Abstract

In present world, information generation, handling and utilization is deeply integrated with various activities. From entertainment to serious professional activities, information content is managed in some ways. Appropriate information content is beneficial and sometimes becomes critical to life, business or the environment that supports them. Handling of information is therefore increasingly perceived as integral part of the activities. Systematic approach for handling information by individuals and organization is known as “information management”.

A common approach towards information management is limited to recording and retrieval of data pertinent to various human activities or environmental processes. The resulting system acts as a computerized log of human activity transactions or phenomena recorded in natural environment. Systems supporting information management are defined based on project specific requirements with limited scope. The project-oriented or mission-specific engineering approaches employed in designing such systems also restrict the scope of supported information management activities.

It is important to realize that projects or missions are identified only as short-term objective that contribute to the long-term goals and vision of entities. A system defined to serve short-term goals may soon become incapable of meeting the emergent needs. Even with accurate estimation of potential change, external intervention cannot be avoided due to dependence of knowledge, authority and resource capability required to realize the goals. The dynamism exhibited by relevant entities, results in continuous change of needs resulting in constantly changing requirements.

With increasing amount of complex interdependence and dynamic behavior of relevant entities, the task of information management has become difficult. From the scale of effort required to address the complex interdependence, it is realized that information management cannot be carried out with systems created and managed by individuals and organizations in isolation. Also, from the dynamic behavior and evolution exhibited by relevant entities, it is realized that underlying systems must also undergo change at similar rates. In summary, a paradigm shift is required in information management strategy and information should be made available as critical infrastructure service.

This thesis argues that information management should be based on the goals of the involved individuals instead of the conventional activity-oriented approaches. The required approach not only should support the goal-specific information, but also allow identification of newer goals with emerging trends in the system. Information need of individuals and organizations is
uniquely identified in the form of situations. The state of having access to relevant information is defined as situation awareness capability. The situation awareness approach proposed for information management strategy identifies role of individuals in producing and consuming information. It is based on the realization that, no one can have the global picture of the situation, but can play a role in building the rich picture of situation by contributing the part of the situation known. The resulting coordinated effort allows realization of situation awareness capability to the contributors.

In order to support the argument, the situation theory and semantics is accepted as base. It is stated that small coordinated assertions regarding situations can be integrated to prepare a rich representation of the world. Qualitative and quantitative estimate of information needs are identified based on the commitment towards goals. Three problems are identified in identification of information needs of individuals and organizations. The implied goal-matching problem relates to the challenge of identification and handling of goals that are not explicitly expressed. The transient system element problem indicates the challenges of numerous short-lived entities that are relevant to the information needs. The third problem is regarding identification of the event space, a set of all possible events that are possible in given scenario.

As a solution to this problem, a conceptual modeling strategy followed by information processing strategy is proposed. The proposal utilizes the rich representation created with conceptual modeling process in meeting the information needs. It is established that scale and scope of work involved in conceptual modeling and information processing requires large-scale collaboration from various stakeholders. For consistency of collaborative effort, appropriate method content is provided. Reuse and traceability of work products are encouraged with unique situation awareness artifacts furnishing information about task and availability of reusable outcomes and other related information. The proposed information management facility is prescribed as a critical infrastructure service required in achieving the large-scale collaboration. Appropriate system architecture is introduced to facilitate realization of required domain specific middleware services.