The FM Road Ahead: Technology – The New Frontier

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In our last article, we highlighted some of the key areas where the FM implementation of technology has been adopted. The FM world was already undergoing change before the COVID-19 pandemic hit. That change has been accelerated due to the workplace requirements for a transition to a *new* or *next* normal work environment. A recent Frost & Sullivan study states "The global Facility Management (FM) market is going through a major transformation driven by technology innovation, new business models, emerging value propositions, competitive disruption, and creative new service offerings." While we were already on this path to leverage the integration of the Internet of Things (IoT), the recent pandemic has made the adoption of relevant technology mandatory. The study further indicates "The future of FM is technology enabled and Coronavirus 2019 (COVID-19) will accelerate the use of digital technology. The Internet of Things (IoT), Big Data, and advanced connectivity will drive efficiency for both service suppliers and client. To recover and grow in the wake of the COVID-19 pandemic, companies will need to segment growth opportunities into the Respond (short-term), Reset (mid-term) and Rebound (long-term) phases."

Based on these recent developments, it is imperative that FMs are prepared for the complex mandate that is unfolding. It is not sufficient to just manage the process. The interpretation of data from the building, workspace, and people needs to be coupled with FM strategies deployed in an agile approach. In this article, we touch on nine key elements (FM Challenges, The Learning Curve, Smarter Buildings, IoT & FM Changes, Data Analytics, Service Innovation, FM Strategies, IoT Standardization & Security, and Digital Twins) for consideration. It is an interesting time to be in this business.

FM Challenges & Technology Solutions

There are many challenges in FM today and there are various technology solutions to meet them. It can be overwhelming even for the tech savvy FM. In previous articles I have highlighted the urgent need for training of FM staff at various levels and the importance of working well together as a team. When it comes to People characteristics, I refer to this key element as the 4 C's. Communication, Collaboration, Coordination, and a Cohesive team. It makes a world of difference when it comes to problem solving and service delivery.

Recognizing the challenges and aligning with the relevant technologies only takes you halfway to achieving your strategic goals. The other part of the equation lies in the interpretation of how an individual solution will impact your organization and how these various solutions (usually from different vendors) will be managed with integration being a key consideration. While individual solutions can be effective when viewed in isolation with a particular use case or study, it is of critical importance that the costs, 3rd party integration impact with other solutions, management resources, and the related supporting software and hardware components are factored in.
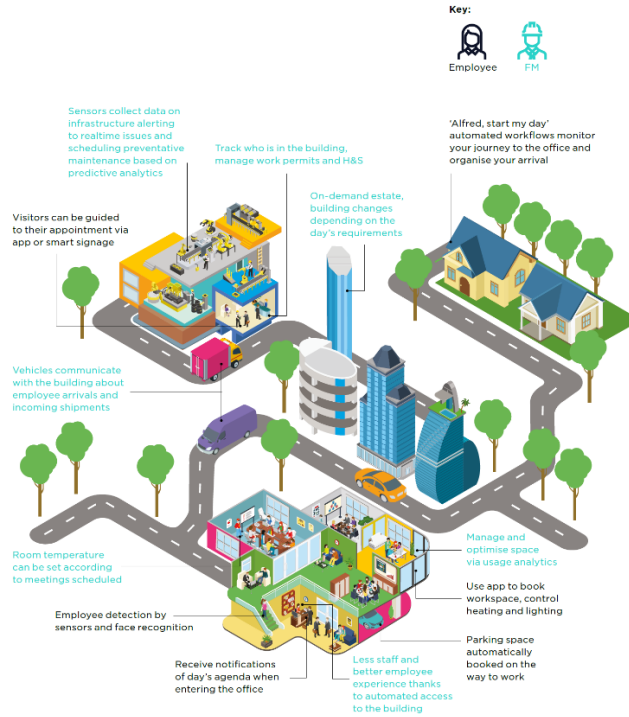
(Source: IWFM)

What is best solution or approach that addresses your needs for today and tomorrow? How easy will it be to adapt or change course based on new requirements? What are the dependencies when adopting a particular solution? And how well do different IoT applications work together if at all? Is there unnecessary duplication and redundancy (user accounts, dashboards, reporting,…) from different applications? When exploring options and potential solutions, the following attributes need to be substantiated; 1) technology impact with existing systems, 2) mobile application accessibility, 3) team collaboration capabilities, 4) security concerns, and 5) data & reporting features. These are technical considerations; however, cost and long-term commitment evaluation certainly form the basis of any decision for adoption of a technology solution.

Due to the many facets of the FM mandate, you need to look at what is the best solution that serves the needs of you organization while allowing for the flexibility to accommodate for change in the future, which will certainly be the case. The path you have chosen will make a difference in the latitude you will have (and the ease of transition) for meeting those future requirements.

Here are a few examples (courtesy of IWFM) of how FM is being served by technology:

FM area of interest	IoT application (current)	Practical example / use / scenario
Smart buildings	Sensor Controlled HVAC	Air conditioning/heating switched on at the optimum time based on the first booking in a meeting room to ensure the desired temperature is reached with minimal energy wastage.
	Smart navigation (including emergency evacuation).	A smartphone app can guide an occupant to their meeting room or a colleague. In an emergency, room signage devices use information from smoke sensors to lead staff to safety.
Resource Management	Sensors on resources – rooms, desks, parking spaces, providing real-time data on space usage and availability.	Staff can view hot desk and meeting room availability throughout the building from a reception kiosk or mobile app. Users can also search for the nearest available meeting room relative to their location or the location of their colleagues.
	On-demand estates.	A company with a flexible working policy can analyse their past and future hot desk bookings and realise demand for space is 50% lower on Mondays and Fridays. They close zones, floors and buildings to save on energy and personnel costs on these days.
	Embedded beacon in portable equipment.	Mobile equipment such as projectors and laptops can be tagged so their location can be tracked within an estate and alerts generated if they move outside of the estate boundaries. The objects can also be easily found within a given space.
Transport	Driverless cars, auto traffic management and navigation.	Users enter the vehicle and ask it to take them to work. The vehicle uses traffic sensors and mapping data to plot and execute the optimum route.
	Sensors collect data on infrastructure alerting to real-time issues and scheduling preventative maintenance based on predictive analytics.	Sensors indicate a dangerous motion on a bridge during high winds and automatically close the bridge and reconfigure lane usage on alternative routes. This also leads to automatically scheduling emergency maintenance checks. Sensors can also detect if an accident has occurred and notify the emergency services within milliseconds of the accident occurring.

FM area of interest	IoT application (current)	Practical example / use / scenario
Security	Implanted sensors to authenticate identity.	Removal of ID cards with the ability to have sensors implanted into hands. Doors and equipment will then use the IoT device to authenticate users.
Workspace Personalisation	Environmental and occupancy sensors. Workplace environments automatically adjusted to a user's personal preferences.	An employee books a meeting room and the booking and building system adjust the environmental elements such as light and temperature to the known personal preferences.
Health and Safety	Embedded identity tags on personnel or safety clothing or equipment utilised to check personnel files for appropriate training/authorisation for tasks.	Machinery will not switch-on unless they sense a personnel beacon associated with a suitably trained operative or an exit door to a secure area will not release unless a high vis vest is detected.
Security	Staff/pupil tracking inside and outside the building using sensors or beacons.	Built-in beacon in school uniform, staff card or implanted in the body to track the location of tenants. Facial recognition via camera could also provide data.
Well-being	Sensors to identify personal physiological levels, e.g. Alcohol levels, hydration levels, illness.	Personnel passively scanned upon entering the building for illness. Periodic 'at desk' scan or via wearable device to provide real-time well-being advice.
Transport	Driverless cars and auto traffic management and navigation.	Driverless cars and auto traffic management and navigation. Driverless cars will choose all elements of a journey from the route, speed based on traffic and weather information as well as minimising mechanical and environmental effects of the journey.
Wayfinding	Augmented reality wayfinding within a building.	Augmented reality allows people to navigate in an unfamiliar indoor environment.
Automated task allocation	An AI building management system will automatically allocate tasks.	Said system would analyse data and allocate task based on proximity, skill set, priority, etc.

FM area of interest	IoT application (current)	Practical example / use / scenario
Workplace well-being	Personalised workspace based on sensor data.	Staff member chooses a work area based on preferences of natural light, climate, noise pollution and population density, based on other bookings and real-time occupancy data.
Health and Safety	Sensors to identify risks in environmental elements such as a drop in air quality or noise pollution.	Within chemical or mechanical engineering, plants sensors are placed on all staff so that all areas of the plant where staff are operating have full environmental sensor coverage as well as enabling early warning alerts in that area.
	Sensors identifying physical risks such as over populated areas.	Flow sensors installed in a nightclub to monitor population within a space as people enter and leave.
	Occupancy sensors provide data on user presence.	Emergency crews utilise live occupancy sensor feeds to identify if, where, and how many people are in danger areas during an incident.
	Sensors detecting noise and vibrations provide data in an area or during an activity.	Exposure to vibrations for machine operatives can be monitored in real-time as well as analysed over time to provide data to avoid any over-exposure.
Security	Occupancy sensors or personalised tags indicate the locations of individuals in an estate.	Alerts triggered for unauthorised personnel in restricted areas as well as providing automated access for authorised personnel throughout an estate.
Cleaning and maintenance	Sensors on bins/containers.	Real-time data on bin/container capacity to help schedule collection and cleaning rotas.
	Sensors indicating which resources have been used and associated volumes.	On a Friday occupancy data indicates that only a 1/3 of the meeting rooms are used and therefore may need cleaning. The room signage and FM mobile app indicates whether the room needs to be cleaned or not.

The Learning Curve

Keeping up with all of these evolving technologies can seem like a daunting task. It is best to look at what your needs are from a higher-level objective perspective, then focus on key areas based on your priorities. For example, you only need to initially understand the overall architecture of a system with the key principles of operations before breaking it down into the technical details of a given system or component. How do the various components support each other and what do they achieve regarding outcomes or deliverables related to your mandate? Details are great but context is essential. Technology in and of itself does not have much value (other than the technical achievement on its own merit) until it is associated with an outcome and benefit. A technology innovation that leverages resources, assists in better decision-making and of course saves time and money! It could also represent an opening of possibilities not previously available or a new process and way of fulfilling your objectives (I won't burden you with the overused phrase of *paradigm shift*). But back to the learning curve. It can appear to be steep, but it doesn't have to be. With today's social media and industry/association collaboration, it goes a long way to educating those that are new to the FM profession (IFMA Engage and AFE Ask the Experts Digest come to mind) and generally improves knowledge sharing and information exchange for everyone, so it is much easier to learn an important topic, where there will be coverage from various qualified sources. You just need to sharpen your Googling skills! I would say that LinkedIn is another valuable resource with paid options for more features (great online learning application), however all subscriptions allow access to groups and the capability to interact with other professionals.

Here are a few online resources that you will find helpful:

https://www.fm.training/
https://www.facilitiesnet.com/buildingautomation/article/7-Steps-Help-FMs-Find-the-Right-Technology--18526
https://www.facilitiesnet.com/buildingautomation/article/Best-Practices-for-Implementing-Facilities-Technology--18527?source=part
https://facilityexecutive.com/2019/10/tech-trends-in-facility-management-the-2019-total-geeks-guide/
https://theafefactor.org/

Do not feel that you need to absorb all the required knowledge and learn everything you need to know overnight. Network with your peers, ask questions and apply your new knowledge where you can, and include those with more technical proficiency in any decisions that need to be made. The best approach is to stay engaged and set smaller goals and learning objectives. Learning is a continuous process that builds on your learning and practical experience over time.

Smarter Buildings

This is a hot topic that has many meanings and connotations. Smart Building? Intelligent Building? Smart Cities? They all encompass technology to provide a technology solution for managing these assets better. There is a lot of information that covers "smart buildings", with technology that continues to evolve rapidly in this area. Actually, smart buildings have been around for some time, even at a basic level, with an old legacy Building Automation System (BAS) or Direct Digital Control (DDC) system, as they were referred to, that helps manage/reduce your building energy consumption and provide automated control of your HVAC system. The difference today is that with the Internet of Things (IoT) and better technology, buildings can be "smarter" in the sense of what they can do (and how) to monitor and control the workspace as well as perform these essential functions more efficiently at a substantially reduced cost. Open architecture and protocols have also come a long way over the last ten years to offer many options for deployment without being stuck with a single vendor solution.

As mentioned previously in this article, you need to evaluate what is being offered from a particular vendor, as there are many solutions that will achieve the same goal, and take a look at how the selection of this vendor solution impacts other requirements that you may have for FM service delivery now and in the future. Does the solution scale well? Is it compatible with other applications or technology solutions that may have to be deployed?

There are certain standardized technology solutions that support an ecosystem of new IoT technology solutions, and they will continue to gain wider adoption. One technology that does stand out is the LoRaWAN® specification that has gained considerable traction since its' inception in 2015. You can explore this in much greater detail at the following links:

https://www.semtech.com/lora/what-is-lora

https://lora-alliance.org/lorawan-vertical-markets/buildings

IoT & Facility Management Changes

The urgent requirement for FMs to review and initiate a plan for people to return to work during the COVID-19 pandemic, while managing how they will ensure a safe working environment. This is the clearest example of the change that has been thrust into the forefront, as companies grapple with the challenge of having some workers continue to work at home, while others return to a new workplace environment that has completely different requirements today. Monitoring the numbers and assembly of people in designated building areas, in addition to real-time notifications to FM staff of important data that reflects the operating parameters for social distancing, contact tracing, air quality monitoring and disinfection, and other relevant technologies that support a proactive approach to maintaining a safe work environment.

There are other areas where IoT technology can be deployed to optimize FM staff time and tasks more effectively, such as a smart washroom system that notifies when dispensers need refilling, to the utilization of AI, ML, and predictive maintenance to pickup on trends and notify staff before a breakdown occurs.

The possibilities are endless with various IoT sensors and devices interconnected now and the development of standards for interoperability and security. After the training aspect has been dealt with, the focus will be on the utilization of all this data that is collected, so that actionable insights can guide FMs in their strategy and decision making where the processes still require people as an integral part of the workflow.

Data Analytics

In 2006, British mathematician Clive Humby first used the phrase "**Data is the new oil**", which today is even more relevant given the evolution of IoT (which generates a lot of data) and the demands for decision making in a complex FM environment. A word of caution though. Clive went on to say "Data is the new oil. It's valuable, but if unrefined it cannot really be used." So therefore, data without intelligence (analytics) is virtually useless. Thankfully, there are many tools that address this requirement, both 3rd party solutions that will interface with other applications and embedded tools that are incorporated as part of a technology platform. It's what we interpret and do with this data that is important. *Actionable Insights* that allow FMs with minimal training and an easy to use interface to extrapolate meaningful data for informed decisions with a reduction in risk is what really counts.


While Business Intelligence (BI) tools have been around for quite some time, they usually required an export/import operation into a database or datastore for subsequent manipulation and analysis. There are exceptions where applications would directly connect with different data sources and automate a large part of this process, however, this was typically in an enterprise solution that was only cost effective on a larger scale. Tools today such as Tableau and other applications overcome this barrier. Actually, I refer to the technology availability barrier here but historically, the main obstacle has been people, ironically enough. This was due to a lack of understanding, misalignment of organizational objectives, and expertise that was not readily available. A lot has changed since then and data analysis is now a core skill for many people, in varying degrees, throughout an organization. Dashboards and well-designed visuals articulate the required information for operational awareness and control. No more tabular reports (that were usually paper generated) and trying to pull out what is important in a sea of data. I am not sure if the term *Data Lake* used today to describe a repository of data was derived from this metaphor.

Service Innovation

Facilities management is a competitive business. It is much more than managing hard and soft services. Providing service is one thing and that can vary depending on the level of customer service engagement and the associated KPI's. *Service Innovation* is entirely another matter and the only parallel is the actual service that you are providing to your client or end user. The *delivery* and how you perform the service is what distinguishes the difference between mediocre and stellar. The monitoring and continuous improvement is what raises the bar to a much higher level. It is essentially the foresight, speed, and accuracy that you can deliver the services coupled with an appropriate feedback mechanism that ensures optimal client satisfaction that separates the winners from the losers.

Technology has evolved to support many new initiatives which improve the level of service to the client while optimizing efficiencies for the service providers. Virtual technicians utilizing highly skilled technical staff in off site locations but connected with in-house staff utilizing shared camera/video technologies allow for a timely response and remediation without the inherent delay and associated cost for the conventional approach to resolve an operational issue. The same can be said for *Drones* when it comes to site security and building or site inspections. Again, the technology supports and leverages existing FM staff (with the assistance of professionals) to fulfill the mandate with added flexibility and benefits to the organization.
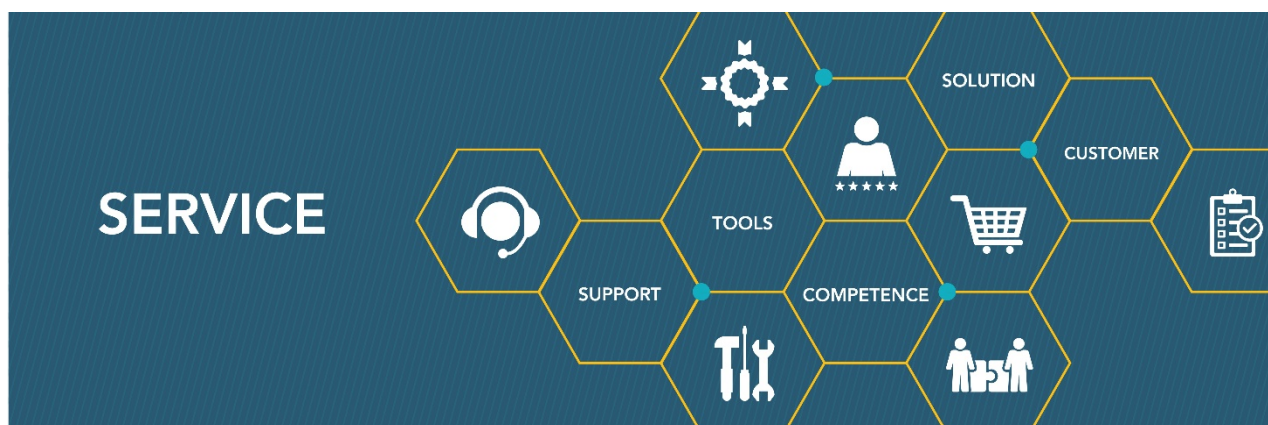
Innovation in service processes – new or improved ways of designing and producing services. This may include innovation in service delivery systems, though often this will be regarded instead as a service product innovation. Innovation of this sort may be technological, technique- or expertise-based, or a matter of work organization (e.g. restructuring work between professionals and paraprofessionals). *Wikipedia*

FM Strategies

Why have a strategy at all? Why not just be agile? Clearly that is a positive attribute to being responsive in a competitive market and demanding business environment, but that is not a strategy. Being innovative is good too but in and of itself, that is not a strategy either. *A strategy is* a framework built on knowledge and experience that can adapt as conditions change. A strategy is also synonymous with *the art of taking action under the pressure of the most difficult conditions (HBR: 5 Myths About Strategy, 2019).*

FM has been undergoing change for quite some time and those forces and parties that are driving it are well aware of the **business value** of a clearly defined strategy.

The following is stated in the recent (2020) "Digital Transformation of the Design, Construction and Management Processes of the Built Environment", Bruno Daniotti • Marco Gianinetto • Stefano Della Torre research paper:

The role of the facility managers—who manage the so-called "no core business"—has always been to support the needs of the Client by ensuring a high quality of building services, the efficiency of the infrastructures and the promptness of interventions. However, in the last years we have witnessed a paradigm shift in the Facility Management sector: Clients increasingly require service strategies aimed at predicting events instead of responding to them. The market is asking companies for an increasingly pressing level of flexibility and innovation, forcing them to migrate from the widespread traditional culture of doing to new strategies aimed at predicting future trends (Konanahalli et al. 2018). This shift marks the transition from corrective or planned strategies to preventive and predictive strategies.

The FM Landscape: Strategies

It is certainly beyond the scope and breadth of this article to delve into the detail that would be required to elucidate **FM Strategy** so all we can really do here is touch on the key elements of the overall FM Strategy and point you in the right direction. There are specific standards such as ISO 41000 (Facilities Management) and ISO 55000 (Asset Management) which provide substantial guidance to meeting the goals and objectives for the mandate in the FM world. The high level strategies outlined below reinforce this:

1) Technology Implementation Strategy
Leveraging the available options today, identify and explore the relevant technology solutions that serve the needs of your organization, keeping in mind the points made previously in this article.

2) Monitor and Control Service Performance Strategy
Employ real-time monitoring and collect data for the requisite analysis and action to prevent issues from occurring and reduce the time spent by personnel for on site inspections.

3) Operations & Maintenance Strategies
Where possible, implement Condition-Based Maintenance (CBM) and Predictive Maintenance programs utilizing the appropriate models and technology (analysis algorithms that use data collected by IoT sensors) to recognize patterns and prevent breakdowns before they occur.

4) Stakeholder Management Strategy
Utilizing the connected IoT ecosystem of people, devices and systems, ensure that all stakeholders have the necessary and relevant information to their specific area. This technology characteristic in conjunction with active FM department engagement will go a long way to ensuring an open communication channel and client satisfaction is maintained.

IoT Standardization & Security

The Internet and Internet of Things (IoT) have experienced exponential growth in several areas and it is a somewhat like the wild west in how this has evolved. Fortunately, there are the right folks and organizations moving forward with a keen focus on standardization, security, and stability. And not necessarily in that order. With market forecasts estimating 41.6 billion connected devices by 2025, it is imperative that industry standards are established as soon as possible. This will support secure configurations of systems that interoperate and serve the needs for FMs to manage various facets of the FM mandate.

Here are a few resources relating to IoT standards:

Open Connectivity Foundation (OCF)
https://openconnectivity.org/

ISO/IEC 20546:2019 Information Technology-Big Data-Overview and Vocabulary
https://www.iso.org/standard/68305.html

ISO/IEC 20924:2018 Internet of Things (IoT)-Vocabulary
https://www.iso.org/standard/69470.html

ISO/IEC 30141:2018 Internet of Things (IoT)-Reference Architecture
https://www.iso.org/standard/65695.html

LoRa Alliance
https://lora-alliance.org/
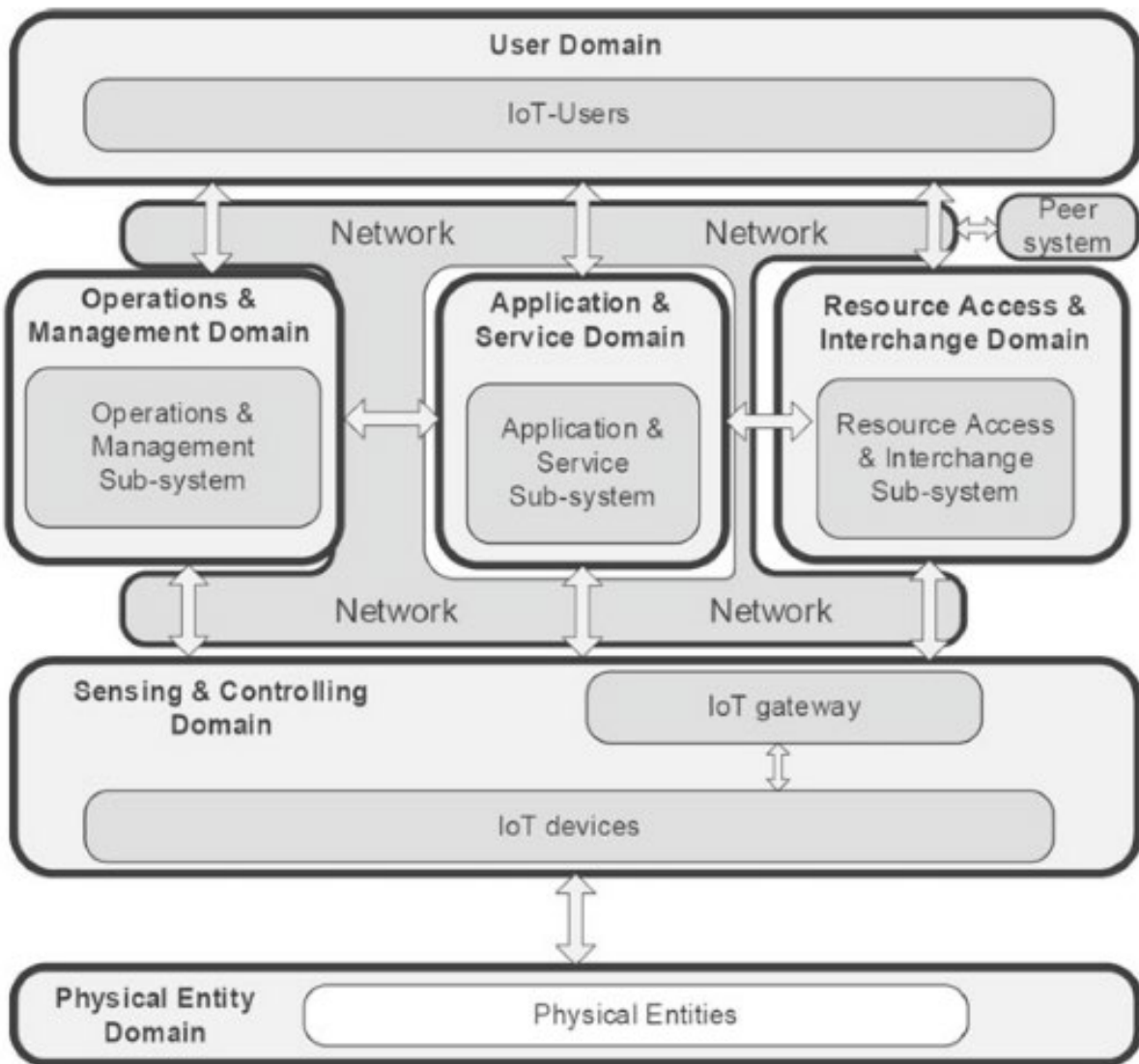
IoT Platform Architecture

Digital Twins

Digital Twins have been around for a few years, however, there is much more interest and development in this area now. Again, *caveat emptor* as there are several offerings that are usually tied to a particular vendor solution with its' inherent dependencies. Digital Twins expand on the conventional building automation system. It connects the physical and virtual world. Having all of the information about your building replete with nameplate data, detailed drawings and other important information allows facility managers to readily access this information and provide real-time insights for informed decision making. We will feature this topic in much more detail in a future article.

Conclusion

We've covered a bit of ground here to whet your appetite for further exploration and knowledge gathering. This is truly an exciting time to immerse yourself and provide value, where this expertise is in high demand in this ever-changing FM world.

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He is passionate about FM and actively engaged in the International Facility Management Association (IFMA), the IFMA FM Consultants Council (FMCC) and the IFMA Corporate Facilities Council. Wayne is also active in the Association for Facilities Engineering (AFE) and is starting the first chapter in Canada, in the GTA. Wayne is co-founder of Origen FM Services Inc., a company providing asset and facilities management consulting & technology solutions for various vertical markets. Origen FM is the first channel partner to introduce a new Virtual BMS IoT platform (https://www.blueiot.com.au/) to Canada and the USA. Wayne is also a principal in the Global Facility Management Alliance.

About GFMA

The **Global Facility Management Alliance** (GFMA) is comprised of some of the most highly experienced and respected facility and estates management subject matter experts to provide professional guidance and support for organizations that desire to achieve best practices, efficiencies, and greatest value for expenditures.

Allied with the premier FM and related industry professional organizations (IFMA, ProFMI, AFE, DRII, and others), the partners and associates of GFMA apply their expertise to optimize the diversity of functions and asset management for business enterprises in both public and private sectors around the world. Client engagements are varied and extend from operational process design for new sites to charting the transformation of existing operations toward best-in-class. The success of GFMA's holistic approach includes operational assessments and FM Analytics, staff development, strategy development, and a wide range of technology applications – all to maximize the contributions of the FM unit for the business.

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https://hbr.org/2019/04/5-myths-about-strategy