The Role of Knowledge Management in Integrated Professional Practice of Architecture, Engineering, Construction and Facilities Management

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Professionals in the fields/industries of Architecture/Engineering (A/E), Construction and Facilities Management constitute interdependent communities of practice. At the core of professional practice in these three fields are collaborative, integrated and productive teams comprised of all stakeholders in a building project lifecycle. The stakeholders include teams of designers, builders, real estate developers, contractors, construction project managers, clients/owners and facility managers. The work of these interdisciplinary, cross-functional and geographically dispersed teams should be guided by collaboration, open knowledge sharing, and effective knowledge management. This type of integrated practice should leverage and facilitate each team's contribution of knowledge and expertise through the use of interoperable Building Information Modeling ("BIM") technologies and reengineered business processes, thereby reducing delays, errors and liabilities associated with the design and construction process while improving the performance, economy, safety and sustainability of the built facilities.

The National Institute of Building Sciences (NIBS) recently published the following definition for Building Information Modeling:

> *"Building Information Models – digital, easily managed and shared representations of physical and functional data that define buildings throughout their life cycles – are increasingly seen throughout the public and private real estate and construction sectors as a way to control cost and performance problems associated with inaccurate and incomplete communications."*

In our proposed chapter, we intend to focus on the opportunities that Building Information Modeling presents the field of knowledge management. Our chapter will define current and historically utilized processes in the building design, construction and maintenance life-cycles, and how these processes have contributed to creation of inconsistencies and inefficiencies between the activities of design, construction and facility management as well as silos of expertise, risks and liability – risks and liabilities in technical, legal and ethical terms. We will then discuss how BIM and KM can help facilitate the building lifecycle processes by means of the following new set of standards and best practices:

1. Redefinition of roles, responsibilities and objectives for each participant (especially the architects, engineers and contractors) as required in integrated practice;
2. Provision of a common model for describing increasingly diverse, complex and interdependent building information;
3. Development of common views of information based on the needs of industry-specific businesses engaged in all aspects of the building lifecycle and building commerce;
4. Establishment and utilization of common standards for organization and communication of information and knowledge between and among industry-specific businesses and their respective (ideally interoperable) information technology applications;
5. Development and implementation of technological capabilities and business support for full integration of discipline- and industry-specific information from heterogeneous project stakeholders in order for decision-makers to evaluate choices, analyze risks and liabilities, identify alternatives and make value-based decisions.

The marketplace demands new approaches towards building production and sustainability. Integrated practice, catalyzed by new business processes and technology solutions, will create a forward thinking framework within which to design, build and operate as efficiently and cost-effectively as possible. Information technology and knowledge management, therefore, present an historic opportunity for process reform within the building industries, especially the architecture profession which currently faces the greatest risk of remaining relevant in the building lifecycle.

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Preliminary Outline

I. Introduction
   A. The interdisciplinary and interdependent nature of the fields of architecture, engineering, construction and facilities management
   B. Current information management practices in these fields
   C. Risks and liabilities associated with and resulting from current practices
      1. The information and process gaps (including silos of expertise) between the activities of professionals in each field
         a) Inefficiencies in terms of information sharing, information management, information flow, collaboration and value-based decision-making
         b) Interoperability of technologies that facilitate current practices
         c) Ambiguity of roles and responsibilities of teams
      2. Business and legal liabilities in terms of performance, costs, project timelines and wasted resources;
      3. Sustainability of design in terms of both environmental impact and building durability.
   D. Why Integrated Practice?
   E. Knowledge Management and Integrated Practice

II. Building Information Modeling ("BIM")
   A. Definition of Building Information Modeling
   B. An Overview of Building Information Modeling Technologies
      1. BIM for Architecture/Engineers
      2. BIM for Building Constructors
      3. BIM for Facilities Managers
   C. How BIM reengineers and improves the workflow and processes of interdisciplinary, cross-functional and geographically-dispersed teams in the building lifecycle.
   D. How BIM addresses information and process gaps
   E. How BIM addresses business and legal risks and liabilities
   F. How BIM facilitates (in conjunction with other analysis technologies) sustainability through computer simulation of environmental impact and variables

III. Early Adopters' Successful Case Studies

IV. The Opportunities that Knowledge Management Offers the Building Industries
   A. Newly defined roles, responsibilities and objectives as required by Integrated Practice
   B. Common model for describing increasingly diverse, complex and interdependent building information
   C. Practice- and industry-specific common views of information
   D. Common standards for organization and communication of expertise, knowledge and decisions between and among industry-specific businesses and their respective, interoperable technologies
   E. New technological capabilities and business support processes

V. Future Directions and Implications for Architecture/Engineering, Construction and Facilities Management Fields

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