systems and Ontology:

Knowledge management means various things to different people. Whatever be the interpretation, the ultimate aim of a knowledge based system is to enhance a structured representation of a body of knowledge and make it accessible and easily understood by a vast majority of people interested in that particular field. Knowledge based systems have the following advantages:

- It creates a more concrete representation of a domain rather than vague mental conceptualizations.
- Provides a platform for experts to interact, negotiate and build upon the existing knowledge.
- Provides a common understanding of the field.

The process of building a knowledge based system involves the following phases (Benjamins *et al*, 2001)

- 1) Knowledge Gathering: Identification, acquisition and collection of the knowledge to be managed.
 - 2) Knowledge organizing and structuring: Imposing a structure on the identified field of knowledge to make it more manageable.
 - 3) Knowledge Refinement: Adding to the structure, correcting, updating or deleting the knowledge.
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Before embarking on the development of the knowledge base, it is imperative to define the context in which the knowledge base will be utilized. The developer should be able to define the additional value provided by this knowledge base to the end user in addition to the field related literature already available. The knowledge base should be able to provide additional reasoning based services over and above that of an ordinary search engine. For example, in the case of the concept 'Risk Management', the knowledge system is concerned with logical knowledge retrieval and eventually a customized guideline generation for a non-expert who wishes to learn more about the risk management practices for a specific event. The knowledge system should also be able to identify the right people, projects etc that belong to this field.

A knowledge management system eventually integrates informal, semi formal and formal knowledge of a particular domain to facilitate an easy access, sharing and reuse. In such contexts, where the knowledge has to be modeled, structured and interlinked, ontologies can help build the structure and formalize the knowledge shared by a group of people.

Objective of this report

eSAFE is the knowledge management system developed for the event management domain at the National Lab for Tourism & eCommerce (NLTeC), Temple University. It is aimed at enabling event management professionals across the world to have a common platform in which they can search, share, renew, and reuse one another's knowledge and expertise to promote and facilitate safer and more secure event planning.

A knowledge base is one of the most critical components of the knowledge management system. It is a repository of the total knowledge of a domain. The knowledge base is aimed at

developing and integrating formal knowledge for the event management domain, with an emphasis on the safety, security and risk management. The system archives both the explicit knowledge (in the forms of books, manuals, articles etc) and implicit / tacit knowledge (in domain experts) of this domain to provide intelligent knowledge retrieval and knowledge intensive services. The 'eSAFE Knowledge Base' is built based on ontologies.

The most important aspect of developing a knowledge base is the conversion of text into knowledge. This activity is central to the development of a knowledge management system for various reasons:

- Explicit knowledge, work practices and information flow in a domain generally tends to be formally structured in text/document sources like textbooks, manuals etc.
- A formal structure which can support logical knowledge retrieval and ontology based retrieval of knowledge is generally lacking in the event management domain.

This white paper describes our approach in developing ontology for safety and security issues in event management domain and eventually utilizing the same to build the "eSAFE Knowledge Base".

Ontology Development for 'eSAFE'

The ontology construction of the knowledge base for organizing safe festivals and events is based on top-driven ontology based approach. The approach involves developing a comprehensive set of concepts of a field, specifying relationships between them and entering instances / examples for the ontology with relevant data extracted from various sources belonging to the field. For example, the present ontology for eSAFE provides a generic set of concepts and their relationships

that help in building a guideline specific model with examples for safe event management (Event Management, Safety, Security and risk Management).

An ontology driven approach has several advantages in building eSAFE knowledge base.

- It can provide a hierarchy of concepts that helps in organizing domain specific knowledge.
- Since ontology explicitly specifies a concept underlying a knowledge structure, it is easy to reuse and interoperate the structure with existing knowledge sources.
- By selecting a unique concept or term to represent each aspect of the field and then linking that concept to the actual knowledge available, we can easily ensure terminological consistency.
- Instantiating a pre-existing ontology is much easier compared to other approaches.
- Ontologies help the user in easier navigation through a knowledge repository and efficient semantic retrieval of information

The most important aspect of developing ontology is the quest to capture 'meta- knowledge'- the knowledge that is implicitly expressed in the literature and data sources. An example of meta-knowledge can be two theories of risk management, which have not been explicitly mentioned in the document under scrutiny. Hence, knowledge base development is just not a formalization of documented knowledge but also extracting meta- knowledge through pre developed knowledge models based on ontology.

Knowledge Base Development

The Knowledge base development involves the following stages

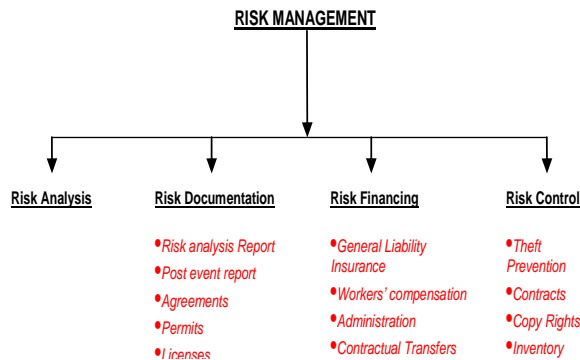
1. Define the utilities of the knowledge base
 2. Identify the relevant sources of data
 3. Identify Key concepts & Develop the ontology
 4. Define the attributes of all the classes
 5. Instantiate the ontology.
- 1) **Define the utilities of the knowledge base:** Before embarking on the development of the ontology and finally the knowledge base, it is imperative to define the context in which the knowledge base will be utilized. The developer should be able to define the additional value provided by this knowledge base to the end user in addition to the documented knowledge already available. The knowledge base should be able to provide additional reasoning based services over and above that of an ordinary search engine. For example, in the case of the concept 'Risk Management', the knowledge system is concerned with logical knowledge retrieval and eventually a customized guideline generation for a non-expert who wishes to learn more about the risk management practices for a specific event. The knowledge model should also be able to identify the right people, projects etc that belong to this domain.
- 2) **Identify the relevant sources and range of data:** Any ontology development has to be based on existing sources belonging to the domain. The knowledge sources can be both explicit and implicit. However, it is important to define the exact sources from which the ontology will be developed. In the case of the eSAFE knowledge base, The explicit sources were the books and manuals written by well known experts belonging to the field of event management and event risk management. A
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few implicit sources like interviews with domain experts also helped in developing the ontology.

3) **Identify Key concepts & Develop the ontology:** Once we define the utility and the sources of the ontology, the ontology development process is more of a technical enterprise. This step involves specifying and formalizing the key concepts of the subject and classifying their positions in the overall structure. As we have mentioned already, the eSAFE ontology is a top down approach, starting with the basic concept and classifying down to a specialized topic. For example, Risk management (basic concept) is further classified into risk documentation of which risk analysis report (specialized concept) is a component. Each basic component is defined as a "Super class" The ontology of eSAFE is divided into the four basic components.

- Event Management
- Safety
- Security
- Risk Management

These four components form the major classes. The major classes are further divided into subclasses as shown the figure below.



4) **Define the attributes / slots of all classes:** In this stage, we define the attributes of each class. We have to define the role of each class as well as their properties. These attributes are essential since they facilitate the entry of instances. To make sure that even a non expert finds the system easy to use and do not find lots of irrelevant attributes, minimal set of attributes are used for each concept. For example, the concept called safety has the attributes, description, keywords, factors, general information and references.

5) **Instantiating the ontology:**

The final aspect of a knowledge base development is to populate the ontology with instances. As mentioned earlier, the eSAFE knowledge Base is an ontology driven top down approach. Every concrete concept of the ontology is instantiated with examples from the literature. This system forms the basic knowledge structure for the entire event management domain.

What can an Ontology-based eSAFE Knowledge Base offer?

From the end user's perspective, eSAFE can be used as a knowledge base for problem solving and improving performance. It helps in effectively storing and distributing knowledge that can be retrieved as and when the need arises amongst the community of event professionals. It can aid communication and resource sharing for creation of new knowledge and innovation to support the development of new product / processes in organizing safe and secure events. Such effective Knowledge Management Systems can be termed as essential in promoting growth, enhancing performance and stimulating innovation in this domain.

Other Readings in this Series

1. *"Searching for Success: Learning through Benchmarking for Destination Management Organizations"* by Zheng Xiang and Daniel R. Fesenmaier
2. *"Forces Influencing Incentive Travel Businesses"* by Sandro Formica and Tanvi Kothari.
3. *"Performance Measurement for Destination Management Organizations"* by Tanvi Kothari and Daniel Fesenmaier.
4. *"eSAFE: An Online Knowledge Based System for Safe Festivals & Events"* by Clark Hu and Pradeep Racherla

About the Authors



Clark Hu is an enthusiastic educator and researcher with experiences in hospitality sales/marketing, consulting, and education. He has been with Temple University's School of Tourism and Hospitality Management as an assistant professor. Clark has published in a variety of journals and presented many conference papers based on his research work.. His major research focus is in knowledge management & discovery to research and develop systems for knowledge creation, transfer, sharing, and coordination in tourism & hospitality industries.



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