**EMERGING TECHNOLOGY: FM IMPLICATIONS**

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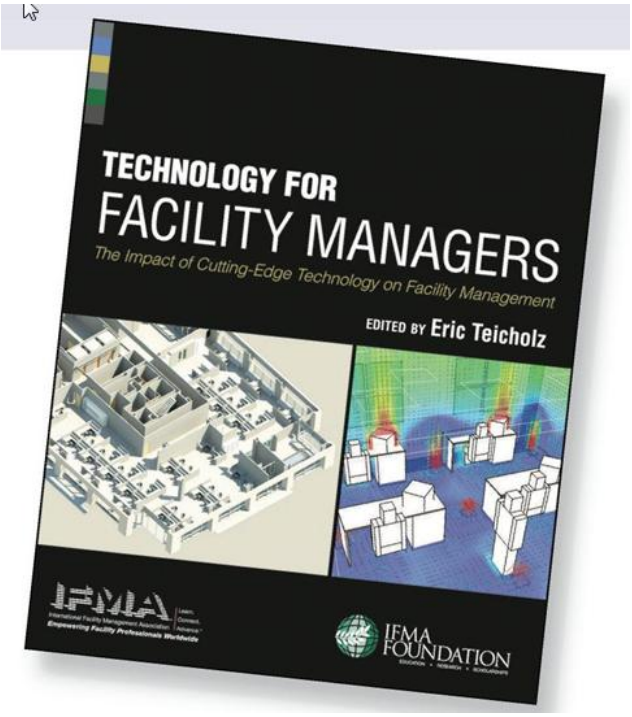


The *Emerging Technology: FM Implications* presentation is based on a recent book published by IFMA and the IFMA Foundation relating to this subject. The book consists of 13 chapters divided into two sections: Technology and Applications.

Each chapter covers a different technology and includes an overview and basic primer about the technology—the current use of the technology, how it's evolving, and how it will impact the practice of facility management in the future—and is complemented with case studies that address how the technology was implemented and the effect it had on the organization

Chapters and their respective authors include:

PART 1: TECHNOLOGY

Chapter 1 CAFM/IWMS- Balancing Technology, Processes and Objectives *Chris Keller*
Chapter 2 Building Information Modeling (BIM) *Louise Sabol*
Chapter 3 Building Automation and Control Systems *Terry Hoffmann*
Chapter 4 Roles of Geographic Information Systems (GIS) in Facility Management *William P. Witts, Jr.*
Chapter 5 Radio Frequency Identification (RFID) *Geoff Williams*
Chapter 6 Information and Communications Technology (ICT) *Richard Hodges*
Chapter 7 Workflow Technology — Knowledge in Motion *Paul Head*

PART 2: APPLICATIONS

Chapter 8 Sustainability *Louise Sabol*
Chapter 9 Condition Assessment in Facility Asset Management *James B. Clayton*
Chapter 10 Computer Modeling *Eric Teicholz*
Chapter 11 Technology in the Workplace *Erik Jaspers and Eric Teicholz*
Chapter 12 The Role of People and Process in Technology *Angela Lewis*
Chapter 13 Social Media *Dean Stanberry*

Brief outlines of the chapters are as follows:

**Chapter 1: CAFM/IWMS: Balancing Technology, Processes, and Objectives**

FM automation (CAFM/IWMS) primarily is viewed as an FM department tool that supports FM operations. The facility can be a key tool for the leadership of an organization to use to achieve its goals. Proper selection and implementation of these tools is critical in determining the current and future value these tools and the FM department has to the organization as a whole. Integrating organizational objectives with the selection and implementation process can ensure the FM department's successful support of these objectives. Facility managers need to adjust technology tools and processes well in advance of a problem's visibility in order to successfully address the new requirements for their customers. Proactively preparing the facility to address its inhabitants future needs requires analyzing trends in facility management, business and technology. New and future technology will facilitate the daunting task of achieving organizational objectives and more easily convey to leadership the value of FM to the organization. The advancing technology relevant to FM is in transition from providing feature enhancements to facilitating process and culture transformations.

**Chapter 2: Building Information Modeling**

Building information modeling (BIM) is a software technology gaining rapid acceptance throughout the architecture, engineering, and construction (AEC) industry. BIM incorporates the accurate 3D real-life geometry of a building, along with a structured information base of nongraphic data, providing detailed information about the building components. BIM has the potential to enable fundamental changes in project delivery by supporting the information needs of all stakeholders in the process from conceptual design through facility management. To date, BIM has been used most extensively in design and construction. Its adoption for facility management is less straightforward. BIM has the potential to offer a new level of functionality for managing buildings and the physical assets within them by offering an integrated information base rich in detail, and powerful by virtue of its capabilities to realistically visualize building environments. The next few years will see facility professionals and solutions vendors work in multiple arenas to leverage BIM's promise in order to deliver better information management to facility management. BIM is a robust information technology, offering a lot of potential for facility management; however, there are many challenges ahead in making the technology truly useful to FM. Facility owners are looking to utilize BIM to bring added efficiencies to their processes. The Military Health System (U.S. Department of Defense) are investigating automated tools to export data from their facilities planning programs into BIM models, demonstrating health care uses for sustainability and BIM.

**Chapter 3: Building Automation and Control Systems**

Facility managers rely on automated systems for monitoring and control of buildings they manage. In this chapter, the author describes the evolution of building automation systems (BASs) as energy management and control systems, their current use in FM, and how they are evolving, and presents a case study of a Florida university. The author summarizes BAS today as follows: "Building automation systems use current technology to provide safety for both occupants and assets. They contribute to the productivity of the enterprise by conserving energy and optimizing the efficiency of equipment throughout facilities and the people who are responsible for operating and maintaining them. They provide a foundation for sustainable programs and projects by providing the accurate and secure data required for decision making and verification." However, although this represents the current state of BAS, most buildings still maintain older stand-alone systems from multiple vendors. In turn, this results in extreme energy inefficiencies. Hoffmann explores what he believes the technologies that have the greatest impact on these factors: Harmonized standards, Wireless technology, Internet protocol (IP)-based control.

**Chapter 4: Roles of Geographic Information Systems in Facility Management**

Geographic information systems (GISs) is software for analyzing geospatial information (i.e., point, line, areas) tied to a global coordinate system. Because of this, GIS can perform certain types of analysis that cannot be done with traditional CAFM systems. Traditionally, GIS has not been used for FM applications. Rather, it has been used for applications such as land analysis, utility distributions, and asset management. Witts uses GIS technology for analyzing spatial components of a building such as floor

plans, building information, and utility structures. GIS can analyze vector, raster, and tabular data, and each has a role for FM applications. For example, vector data can perform traditional computer-aided design (CAD) analysis; raster data can analyze a building in the context of the other buildings using a vast array of existing geospatial databases; and tabular data can store attributes associated with vector or raster data or exist outside of a spatial reference. This chapter describes and illustrates both traditional FM applications as well as applications that traditionally fall outside the scope of CAFM or IWMS software. For example, location maps can depict the closest exit of a fire hydrant to a building; density maps might display population densities on a campus at different times of the day; and change detection maps can show how a facility has changed over several years. Finally, Witts presents a case study of how GIS is deployed at MIT for facility management applications—both inside and outside of a building.

**Chapter 5: Radio Frequency Identification**

Radio frequency identification (RFID) is a new technology that is just beginning to be adopted by facility managers. RFID uses radio waves to automate the identification of objects (e.g., assets, people). This is accomplished by storing data about the object within a microchip (an RFID tag) that is attached to an antenna. The tag is able to transmit the data using radio frequencies back to a reader which converts the radio waves back into digital information. These tags are very inexpensive and offer a host of potential applications for the facility manager. The chapter explores barcoding and RFP technology. Barcoding currently is used extensively for the tracking of furniture and equipment. In the past, the asset management of a facility relied heavily on barcoding systems for tracking a site's furniture and equipment. RFID differs from barcoding in a number of ways that are explored in the chapter. Finally, the chapter focuses on how this new technology is being used for facility management. Given the technology and characteristics of RFID technology, Williams discusses a number of FM applications that lend themselves to this technology.

**Chapter 6: Information and Communications Technology**

This chapter describes how the accelerating rate of innovation in information and communications technology (ICT) is shaping life in the twenty-first century, and the effect those changes will have on the design and use of commercial buildings. He identifies five major technology trends: Ubiquity, Mobility, Personalization, Virtualization and Visual Communication. For each of these trends, the author analyzes the behavioral effects of those trends and argues that FM professionals must understand and plan for operating in a world of technology-driven change. As an example, the chapter includes a review of wired and wireless communications infrastructure technologies and presents ideas for new "future-proofed" designs that reduce both cost and eco-footprint of ICT infrastructure. The chapter concludes with case studies that provide real-world examples of the new design approaches in various types of buildings.

**Chapter 7: Workflow Technology**

Workflow technology moves business forward by supporting enterprise requirements for transactional and human-centric processes. The facility management organization can leverage the extended enterprise to propel knowledge into motion. Evolving from imaging and transactional processes, workflow technologies have come a long way to support the more human-centric business requirements to positively affect every employee, manager, supplier and customer. Standards developed by the Workflow Management Coalition (WfMC) have helped establish an effective framework to support a common software development and communication method between diverse technologies that require workflow to drive their requirements. Documentation standards such as business process modeling notation (BPMN) benefit the organizations leveraging workflow and ensuring a common way for business process consultants to document the business requirements and technology consultants to implement the requirements. As a facility management professional, it is important to understand the basics of workflow and the significance of how it can influence daily life. Through a better understanding of the types of workflow and areas that can be effectively controlled by workflow solutions, you can leverage your expertise and current facility management technologies into a series of repeatable best practices. In a period of uncertainty and an ever-changing workforce, workflow technology can ensure a faster ramp-up for new employees, reinforce standard operating procedures for existing employees, and support

regulatory reporting for compliance. As with any benefit, to maximize your investment requires the necessary time to capture effective processes and correct broken processes to provide the highest yield. Whether interacting with multiple organizations to complete a task, monitoring systems to ensure maximum up time, or interacting with internal groups to communicate change, workflow technologies support facility managers to execute their strategic mission through the leveraged use of the extended enterprise.

**Chapter 8: Sustainability**

Buildings consume significant natural resources and have a vast impact on the environment. Building operation alone accounts for approximately 40 percent of U.S. primary energy use. A well-crafted plan to improve the environmental performance of facilities often will result in significant benefits to both the organizational bottom line and to our overall energy efficiency and independence. Owners increasingly will need to make informed decisions to control and reduce their facility's energy use in sync with the costs and efficiencies of their building systems. Software technologies are being rapidly developed and enhanced to support decision making on sustainability initiatives and energy analysis. One of these, building information modeling (BIM), offers a means of analyzing building designs for sustainability requirements and energy efficiency, and increasingly can interact with a range of external software applications for advanced analysis.

**Chapter 9: Condition Assessment in Facility Asset Management**

Facility asset management is an emerging, strategic approach to capital budgeting and optimal allocation of scarce funds for the repair, renewal, and modernization of aging facilities. The promise of facility asset management is that practitioners will reap budget success, reliable mission performance and grateful stakeholders. Advocates also claim the approach can control operational risk, reduce cost of ownership, prolong component life, eliminate unforeseen dollar demands and, thus, help optimize return on investment in facility performance. The author sets the stage for the chapter's main topic of condition assessment by discussing the origins of facility asset management, describing each phase of the process in detail, and explaining the role that condition assessment plays in one of the phases. Clayton then drills down into the four techniques of building condition assessment, describing in detail and with cited references the origins, characteristics, strengths, and weaknesses of each. The chapter concludes with guidance on how to decide which technique is best for an organization.

**Chapter 10: Computer Modeling**

This chapter presents an overview of computer modeling and simulation related to facility management applications. Following a brief review of computer models and simulation, the chapter describes four areas in which models have been successfully used: visualization, space allocation, facility asset management, and energy. Every model represents some simplification of a more complex reality to allow for the calculation of relevant variables (heat flow, stress, cost, etc.). Simulation models require external data input into the model because the universe of possible solutions for the model cannot be computed without such input. For example, an energy model designed to calculate an ENERGY STAR score for a building might have initial input from a variety of sources: from the user (e.g., building type, address, age), from pre-stored tables (weather conditions, energy costs for that location) or from building automation sensors (BAS) that automatically track and control energy usage for various assets.

Visualization models discussed in this chapter include CAFM and BIM. The BIM discussion is meant to complement the discussion included in Chapter 2 of this book. The space allocation discussion breaks down space management into its discrete inputs: space inventory, requirements, allocation, and planning/forecasting. Asset and energy management modeling are likewise discussed in this chapter.

**Chapter 11: Workplace Technology**

A key challenge for today's facility manager is to effectively adapt to change. Change caused by globalization, economics, changing work styles, and technology innovation directly impact the world of facility management, the services performed by facility managers, how they communicate, and the physical workplace itself. Traditional IT technologies such as computer-aided facility management (CAFM), integrated workplace management systems (IWMSs), computerized maintenance management system (CMMSs), and geographic information systems (GISs) as well as new mobile, collaborative, workflow, and sensor-based technologies are valuable tools for facility managers that increasingly will impact the workplace. The scope of new and emerging tools is vast and the FM needs to understand not only the technologies but when and how to apply them so as to realize the greatest benefit for the organization. The facility manager needs to establish priorities regarding what to automate and be able to understand the potential impact of that technology on the workplace. Factors such as the type of organization, available resources, culture, and IT competency level must all be taken into account. This chapter is designed to assist the facility manager in understanding these traditional and emerging technologies, their impact on the workplace, and when and how to apply them. Numerous examples of how these technologies are being used are likewise presented. In this manner, facility managers not only are assisted in acquiring an understanding of relevant technologies available, but how and when to apply them.

**Chapter 12: The Role of People and Process in Technology**

Technology is a foundational part of the daily responsibilities of facility managers. In fact, IFMA defines facility management as "a profession that encompasses multiple disciplines to ensure functionality of the built environment by integrating people, process and technology."[AU: pls replace with complete footnote] The focus of this chapter is to discuss the importance and interactions between people, process, and technology. Although the concepts discussed within the chapter can apply to many facility management technologies, the chapter uses energy and maintenance management software to frame the discussion. The chapter first discusses some fundamental concepts and definitions. The chapter then provides an overview of the challenges that result when technology, people and process are not balanced during a technology planning and implementation project. The chapter acknowledges current needs using examples from energy and maintenance software planning and implementation projects. The discussion of current needs is followed by a discussion of what is needed to support emerging technologies. The chapter closes with two case studies. The first case study provides an overview of how to use a building automation system (BAS) to benchmark and improve energy efficiency within a lab building. The second case study summarizes the importance of people and organizational roles within a software enterprise system integration project, with an emphasis on lessons learned.

**Chapter 13: Social Media**

Social media has infiltrated most everyone's professional and personal life. Whether you herald its arrival or curse its existence, you can't escape its impact on the world around you. In step with the swell of technological advancement, social media is evolving at a pace seemingly beyond our capacity to absorb. The objective of this chapter is to strip away the irrelevant and focus on the elements of social media that matter to you professionally. We start by providing a historical perspective on the evolution of social media. While it may seem revolutionary, it has, in fact, evolved over the past 30+ years, beginning with the introduction of the personal computer in 1982. Next, we explore facility management–focused social media, pointing you toward a wealth of FM knowledge. Finally, pointers are offered on making social media work for you. In this age of shifting priorities and tenuous employment, everyone needs to maintain a professional edge. Social media is one of the many vehicles at your disposal to maintain that edge—but it does not happen without some effort on your part. Ultimately, engaging in social media is a matter of personal choice.