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Seeking Higher Ground: Navigating the FM Industry's Transformation

MARK MOBACH, NANCY SANQUIST & JEFFREY SAUNDERS

Introduction

In October 2021, the International Facility Management Association (IFMA) launched its new research entity supported by an international, multidisciplinary Research Advisory Committee.¹ IFMA Research's objective is to advance insights and discussions on best contemporary practices and emerging industry-critical issues among a global community of highly engaged practitioners, scholars and students to catalyze transformation in the facility management (FM) industry. The following white paper describes the strategic direction for IFMA Research activities. Through these interactions and conversations, we hope to inform and form a community of evermore resilient practitioners transforming the built environment and society for the better.

Facility management has recently met several inflection points that call for new working methods; therefore, IFMA must foster and facilitate discussions to help set a new course for the industry. FM should build upon a history of innovation and use the field's complexity and multidisciplinary to its advantage. By understanding current and emergent end-user needs and societal requirements, FM practitioners can identify new opportunities for future development. By understanding how building layers interact across disparate time scales, facility managers can enact systemic change for the benefit of end users, organizations and communities. Facility managers have an opportunity to be at the forefront of transformative change and lead the industry to higher ground. IFMA Research will help inspire that journey.

¹ IFMA (2021) "IFMA Focuses on the Future of Facility Management" (October 12) IFMA News. <https://www.ifma.org/news/whats-new-at-ifma-new/research-advisory-committee-oct-2021/>

I. Inflection points – rapidly shifting the industry's future direction

Significant changes have accelerated and shifted the FM industry's future direction. For example, workers no longer need to come to the office to be innovative, collaborative or productive. Digitizing assets and operations provides opportunities to close gaps and develop new services. Several concurrent environmental crises have made us aware of buildings' massive ecological footprints, which must be reduced, mitigated and remediated. Buildings' impact on people's health and well-being has amplified facility management's role in creating cleaner, safer environments. In summation, these inflection points create vast opportunities for those facility managers amenable to developing new mindsets, business models and services.

Workers do not need to come into the office. The COVID-19 pandemic shifted many knowledge workers into distributed workers. Before the pandemic, the average number of work-from-home (WFH) days doubled every 12 years in the United States. In 2019, approximately 5 percent of all workdays were WFH. Now roughly 30 percent of all workdays are WFH – a sixfold increase corresponding to 30 years of pre-pandemic growth compressed in a little over two years.²

Evidence does not support that knowledge workers (approximately 45 percent of the workforce and growing³) must come to the office to be innovative, collaborative and productive. Innovation exploded during the pandemic. A recent study by McKinsey & Co. showed that business formation (registrations of new businesses) increased during the pandemic along with patent registrations – filing activities grew across the 150 authorities according to the World Intellectual Property Indicators.⁴ These advances "required people collaborating remotely, leveraging technology in different ways, and being bolder with innovation, automation and digitization."⁵ How can facility managers integrate emerging technologies like avatars, avatar-based virtual worlds and persistent video to create digitally integrated physical spaces to transform working environments into places people clamor to use?

Digitizing assets and operations provide opportunities for new business models and services. Unsurprisingly, the pandemic catapulted many organizations – including FM organizations – into a digital-first orientation.⁶ Before the pandemic, studies identified that FM practitioners had relatively low technological knowledge and were complacent about the profession's digital future.⁷ The FM industry is now rapidly digitizing assets and operations. Digital technologies are critical for developing solutions for the industry's most vital challenges in occupant health and well-being, pollution control, energy and materials use, and more. Technology uptake is now catching up with other digitally enabled industries. A 2021 assessment of the global PropTech sector identified 2,045 companies in 66 countries that raised US\$12.05 billion in funding from 1,809 investors for new technology solutions.⁸

The digitization of the FM industry will enable organizations to reinvent industries, substitute products and services, craft digital businesses, reconfigure delivery models and create new value propositions. The digitization of the FM industry will also transform required skills and competencies. With robots, digital assistants, chatbots, digital avatars, VR/AR headsets and other interfaces, we are amid a cobotic

² Nick Bloom (2022) The Future of WFH. Stanford Executive Presentation (July).

³ Nick Bloom (2022) The Future of WFH. Stanford Executive Presentation (July).

⁴ "How virtual work is accelerating innovation" (2022). McKinsey & Company (June 6).

<https://www.mckinsey.com/business-functions/operations/our-insights/how-virtual-work-is-accelerating-innovation>

⁵ "How virtual work is accelerating innovation" (2022). McKinsey & Company (June 6).

<https://www.mckinsey.com/business-functions/operations/our-insights/how-virtual-work-is-accelerating-innovation>

⁶ Jeffrey Saunders (2022), Leading the Digital Transformation. IFMA. (forthcoming).

⁷ IWFM, (2018) "Embracing technology to move FM forward"

⁸ PropTech Global Trends 2021 Barometer (2021)

revolution in which workers work alongside machines. As technology automates and augments, technology enables FM organizations and workers to do things that were once impractical, requiring new skills and competencies.^{9,10} How will FM operations transform in ways that support individuals' ability to control the information that is shared? What skills and competencies will facility managers need to be successful?

Buildings' ecological footprint is enormous, and facility managers must reduce the impact. Buildings' environmental footprints are massive and need to be reduced. The construction and building sectors are responsible for 33 percent of global resource consumption¹¹ and 40 percent of global waste.¹² Operations are also a significant challenge as building operations account for 80-85 of real estate's total energy usage.¹³ Given that most office environments go unused during working hours,¹⁴ there is much to be done to make operations more sustainable. For example, what can facility managers do to decrease buildings' greenhouse gas impacts? How can facility managers reduce, narrow and close materials, energy and water flow into and out of the built environment? How can the built environment and surrounding areas restore local biodiversity?

The built environment impacts health and well-being. The COVID-19 pandemic crystalized how the built environment affects health and well-being in people's minds. People spend 21 hours a day indoors, where concentrations of indoor air pollutants can be two to five times higher than outdoors.¹⁵ However, poor air quality is not the only indoor environmental health challenge.

The built environment can directly and indirectly effect physical, mental and cognitive health. For example, dementia and Alzheimer's patients adjust better to smaller, homier facilities. People living and working in crowded conditions often experience psychological distress; and a lack of access to daylight leads to increased depressive symptoms.¹⁶ What spaces and services can facility managers provide that will improve the quality of the indoor experience and increase occupants' physical, mental and cognitive well-being?

As the above inflection points suggest, the FM industry faces several complex challenges over the coming decade and needs insight, knowledge and thought leadership to move to higher ground. Traditionally, facility management has supported the primary process of an organization by ensuring that the built environment is fit for purpose and by providing services that fulfill end-user needs. These activities have often been completed independently of other support functions.

This approach is no longer sustainable. Facility managers can only develop effective solutions when they consider them holistically, which requires a multidisciplinary mindset. Understanding how one potentially positive solution could negatively affect another is critical. For example, digital technologies could increase the built environment's environmental footprint through increased e-

⁹ WEF, (2022) Digital Transformation of Business

¹⁰ Jeffrey Saunders (2022), Leading the Digital Transformation. IFMA. (forthcoming).

¹¹ Ellen MacArthur (2019) From Principles to Practices: Realising the value of circular economy in real estate. Acharya, D., Boyd, R. and Finch, O. A Report of Ellen MacArthur Foundation and ARUP.

¹² Ness, D.A. and Xing, K. (2017) Toward a Resource-Efficient Built Environment, A Literature Review and Conceptual Model, Journal of Industrial Ecology, 21(3), 572-592, DOI: 10.1111/jiec.12586.

¹³ Sharma, A., Saxena, A., Sethi, M., Shree, V., and Varun (2011) Life cycle assessment of buildings: A review, Renewable and Sustainable Energy Reviews, 15(1), 871-875, DOI: 10.1016/j.rser.2010.09.008.

¹⁴ Ellen MacArthur (2019) From Principles to Practices: Realising the value of circular economy in real estate. Acharya, D., Boyd, R. and Finch, O. A Report of Ellen MacArthur Foundation and ARUP.

¹⁵ EPA (2022). Report on the Environment: Indoor Air Quality. <https://www.epa.gov/report-environment/indoor-air-quality>

¹⁶ G. Evans (2003) "The built environment and mental health" Journal of Urban Health (December). <https://pubmed.ncbi.nlm.nih.gov/14709704/>

waste and energy consumption through distributed ledger technologies, the Internet of Things, platforms, and virtual and augmented reality concepts.¹⁷

While the FM industry needs a multidisciplinary mindset to deal with these inflection points, the industry should not forget its long history of innovation. Facility managers should infuse the reshaping and repurposing of the built environment with inventiveness and abundant industry expertise. Through research, we can unlock, understand and use ingenuity and expertise wisely, creating a relevant and trailblazing evidentiary base.

¹⁷ European Commission (2022). 2022 Strategic Foresight Report. https://ec.europa.eu/info/strategy/strategic-planning/strategic-foresight/2022-strategic-foresight-report_en

II. A History of Innovation

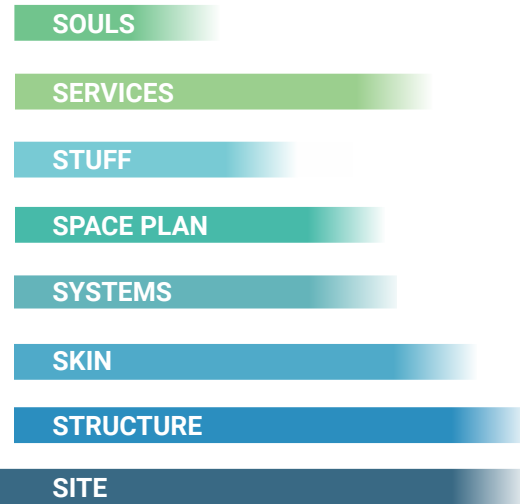
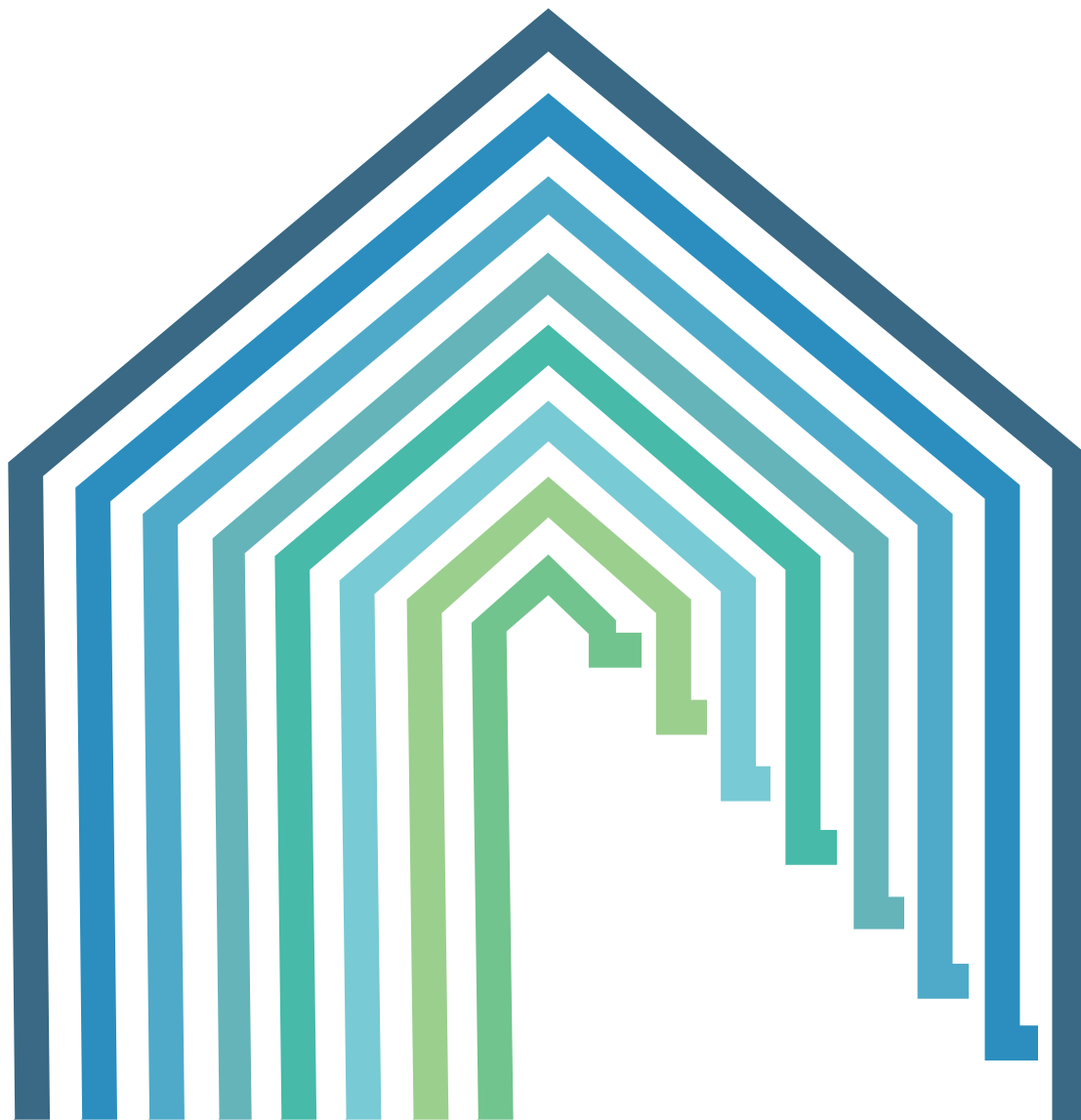
A common assumption is that facility management is a young discipline; it is not. The FM industry has a long, rich tradition. Current and future facility managers should not ignore this history when creating the future industry. Ancient buildings had custodians and perhaps even location managers, and building operations in support of organizations have a longstanding tradition in practice and science. For example, in the 1859 book “Notes on Nursing,” British social reformer, statistician and founder of modern nursing Florence Nightingale reported on topics that we now classify as facility management. Under her supervision, hospital mortality rates dropped by 32 percent due to improved air circulation, better cleaning and daily trash removal.

Examples from the early 1900s include “The Modern Hospital,” which demonstrated the coherence of hospital building, laundry logistics and related work processes,¹⁸ and “Business Building,” which describes the built environment of offices, factories and shops, along with organization principles combined with interior design, lighting and ventilation.¹⁹ Plans, buildings and research have always marked new ideas about organizations. Examples extend back to the 18th century, but more recent examples include the Bürolandschaft movement (1961, Germany, office), “Evidence-Based Design” (1984, U.S., hospital), and “Sick Building Syndrome” (1984, WHO, office). This relationship will continue as new interactions among places, processes and technologies emerge and reshape the role of place in value creation. These interrelationships continue to drive research interest, and ongoing areas for future research include organizational space, biophilic design, new ways of working, healing environments, intelligent workplace, healthy workplace, hybrid working and more.

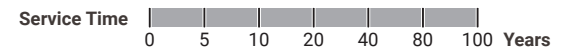
How will place, people, processes and technologies interact to create new requirements for the FM industry? To answer this question, we must understand how the built environment's components interact and define how the focus within the built environment shifts from form and function toward experience. Then, we must define the contours of the FM industry to provide a concise basis for our argument.

¹⁸ J. Hornsby & Schmidt. (1913). The Modern Hospital

¹⁹ F. Sharles. (1923) Business Building



SCALE



III. Shearing layers of change – building components and how they interact with each other

Facility managers should understand built environment components and how they interact with the organization and people. This understanding will help facility managers integrate new frameworks like the Baukultur Quality System (presented in section IV) into practice. The built environment consists of nine shearing, or pace layers, which change at different times. An intervention at a fundamental layer (e.g., site selection) can last 50 or more years. In contrast, an intervention at the level of "stuff" (e.g., furnishings) is more ephemeral, lasting only a few years. Due to the interaction of these layers, no two buildings, even ones constructed and owned by the same operator, are ever identical. Extending earlier work²⁰ and tailoring it to facility management,²¹ we have defined the shearing layers as follows:

1. Scale	2. Site	3. Structure	4. Skin
5. Systems	6. Space Plan	7. Stuff	8. Services
9. Soul			

1. Scale. A building never stands alone and is embedded in a larger-scale system of buildings and infrastructure. On our way to work, we may drive on highways, streets and alleys; pass bridges, traffic lights and intersections; and observe other buildings along the way. We also envisage an individual building embedded in a broader family of buildings: a building complex, industrial zone, shopping mall, business district, neighborhood, campus, village, district or city. All are imprinted in our minds, establishing a mental map through a built environment to a destination.
2. Site. A building is grounded on a lot or occasionally could be floating on water. A site may be hidden by the construction or bordered by pavement, garden or fence. Arrival at the building communicates much about the organization to the trained eye. Looking down and around the site serves as a signifier of an organization. Its population, sobriety, neglect or care are often evident at first glance. These immanent visual messages act as a daily dose of "this is how we do things here," immersing people in a meaningful geographical setting from the gate to the entrance.
3. Structure. A building consists of a foundation and loadbearing components, like the roof, walls and floor. A roof may be carried by wall, beam and column, transferring its weight to the floor, transverse a ceiling, then to the wall, beam or column below. They do so repeatedly until the roof's weight hits the foundation. Together, these primary forms define the interior spatial possibilities for organizations from attic to basement. The structure frames the opportunities for organizational resilience and change. When columns and side-bearing walls replaced internal load-bearing partition walls, it created previously unattainable wide spaces with enormous flexibility of use over the building's life expectancy.
4. Skin. A building's exterior consists of a facade with a door and windows and possibly a balcony, veranda or gallery. This layer is the building's main connector to the surrounding world – from the outside-in and inside-out. The skin shows its shape, size, colors, textures and cladding to the environment. Doors regulate accessibility, allowing people to enter and leave. Windows define connectivity and privacy, enabling users to affect their well-being by providing views of the world and the ability to regulate light, fresh air, temperature and noise levels.

²⁰ S. Brand. (1994). How buildings learn: what happens after they're built. New York, NY, USA: Viking., F. Duffy. (1977). Office interiors and organizations: a comparative study of the relation between organizational structure and the use of interior space in sixteen office organizations (dissertation). Princeton, NJ., and R. Koolhaas, J. Westcott, B Davis, T. Avermaete, R. Bego, S. Trüby, M. Mostafavi, Izdatel'skaia gruppa AMO, Harvard University. Graduate School of Design, & International Architectural Exhibition (14th : 2014 : Venice, Italy). (2014). Elements. Marsilio Editori Spa.

²¹ M.P. Mobach. (2009). Een organisatie van vlees en steen. [In Dutch, An organization of flesh and stone]. Royal Van Gorcum.

5. Systems. A building contains a complex array of technical systems. These systems are often invisible, hidden behind or incorporated into ceilings, walls or floors. They significantly impact a building's functionality. Such systems are the building intestines and often constitute the world of engineers with installations, fittings, piping, wiring, sensors and routers. These systems regulate the supply of water, air and electricity. They provide heating and cooling, artificial light and access to the internet. They drain and dispose of waste materials. Systems provide for Maslow's basic human needs – nourishment, hygiene, safety and security – so people can work, learn and socialize no matter the time or place.
6. Space Plan. The non-supporting walls and partitions constitute the space plan. These walls and partitions provide designers or planners with many possibilities to limit or expand main spaces within a building. A designer or planner can decrease or increase the size of an area, affecting the size of a group that can use a space. The space plan can divide or connect humans. The following elements and their spatial positioning determine a space plan: stair, escalator, elevator, ramp, corridor, fireplace and toilet. These elements create a spatial logic or grammar that denotes how a building should be understood and read. The space plan defines group formation, working routines, social structures and chance encounters.
7. Stuff. The stuff inside mediates users' experiences within buildings. Stuff includes furniture, furnishings, and the use of materials and colors, including art, plants and signage. It is the most appealing layer for many, as stuff viscerally affects our senses. Its condition can make a space aesthetically, ergonomically and acoustically pleasing. Its state determines how users experience buildings. The interior architect or designer can use these elements to create a targeted atmosphere, absorb or amplify sound, brighten or dim a building, or nudge people in the right direction.
8. Services. Buildings need a wide array of services to maintain a built environment and serve its inhabitants. A building needs reception, catering, hospitality, safety and security services. For example, the site may need gardening services. Surrounding pavements or roads need sweeping, and various machines need repairing or replacing. Security services assure that the right people access the building and ensure occupant safety and security. Windows, floors and furniture need regular cleaning. These services are critical for a building's upkeep. Services fulfill people's physiological needs, including safety, belongingness and comfort.
9. Souls. The final sheering layer is also the most fleeting. It consists of the human layer and how occupants experience a building through the human senses. We perceive and judge the building and its other eight layers quickly. We attribute meaning to a building, which can make a significant or terrible impression. A building can make us happy or inspire us, and it can also frighten or repulse us. Spaces can be socially engaging and help us with the things we need to do by stimulating human interaction, providing structure to our work, or providing affordances to help us concentrate on a complicated task. Buildings are more than mere spatial containers; they are living spaces where the quality of life can be felt and experienced.

Understanding how these sheering layers interact is critical for designing and retrofitting more people-oriented, sustainable buildings. For example, senior leaders in many organizations have imposed net-zero targets, and facility managers must make buildings more carbon efficient. In many cases, facility managers try to achieve carbon neutrality goals by focusing on level 5 – Systems – interventions. FM teams remove emissions from the building by replacing gas-powered HVAC systems with heat pumps. Often, they do so without considering changes to the building envelope, level 4 – Skin. By changing heat pumps (level 5) without considering changes to the building envelope (level 4), they are, in effect,

making buildings colder and less welcoming for occupants (level 9 – Souls). Colder environments are not only less comfortable for women, they also impact women's cognitive performance.²²

The built environment encompasses many professional disciplines that finance, develop, plan, design, build, operate, maintain and recycle its components. Facility management is one of these disciplines and is one of the few that works closely with other professions like real estate brokers, architects, interior designers, contractors, engineers, urban planners, environmentalists, technologists, sociologists and more. Strengthening facility managers' multidisciplinary is vital to the industry's future.

IV. The built environment – integrating the quality of place

The quality, not just the efficiency, of place is now an important focus area among policymakers, especially in, but not limited to, the European Union. Every year, global elites convene in Davos, Switzerland, to discuss the most critical social, economic and political issues. In 2018, the built environment was the central focus, and the European Ministers of Culture adopted the Davos Declaration in response to the problems they saw in existing physical places. Based on this declaration, the Davos Baukultur Quality System (BQS) editorial team formulated a system to guide professionals to ensure that the quality of future places, including historical sites, is better than what we experience today.²³

The European Union has now focused on building culture through the New European Bauhaus initiative that combines the focus on beautiful and sustainable spaces.²⁴ This section will present the principles of the BQS as well as other frameworks in the United States to inspire facility managers to create higher quality spaces and places by fostering a connected culture within a place and linking it to the surrounding community outside. Facility managers should also engage in critical discussions shaping future policy concerning the built environment and community development.

The BQS places experience on par with form and function, and experience affects occupant behavior. Yet, most in the built environment have focused on the form and function to describe the places we live, work, play and learn. As we digitize our spaces, we hear the cry to "build back better" and focus on experience as the physical environment changes. Having an experience/quality management system is critical as new phygital (physical and digital) experiences emerge and digital avatars, digital twins, AR/VR interfaces, voice-activated assets and more integrate into the built environment.

Baukultur is a German concept. In English, it means the culture of building or the building of culture. The idea builds upon ambitions expressed by Howard Davis in his 2006 book, "The Culture of Building," in which he describes a "hope for a new century, as the quality of buildings and cities, is re-emerging as a central responsibility and challenge."²⁵ The Davos Declaration codifies Baukultur, and the BQS describes eight criteria for defining and managing high-quality places, which are:

• Governance	• Functionality	• Environment	• Economy
• Diversity	• Context	• Sense of place	• Beauty ²⁶

²² T. Chang et al. (2019). "Battle for the thermostat: gender and the effect of temperature on cognitive performance." Plos One (May 22). <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0216362>

²³ Swiss Federal Office of Culture (2021). The Davos Baukultur Quality System: Eight Criteria for high-quality Baukultur. Berne.

²⁴ European Commission (2021). New European Bauhaus. https://europa.eu/new-european-bauhaus/index_en

²⁵ H. Davis (2006). The Culture of Building.

²⁶ Swiss Federal Office of Culture (2021). The Davos Baukultur Quality System: Eight Criteria for high-quality Baukultur. Berne.

The Davos Declaration and the Baukultur Quality System promote a quality-built environment. They define the places that make up the built environment and what a quality place means. Places are:

- For residential use, work, leisure and infrastructure (we add learning)
- Made up of spatial components with physical dimensions and geographic locators
- Built structures, as well as in-between spaces (e.g., stairways, hallways and pathways)
- Visible or invisible (e.g., archaeological sites below ground)
- Existing (historical or not) and projects in construction
- All types of scale, sizes and configurations of buildings, interiors, neighborhoods, districts, campuses, regions, countries, continents, oceans, landscapes, infrastructure and parks in urban, rural and suburban locations
- Created by human activities and experiences

The problem with many of today's places is that they often are unsustainable and lack quality or could even be called "placeless." They are typically poorly fit for their functions, and the people who use them find them dull, ugly and lifeless. In addition, many buildings are unsafe or have unhealthy interiors. The BQS "stresses the central role of culture for the quality of the built environment." These quality places:

- Are well-designed and change in line with society's needs while preserving their historical characteristics
- Are fit for purpose, sustainable, safe, comfortable and healthy
- Focus on social needs and sustainable use of resources and economic value
- Promote overall quality of life, subjectivity and a sense of community
- Ensure attractive, diverse and inclusive cities, villages and open landscapes.²⁷

Focusing on high-quality places is not only a European phenomenon; organizations in the United States have developed similar programs without governmental endorsement. These programs and the BQS can inspire facility managers with new frameworks for improving the quality of their spaces and places. For example, the New Urbanism movement focuses on high-quality urban design, the International Living Future Institute (ILFI) emphasizes creating sustainable places, and the Academy of Neuroscience for Architecture (ANFA) concentrates on the interplay between buildings and human cognition and behavior.

New Urbanism created alternative building codes for adoption by local governments to help guide design decisions (i.e., Form-based Codes). This movement was started in 1991 to develop new standards for taking our cities back from an auto-centric view of city planning. The ILFI created the Living Building Challenge to promote sustainability measurement through certification.

ANFA fosters collaboration among architects and scientists from the Salk Institute and the University California San Diego (UCSD) in La Jolla, California, USA. Their work has increased our knowledge of the interplay between the built environment and human beings. Dr. Michael A. Arbib, an active participant in ANFA, wrote an influential book in 2021, "When Brains Meet Buildings." He stated, "understanding 'how the brain works' is a major motivation for this book and that buildings provide a key locus in

²⁷ Swiss Federal Office of Culture (2021). The Davos Baukultur Quality System: Eight Criteria for high-quality Baukultur. Berne.

which the intertwining of the social and physical offers fresh challenges for cognitive- and neuroscience."²⁸

Key ANFA members have participated in two interesting international dialogues on potential frictions when integrating Baukultur and new technologies like cybernetics and artificial intelligence into the built environment. One such study was published in the 2019 issue of *Intertwining*; the other in *The Plan Journal (TPJ)* in 2021. Both studies deal with the concerns that arise in the intermingling of the arts and science. For example, one key challenge focuses on how we create community when digital technologies foster virtual communities over local ones and when urban and physical design reinforces these trends. According to the architect Kevin Roche, "the most important thing one can achieve in any building is to get people to communicate with each other. That is central to our lives. We are part of a community. The old villages did that, and then we destroyed all that in the 19th century when we started to build these vast expansions where there was no center and no community." For example, developers often plunk down office buildings in neighborhoods with little or no effort to connect the community inside the organization to the surrounding area.

The focus on BQS and other frameworks promoting high-quality spaces demonstrates that the built environment consists of more components than just buildings. The term that best describes this is "places." Yet, urban planners have given this word a single connotation in the United States and other countries. According to U.S. urban planners, places refer only to "public" areas. Therefore, "placemaking" describes the process of creating more people-oriented streets, neighborhoods and public spaces.²⁹ Place should have a broader connotation, and facility managers should be at the forefront of redefining place and placemaking. Facility managers should, by implication, define place maintenance's role in upholding high-quality places.

Facility managers can foster a sense of community by enabling a connected culture within a place and linking it to the surrounding community outside. Facility management plays a crucial role in "maintaining and improving the existing qualities of a place."³⁰ Therefore, facility managers must participate in the "continuous inclusive dialogue and professional and societal debate...for discussion on quality criteria and what constitutes them to achieve a common and established understanding among people (experts and non-experts) of what distinguishes high-quality Baukultur."³¹

²⁸ M. Arbib, (2021) *When Brains Meet Buildings*. Oxford University Press

²⁹ The definitions of place and placemaking have traditionally been based on the observations of Jane Jacobs and William Whyte in the 1960s. Later, Fred Kent took these concepts and created the Partners for Public Spaces (PPS), which advises on revitalizing downtowns and neighborhoods (the guidebook is "How to Turn a Place Around").

³⁰ Swiss Federal Office of Culture (2021). *The Davos Baukultur Quality System: Eight Criteria for high-quality Baukultur*. Berne.

³¹ Swiss Federal Office of Culture (2021). *The Davos Baukultur Quality System: Eight Criteria for high-quality Baukultur*. Berne.

V. Facility management – multidisciplinary is key to success

The FM industry is multidisciplinary, connecting fields within the built environment with people and organizations. Ideally, a built environment is responsive to an organization's wants and needs. In turn, an organization appreciates the necessary investments in the built environment. Combined, these enable better organizational performance through better coherence.

Unfortunately, this vision remains far from reality. Many spaces do not work. We stumble upon them daily. Too many classrooms do not work for teaching. Too many office concepts lead to significant staff dissatisfaction. People often get lost in buildings, and hospitals lack facilities where people can give a dignified farewell to loved ones. We have too many spaces that cause problems with end-user experiences or the work that needs to be done, imposing costs, pollution, safety and even health impacts. Why are we unable to fix it? Why is it so hard to get things right? Is the problem too inscrutable? Where is our learning imperative? As organizations continue to digitize operations and assets, which function will ensure their coherence and performance – FM or IT departments?

Organizations are in constant flux, and facility managers should identify opportunities for synergy through a better-built environment. Changes, small or large, put pressure on the initial fit of the building and organization, eventually turning it into a misfit. In many organizations, decision makers are busy with primary functions rather than supportive ones. Whenever possible, they seek to cut costs and find ways to build and procure cheaper services. They prefer to invest in people rather than bricks and mortar. However, this is misguided. There are many opportunities in which facility managers can create synergy and add value to the business with a fit-for-purpose built environment. Developers, architects, engineers and real estate professionals – many acting outside the organization and within a project management structure – detrimentally lack a profound understanding of the organization and how to make the built environment fit for purpose and flexible.

We believe facility management can address these issues. Positive change is within reach. Consider new office concepts: Workplace professionals often complain that people do not use them properly and that management must increase efforts to make them work. While this contention may be correct, it is nonsense in most cases because designers can design spaces in which people immediately make the right choices and feel well.

In the first quarter of 2022, Global FM reported that facility management is a US\$1.15 trillion global industry, with an estimated 2.5 million professional practitioners and industry participants worldwide.³² As a thriving global industry instrumental to organizational success, employee experience, and efficient and responsible building operations, facility management can play a crucial role in connecting management and design, "leading the future of the built environment to make the world a better place."³³

Facility management is the most knowledgeable sector on building operations. FM practitioners engage with end users and the building throughout its lifetime.³⁴ FM activities are multi-faceted and firmly nested in different phases and related fields. FMs are well-informed about developments in architecture, design, engineering, science, ICT, hospitality, cleaning, security and catering. Facility management can connect spatial (re)design with organization and service (re)design. Facility managers can infuse their experiences and knowledge into the concept, design and building phases.

The scope of FM responsibilities is vast; however, the industry's success comes from achieving coherence among the built environment, organization and users. Facility managers know where, and

³² Global FM (2022). Global FM Metrics. <https://globalfm.org/about-fm/>

³³ IFMA (2021). IFMA Announces New Vision, Mission and Launches Refreshed Brand, Website (April 21) <https://www.ifma.org/news/whats-new-at-ifma-new/ifma-announces-new-vision-mission-and-launches-refreshed-brand-website/>

³⁴ Neufert, E., Neufert, P., & Kister, J. (2012). *Architects' data* (4th ed.). Wiley-Blackwell.

under what circumstances, people are either happy and productive or discontent and ineffective. Applying experience and insight in building management, operations, conditions and use, facility managers can help unlock designers' creativity to meet the demand and expectation of all stakeholders: deliver a built environment that works.

To continue to add value to the built environment, FMs must stay abreast of changes in society, business and the industry; and engage in thought leadership surrounding environmental sustainability, digital transformation, work and workforce change, interwoven work and workforces organizations, and change in an interconnected world. As the next section attests, the industry faces several transformational stresses, which can be alleviated by research.

VI. Areas for future research

The facility management industry faces systemic change, constituting all layers of the building system and considering its different constituents and interdependencies. For example, new technologies and digital practices allow architects to build seemingly gravity-defying buildings, enable users to demand evermore personalized needs, and facilitate better responses from facility managers to user needs. Changes at one level of the system, even seemingly minor ones, can lead to change in every corner of the system. In the following section, we categorize challenges and transformative trends impacting the facility management industry into five systemic areas of change. These areas represent multilayered, cross-disciplinary and interwoven change, influencing different layers of the built environment. Each area involves various fields of practice, research and education.

Change is a permanent factor in facility management; it has always been present, is here to stay and will continue to influence the business. However, recent developments have created disruptive change, led to a greater awareness of global interdependencies, and have awakened previously dormant possibilities for better performance.

The subsections below describe challenges for which the industry should prepare. For each section, we suggest research topics that could be explored by IFMA Research or by others to create a better understanding of changing dynamics.

Environmental Sustainability

Research floods us with bad news daily about environmental challenges and impending risks to society and the built environment. Forty percent of U.S. residents lived in counties hit by climate disasters in 2021, and 80 percent lived in counties that experienced heat waves.³⁵ While the public, and many FM practitioners, often ignore these risks, experts advise us to act. Inaction to climate change and other natural disasters bear costs. According to insurers like Swiss Re and Aon, natural disasters caused economic losses of between US\$283-343 billion globally in 2021.³⁶ According to Swiss Re, 50 severe flooding events caused combined losses of US\$80 billion, whereas only US\$20 billion was insured.³⁷

Even the slightest change can have an enormous impact on the FM sector. Facility management can drive change through how FM practitioners choose to design, build, finance and operate buildings. Facility managers can develop interventions that mitigate climate effects and risks from natural disasters. Such interventions require construction or retrofitting for more energy-efficient buildings (e.g., better insulation), recommending different construction materials and utilizing sustainable energy. But it also requires that FM practitioners go beyond zero emission, self-sufficiency, and existing regulations, standards and certifications.

Facility managers must consider mitigating the impacts of climate change and natural disasters on operations. Mitigation efforts include on-site energy production and storage, alternative methods for water management, and different procurement and waste management strategies. For example, the possibilities to produce sustainable energy seem endless: wind turbines, solar panels, hydropower, tidal power, geothermal energy and ground-coupled heat exchangers. This energy can be stored in batteries of vehicles, buildings or districts or in hydrogen to accommodate fluctuations in supply and

³⁵S. Kaplan and A. Ba Tran (2022) "More than 40 percent of Americans live in counties hit by climate disasters in 2021." (Jan. 5). Washington Post <https://www.washingtonpost.com/climate-environment/2022/01/05/climate-disasters-2021-fires/>

³⁶Aon. (2022). Weather, Climate and Catastrophe Insight. <https://www.aon.com/weather-climate-catastrophe/index.aspx> L. Bevere. F. Remondi (2022). Natural catastrophes in 2021: the floodgates are open (30 March). Swiss Re. <https://www.swissre.com/institute/research/sigma-research/sigma-2022-01.html>

³⁷L. Bevere. F. Remondi (2022). Natural catastrophes in 2021: the floodgates are open (30 March). Swiss Re. <https://www.swissre.com/institute/research/sigma-research/sigma-2022-01.html>

demand. Facility managers could deploy wadis, plants, climate roofs and walls, and large water storage capacity in facilities to adapt to heavy rainfall and mitigate drought risks. Using dikes and terps - North European artificial dwelling mounds - we can protect ourselves from rising sea levels and flooding rivers. These new water conservation and management techniques in operations could smooth more wild fluctuations in water availability during wet and dry seasons (e.g., water tanks in buildings, campuses or business districts). Even guerrilla gardening and dry toilets can help to adapt to climate change.

Procurement and waste management strategies can reduce the use of virgin materials and secure zero waste with fully degradable, renewable, or reusable products and packaging, a transition from plastics to bioplastics. Production and service processes do not have to pollute: Buildings can be created that produce rather than consume energy, and processes can be designed to clean rather than pollute the air, water and soil. The FM industry, supported by smart technologies and dashboards in our buildings, can help management make the right decisions and users develop sustainable behaviors.

FM operations can combine nature-based solutions with the restoration of biodiversity and mitigating the impacts of climate shocks. Some of these solutions, at first glance, could appear to be a nice-to-have environmental gesture. But they could have direct bottom-line benefits. For example, a green roof can provide hard cash in facility operations as they often have better insulation and better water management, which offer longer roof lifespans. These benefits also need to be balanced with the costs of green roofs stemming from gardening/maintenance and replacement. However, this can be calculated and managed. The FM industry needs to develop and deliver interventions and provide evidence that these interventions are accurate, repeatable and reliable.

FM practitioners can source products and services for their buildings, products and services locally, reducing transportation footprints. Applying biomimicry and circularity to the built environment can provide nature-based solutions, contribute to preserving species, and stimulate awareness and fun among staff and the local community.

Facility management is no longer only about pest control, mowing lawns and trimming hedges. FMs should help restore biodiversity in their communities, paying special attention to inviting in other life forms with care. FM organizations can use sites for green-blue strategies to support endangered species with trees and flowers that attract birds and insects, and with beehives, nesting cabinets and wadis, combining methods to help endangered and non-hazardous species with climate adaptation. Rewilding is now a beautiful alternative to formal, high-maintenance gardens responding to the natural, local environment.

As the above suggests, the FM industry needs change agents and new methods to boost sustainable practices. These practices could attract the attention of new workers to the industry – young and old. Moreover, waste and pollution cost money, but finding new ways to fit more smartly into value networks can tap into new revenue streams. But is it true? Waste is said to be food for another part of the supply chain and can generate money, and new strategies contribute to new business models. Still, as with all investments, research needs to substantiate these claims with evidence on sustainable interventions' return on investment and payback time. The following provides some suggestions for areas for future research.

Research topics

- What is the current impact of facility management on global warming and biodiversity? How can our industry help reduce buildings' environmental impacts?

- How can facility management transform buildings' destructive impacts into positive ones for the environment and local community? How can these transformations be integrated with materials passports, buildings as materials banks, circularity concepts, extended life expectancies and the tradeoff between investing in new technologies given the embodied carbon on materials?
- How can the built environment and related services contribute to climate adaptation and mitigation and restoring biodiversity? What related (social) cost-benefit analyses of such interventions can be used to develop actionable business cases?

Digital Transformation

Two years of the COVID-19 pandemic have done more to transform organizations than any other change initiative. Organizations have adopted new technologies and work modes at unprecedented rates, and McKinsey & Co. estimates that organizations accelerated the adoption of technologies by a minimum of six to 10 years. For most people, the consequences of this transformation introduced the concept of hybrid working, transforming not only where but how they work. However, digitization and technological change have more fundamental impacts through automation and augmentation (enabling organizations and workers to do new things that were once too expensive, dangerous or impractical). Automation and augmentation will transform how we live, work, play and relate to one another. Digitization and technological change enable organizations to reinvent industries, substitute products and services, craft digital businesses, reconfigure delivery models and create new value propositions.

For workers and creatives, digitization and technological change transform the talent equation by requiring new skills and competencies and empowering them through cheap, powerful tools. These tools enable workers to offer their skills and services free from geographical constraints and compete against established companies.

Accelerated adoption of technology impacts how and where organizations create and add value; it affects buildings' role in value creation and how facility management companies organize operations and serve core organizations and end users. While digital transformation and the shift toward hybrid ways of working pose several significant challenges, they represent only a few of the many tests and transformative trends concurrently shaping the facility management industry.

Technology gives the industry incredible opportunities for better-built environment performance. Sensors provide a continuous flow of information about the state of the building, its use and performance. An intelligent built environment can help the industry predict maintenance, inform service providers where to intervene, and forecast the number of building users and related demand for catering services. It also reports where congestion emerges, where people like to work, and where potentially unsafe or dangerous situations occur.

Developments also include new platforms, the proliferation of networked devices, cybersecurity, distributed ledger technologies, new human-machine interfaces, robotics and information management systems. These changes can potentially support facility management and organizations with better-informed decision making, let alone the spin-offs from big data and artificial intelligence. The enrichment of data sources offers excellent promise for management and research.

Such technology allows facility managers to monitor processes and behaviors and intervene whenever necessary. However, many facility managers, as well as scholars, struggle with these abundant data streams. How to understand its relevance, how to order and select it, and how and where to use it? What structure, what dashboards, what interventions and what learning loops? While there is still a

lot to discover, it is evident that building technology has the potential to create better buildings. However, new topics emerge from these abundant possibilities, such as: How ethical is it?

Linking the built environment to individuals' behaviors, perceptions and physiological responses can be a rich research strategy. It allows our community to learn and, by doing so, to design and build better buildings. The opportunities must be balanced through methods and processes guaranteeing individuals' anonymity and privacy. The FM industry should help with technology studies and advance understanding of how buildings can be better built and used while securing user privacy.

Upon designing, building and maintaining a built environment, digital worlds also provide a rich base to improve organizational performance. Building information modeling and digital twins can help with the (re)design, (re)construction and maintenance of the built environment. This information allows designers, constructors and decision makers to understand what bulb, brick or beam to produce, when to deliver, and when to repair or replace. It can also support increased sustainability, as with a materials passport informing management which building parts are where, what condition they are in, and how these can be reused and in what way.

Virtualization, simulation, virtual reality, augmented reality and gaming can help FMs understand and forecast the interrelatedness between the built environment, people and organization. It can support data collection and advance user involvement because visualization of a building design in advance of its actual use, preferably with agent-based modeling, can boost the imagination of future users. Studies show that when such models are coupled with an organization's key performance indicators and research results, it allows design refinements, avoids failure, and creates a better fit between building and organization.

Research Topics

- How can technology help to make better buildings for organizations? How can we use information technology to create learning loops that professionally and academically advance the FM industry?
- Virtualization took the design and production of a new engine from 7-8 years to 12-18 months. How would that work for buildings? How will building design and operations affect how end users perceive and interact with buildings as interfaces?
- As industries digitize, they tend to invest more in technology and less in their workers. How can FM transform and break with the digital transformation norm?
- What are the ethical dilemmas of our business when applying new technologies? How can these dilemmas be understood, respected and wisely immersed in contemporary facility management practices?

Work and Workforce Change

The global workforce had markedly different experiences during the COVID-19 pandemic. Workers in critical jobs (e.g., health care, education, security, cleaning), or who lived under unfavorable socio-economic conditions (e.g., less developed countries, low income, unskilled) had to work. Moreover, idle workers (e.g., hospitality industries and performing arts) were simply forbidden to practice their profession. The remaining healthy workforce worked remotely in an unparalleled worldwide experiment. The Organization for Economic Co-operation and Development (OECD) reported that in Australia, France and the U.K., 47 percent of employees teleworked during lockdowns in 2020.³⁸ Bloomberg recently reported that U.S. office occupancy rates are at about 43 percent of pre-COVID levels and that companies are struggling with workers who prefer to work from home at about 30

³⁸ OECD. (2021). Teleworking in the covid-19 pandemic: trends and prospects (Ser. OECD policy responses to coronavirus (COVID-19). OECD Publishing.

percent.³⁹ It is a potent reminder from our occupants that workplaces may not always be as good as we like to think.⁴⁰

All daily work routines changed abruptly when the pandemic hit. Commuting and workplace routines dissolved, and new practices emerged in workers' homes. Remote work drastically changed physical, social and mental ratios.⁴¹ The workforce became spatially grounded and socially digitalized, and the knowledge workforce became both mentally relaxed and strained. Vacant properties underlined a nearly physically empty but digitally vibrant world. Initially, many workers appreciated more time at home. When quarantine progressed, workers felt increasingly isolated and mentally exhausted. This blurring of online and offline worlds coincided with a new flow of atypical micro-mindset changes between work and home that emerged from hybrid working. It made place as a concept harder to grasp and introduced the conundrum of how to support a new world of work.

Facility management repeatedly faced abrupt, erratic challenges requiring quick thinking and reorganized priorities. They had to adapt new safety regulations, support home offices and home services, and find ways to mitigate mental stress. Facility managers had to reopen contract discussions concerning rent, maintenance and other services. Subsequent discussions concerned cleaning, ventilation, aerosols and returning workers. Even though many buildings were empty, the industry was tasked with developing new solutions in a high-pressure environment.

Facility managers supporting critical occupations faced even more stringent demands. On top of immediate response actions, facility managers had to introduce additional behavioral changes into the built environment. These interventions included new user logistics and work routines, cleaning and hygiene practices, food practices and seating arrangements. FM organizers had to ensure strict compliance with changing regulations and requirements at the risk of being fined or shut down.

These pressures created new insights into the industry's capabilities. Facility managers can pivot quickly amid sudden dramatic events. Facility managers have many response scenarios to support the organization's operations and workers both on site and remote that can be deployed for another pandemic. Many organizations also discovered the benefits of digital tools, finding that a number of in-person activities such as job interviews, staff meetings and training could be accomplished online. For organizations that did not (or could not) shift to virtual work, digital tools did not lead to fundamental organizational or work changes.

While beneficial for many, remote work can come at a cost. According to studies by Gallup, remote workers experience more negative emotions than on-site workers. Remote workers are more likely to report being anxious, sad, worried, lonely, stressed, depressed and bored than on-site workers.⁴² Simple structures and basic guidelines can help workers to stay well, wherever they work. The body benefits from good ergonomics, good food, physical activity, mental breaks, fresh air and natural light. As social beings, we also need contact with other members of our social ecosystem. Real-life encounters, taking walks, running errands – diversifying our interactions and surroundings help us feel more connected to our community and our world, which makes us feel better. It is important to note that women, minorities, and introverted and sensitive workers report being happy and more productive at home. Facility managers should recognize that one size does not fit all.

Research Topics

³⁹ A. Wooldridge. (2022). Workers Are Winning the Return-to-Office War Because They're Right. Bloomberg. April 25.

⁴⁰ L. Kaplan. (2018). *Excess-the factory*. (J. Carr & J. Pap, Trans.). Oakland, California, USA: Commune Editions.

⁴¹ H. Lefèbvre & D. Nicholson-Smith. (1991). *The production of space*. Oxford: Blackwell

⁴² Gallup (2022). Gallup's Insights: the Gallup CHRO roundtable briefing.

- What implications do the pandemic, digitization, and the focus on identifying synergies among the built environment, organization and user have on the future of the facility management industry, including future competencies?
- How can the industry identify and promote working practices that improve the lives of frontline workers?
- How can facility management help workers and organizations to find a new balance between WFH and on-site work? How can this be done with a balance between work in physical, social and mental spaces?
- What is the role of place in an increasingly digital age? How do we build, nourish and maintain social communities physically as well digitally? How do we integrate the functional needs of organizations with the cultural, spiritual and natural conditions of people? How to do so among an increasingly remote and hybrid workforce?
- What can the industry learn from its responsive actions during the pandemic? How can these actions be understood and improved, and how should lessons be shared with peers and students?

The Interwoven Work and Workforces in an Organization

Facility management consists of two primary, interwoven workforces: one facilitating the other. The FM industry keeps the built environment accessible, safe and clean, and prepares, executes and manages contracts. Facility management is involved in construction and reconstruction projects and purchases of necessary and replacement equipment.

Margins in the industry are relatively low, and the business is under constant pressure for cost efficiency. Cost reductions, or the threats of them, are the order of the day. This pressure permeates how the industry is structured and managed, potentially threatening its effectiveness, social sustainability, inclusion and ethicality. The question is: How has the pandemic affected frontline workers in the FM industry? The International Labour Organization (ILO) reported that inequality deepened within and between countries during the pandemic, hitting a more vulnerable workforce – young people, women, migrants and lower-skilled workers – the hardest.⁴³

If the industry can prove the financial and social impacts of its interventions on the organization, workers and society, the FM industry has the potential to reverse this trend. For instance, an extreme focus on cost reductions in air treatment could affect air quality in a building. What impacts could this intervention have on workers and the organization? Could it push ethical boundaries by negatively affecting workers through sick building syndrome or transmission of building-related illnesses? Other risks are related to an overreliance on cost-cutting, including adverse effects on productivity and sick leave, negatively impacting organizations' performance and putting worker relationships on edge.⁴⁴ Conversely, and more importantly, we need to ask ourselves: What investments improve workers' and organizations' performances?

The built environment, related facility services and organizations should be viewed as one system. The interlinkages and how facility managers can use them to create positive change in organizations need further investigation – specifically how interventions in the built environment change people and organizations for the better. Facility managers need further research on the relationship between the built environment and related services on organization strategy, structure, culture, efficiency, profitability and competitiveness.

⁴³ ILO, International Labour Organization. (2021). Work in the time of COVID. Report of the Director-General. ILC.109/Report I (B). Geneva: International Labour Office.

⁴⁴ EPA, Environmental Protection Agency. Office of Air and Radiation. (1991). Indoor air facts, no. 4 : sick building syndrome. United States, Environmental Protection Agency, Office of Air and Radiation.

Practice should support academics with targeted funding. This support would allow scholars in facility management to take the lead with research and invite other disciplines to participate. Other research participants could include architecture, interior design, construction, engineering, art and spatial planning, as well as related areas in management and organization studies, service design, real estate, hospitality management, data science, neuroscience, anthropology, environmental sciences and psychology. Next to facility managers, we need users and other practice experts to support our research. Other practice experts could include environmentalists, visualization and gaming experts, technologists, sustainability experts, occupiers, service providers, owners, design professionals, builders, property developers and investors.

Research Topics

- How do human activities, with a particular focus on work, intersect with places and spaces that need to reflect a different nature of work, cultures and needs, locally and worldwide?
- What is the new role of facility management in organizations? How can it help design a built environment that is aesthetically pleasing and advances workers' productivity, health and well-being, both in their homes and organizations?
- And as inequality deepened during the pandemic, how can facility management advance inclusion?

Change in an Interconnected World

The global economy is strongly interconnected: Work is assigned to the producer that delivers the highest-quality resource, product or service at the best price. Such structures have promoted a flourishing global trade, and recent developments have also clearly exposed mutual dependencies and vulnerabilities in existing supply chains. The chain is only as strong as its weakest link. The Russia-Ukraine war is reversing the global recovery from the pandemic⁴⁵ and is leading to energy crises across Europe and food shortages in the Middle East and Africa. Multilateral efforts to respond to the humanitarian crisis, prevent further economic fragmentation, maintain global liquidity, manage debt distress, tackle climate change and end the pandemic are essential. These interventions show how interconnected the global economy is. Such developments create a demand for increasing responsiveness through unstable and insecure supply chains with new types of partnerships. Moreover, geopolitical developments can cause severe damage to existing supply chain relations and a need to create different, more local-oriented supply chain partners and producers.

Research Topics

- How can facility management increase its responsiveness through unstable supply chains? What kinds of partnerships can help create more stability?

Conclusion – The Facility Management Shot

In response to these trends and challenges, facility management organizations can develop new frameworks and models, products and solutions, and industry development pathways. The industry must collectively challenge assumptions about the future around which the industry has traditionally operated and team up with facility management academia to succeed on this metamorphic journey. As with most things, assumptions are fundamental to decision making. Assumptions provide quickly accessible representations of how things work, which can be very helpful in an increasingly complex world. They can also have adverse effects and limit change: Assumptions can prevent people from considering new ways of working and retrain biases that reinforce the status quo and hinder innovation and evolution, resulting in stasis. Research can give facility management a shot to provide

⁴⁵ IMF (2022). World economic outlook - war sets back the global recovery. April. Washington, D.C., USA: International Monetary Fund

a solid evidence base for these much-needed systemic changes. Scientific insights into these emerging areas should allow the industry to improve organizational performance and values, engage with different stakeholders, accelerate sustainability practices, increase emphasis on health and well-being, and create new methods for the evolving built environment inclusive of the flow of related new technologies while at the same time, making the world a better place.