Data synergy in integrated facilities management: The key to clearer insights, smarter decisions and optimised operations

Received (in revised form): 22nd April, 2024

Chris Lilly

Senior Vice President, Technology, ESFM, Compass Group, USA

Chris Lilly *has, since joining ESFM's parent company Compass Group in 2001, served in technology leadership roles supporting vending, analytics, corporate technology solutions and, most recently, IFM. Chris' experience with systems, business processes and data have led to many exciting projects and innovations over the years. These include designing several systems that capture, manage and report remote data; implementing, refining and aligning back-of-house solutions; and designing mobile applications to support operations. Chris joined ESFM as the Senior Vice President of Technology in 2020, where he identifies strategic opportunities for division-wide technology solutions and services. He received his MBA from St. Thomas-Opus College of Business.*

Abstract

Today's corporate real estate landscape has evolved within the digital age. Operations, including hard and soft services critical to a facility's infrastructure and occupant experience, can now produce vast amounts of data to better adapt, generate reports and optimise resources. Many facilities, however, are not reaping the rewards of technological advancements because of solutions operating in silos. Data is being cobbled from disparate streams, leading to inefficiencies and a burden on operational leadership. This paper explains the paradox within integrated facilities management (IFM), wherein five or ten standalone applications that do not interact with each other are often used to perform vertical functions. By looking at how other industries have approached similar challenges, including the emergence of enterprise resource planning, standalone buildings, and those within a corporate real estate portfolio, can integrate technology solutions and processes for a more synergised approach. This move can lead to clearer data both at unit and above-unit levels. Combined with the power of artificial intelligence (AI) and machine learning (ML), infinite variables can be incorporated into processes via smart technology to maximise the impact of resources, including labour, critical systems and infrastructure. From data-driven cleaning to asset management, integration opportunities abound. Whether enhancing existing platforms or seeking new technology solutions to broaden functionality, it is critical to understand the power of synergy.

Keywords: technology, integration, software, building systems, data-driven decision making, AI

DOI: 10.69554/WDHR8572

Chris Lilly

INTRODUCTION

Consider this paradox: why do integrated facilities management (IFM) service providers use so many standalone software solutions (see Figure 1) to manage and run their operations? Should it not be that *integrated* FM operations use *integrated* software platforms to run their business and support the operators managing that work?

ESFM,
Compass Group,
1550 Liberty Ridge Drive,
Suite 110,
Wayne, PA 19087,
USA

E-mail: chris.lilly@compass-usa.com

Corporate Real Estate Journal
Vol. 14 No. 1, pp. 75–85

2043–9148

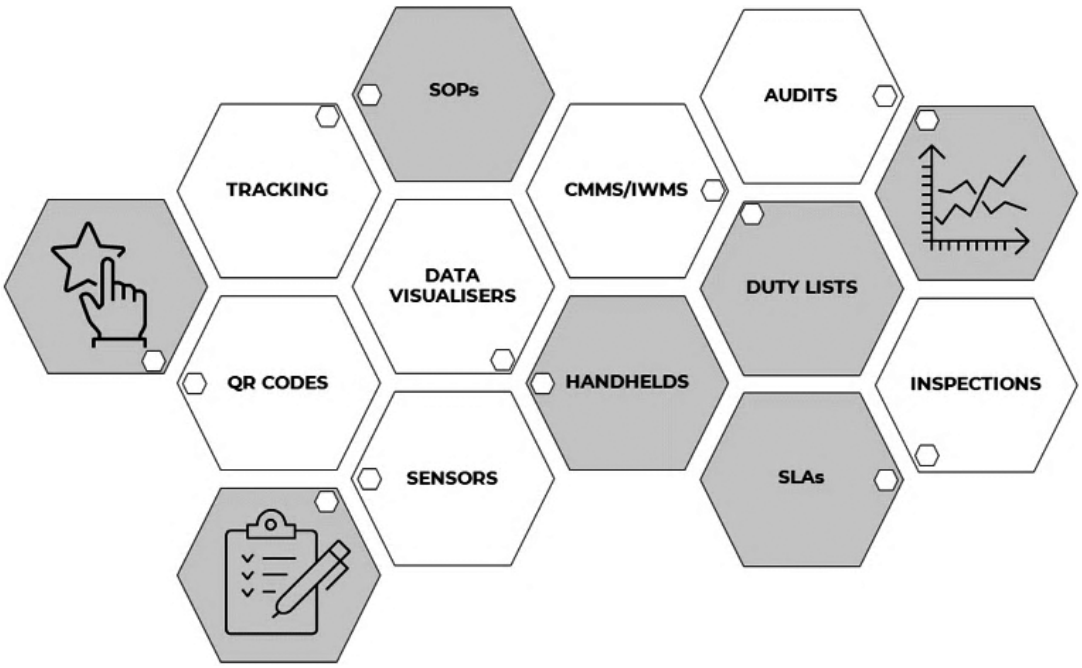

Figure 1 IFM standalone software solutions
Source: ESFM: Lilly, C., Menard, D. and Rossitter, A.

It sometimes helps to look at how other industries solve problems when building a strategy for running one's own operation. Companies that manufacture goods, for example, use seemingly complex systems that simplify the process of knowing when to order the right amount of raw materials to meet expected sales. The more accurate the sales prediction is, the more timely and accurate those raw material orders will be. For that to work, the forecast needs to be integrated with production schedules, which needs to be integrated with bills of material, which needs to be integrated with purchasing, which needs to be integrated with accounts payable, and so forth.

This led to the creation of materials resource planning (MRP)[1] in the 1960s — the first computerised supply and production planning solution widely adopted across an industry. The onset of MRP was quickly followed by distribution resource planning (DRP), which focused on warehousing, order processing and both the inbound and outbound supply chain, designed for distributors. Later, in the 1990s, enterprise resource planning (ERP), combining MRP and DRP, was born and evolved to manage day-to-day business operations more cohesively. Today, companies such as Amazon use very sophisticated integrated platforms that direct robot traffic in their warehouses to simplify the picking and shipment of products often ordered only minutes prior. The key idea behind these solutions is that software sharing master data resources enables interoperability that supports more advanced business functions, streamlines report generation, drives automation and leads to better decision making. In a word, *synergy*.

THE STATE OF IFM SOLUTIONS

There are many variations and complexities of FM services. They can be as simple as providing a single service such as janitorial, landscaping, security, mail delivery, concierge, transport, stock room management,

asset maintenance, space management, energy management, etc., or as advanced as providing every service needed to run a building on behalf of the customer. IFM service providers need to be prepared to efficiently support as many of those services as possible for their customers. Customers expect a seamless experience when working with their facility service providers whether they are providing one service or every service.

Many IFM providers utilise various applications, such as a computerised maintenance management system (CMMS) or integrated workplace management software (IWMS) for managing space, assets, requests and work orders; scheduling, dispatch, task management and tracking tools for managing soft services such as janitorial, concierge or transport; audit and inspection tools for verifying the quality of services performed; digital twins for driving efficiency in space and asset management; building automation systems (BAS) for managing run-time, alerts and energy use of assets; and a host of other specialised platforms to support various business functions, engage with their customers or solve specific problems. On top of that, IFM providers are leveraging sensor and robotic technologies to drive efficiencies in their spaces. They are expected to provide comprehensive reporting and analytics to their customers. In some cases, they are using artificial intelligence (AI) and machine learning (ML) solutions to drive efficiencies and improve customer experiences. The problem is that without a proper digital infrastructure (see Figure 2), these tools do not communicate with each other, thus reducing the overall potential to drive efficiency while adding substantial cost to the overall support of the platforms.

Take ESFM, for example. As an IFM company that distinguishes itself in self-performing more than 80 per cent of the hard and soft services it provides clients, it is important that ESFM remains agile to accommodate various client needs in settings that range in geography across the US, and in their environment, from corporate offices to controlled environments, such as lab spaces, regulated manufacturing facilities and technology hubs. Supporting client-specific needs while ensuring consistent quality and hospitality requires a great deal of synergy.

On the journey to technological synergy, the company assessed its solutions: a leading CMMS platform, a standalone inspection

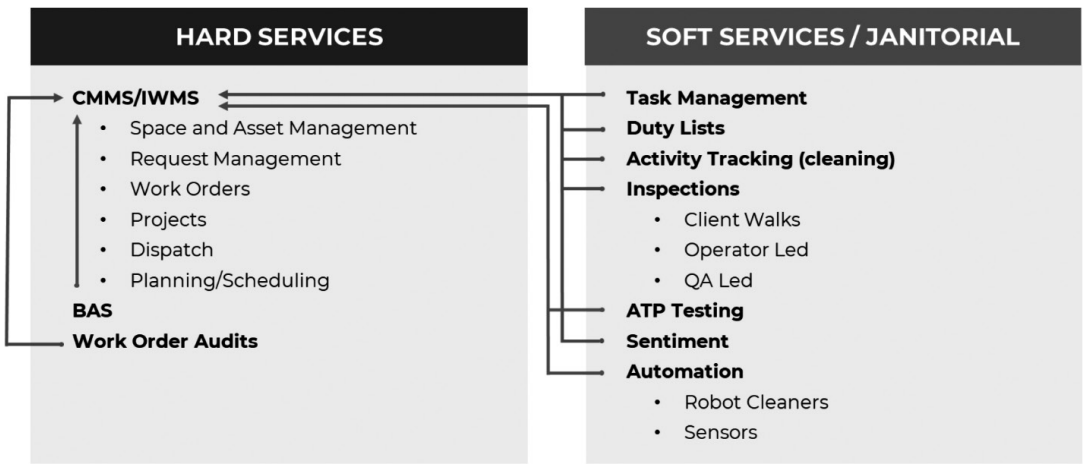

Figure 2 IFM digital infrastructure

Source: ESFM: Lilly, C. and Rossitter, A.

platform to verify performance quality, several tracking solutions with checklist support to document schedule compliance, a homegrown auditing platform to demonstrate process and documentation compliance as well as adoption and experimentation with sensor and robotic technologies to drive efficiencies. In addition, there were workplace management and employee engagement dashboarding tools as well as a plethora of spreadsheets and client-owned BAS products and security systems. All of these — useful in their own respects — make the job description of an IFM operator more akin to that of a business analyst.

While this portfolio of solutions did provide a set of tools needed to run an operation, it seemed that a more integrated solution would simplify the life of a facility manager (operator) and provide better above-unit insights into the operations for leadership.

EXAMPLES: BEFORE/AFTER INTEGRATION

Here are a few examples of how using a single integrated platform created simplicity in the IFM delivery model, driving value for their customers (corporate real estate professionals, building owners, etc.).

Janitorial support

Before integration

A big part of janitorial service provisioning is verifying the cleanliness of a space. Several types of inspections and audits take place to verify that quality work is being performed. Generally, the day starts with a supervisor doing a deviation walk. They walk the space to look for any specific problems that need to be addressed outside of the standard duty list. The detected deviations are typically noted on paper and then manually entered into a CMMS/IWMS system to generate a work order. Then, the cleaners will set about their day cleaning the space based on their duty list, which is either simply on a piece of paper that gets signed or initialled when complete, or managed in a standalone task management application. Eventually, spot inspections, client walks and process audits will take place, with the results captured in a standalone application that was purpose-built for validating quality. Any deviations would be manually entered into the CMMS as a work order or communicated directly to someone to remediate without documentation.

Opportunity

When a supervisor inspects the space, would it not it be helpful to know when the space was last cleaned? Who cleaned it? If there are any open work orders for that space? If it was not able to be cleaned, and why? Are there any open client requests? All of that information provides context to the evaluation. Furthermore, the best information available about a building is going to be in the CMMS/IWMS platform. Would it not be easier to manage and report if the janitorial process support from duty lists, active tracking and inspections/audits utilised the same master data as the work order system?

After integration

When janitorial support (duty lists, task lists, tracking, etc.) and inspections and audits are integrated into the CMMS platform, the benefits include not only a more efficient process but also an easier implementation for people-counting sensor technology that can be used to dispatch cleaners on demand, as needed. With integrated sensor technology, one can route deviations back to the cleaning technicians using the same handhelds that they use to track activity, use advanced ML algorithms to recommend optimised cleaning cadences and easily consolidate reporting from janitorial operations along with other building maintenance operations. In addition, scheduling assets such as floor-cleaning robots using

the same platform makes it much easier to include that activity in comprehensive client reporting.

Asset management

Before integration

Engineering managers generally start their day by looking at their open work orders to see if any critical work needs to be completed, reviewing all work orders on hold to see if they can be assigned, verifying that they are on track for scheduled maintenance activity and, finally, scheduling the day's activities for their team. They will typically use a CMMS/IWMS that excels at space and asset management. These platforms are very good tools to assist with asset tagging, scheduling planned maintenance activity, task lists, cost tracking, lockout/tagout support, time tracking, work order management, request management and parts replenishment. It may seem as if there is not much opportunity to enhance asset management with an integrated system plan; however, asking a few questions may help avoid the pitfall of complacency.

Opportunity

Why do operators spend so much time in spreadsheet systems, such as Excel, making sense of the information in their platforms? Why do they use forms or other systems for creating permits, performing work order audits or generating purchase orders for suppliers? When it comes to larger operations, it is very common to have a separate instance of the CMMS/IWMS platform running at each location. Often, those different instances are running with a different set of standards and naming conventions based on local operation's preferences. And what about those digital twins? How are they going to add value?

After integration

A fully integrated platform incorporates all day-to-day functions into a single solution with built-in work order auditing, built-in permitting, integration with BAS, integration with sensors and a common request management interface while leveraging a single cloud instance across all properties. This creates opportunities for predictive maintenance, providing above-unit insights and greatly simplifying life for the operator (in this case the engineering manager).

Many work orders require a permit, ensuring the work will be performed safely by a qualified engineer. Having the ability to issue, approve and attach the permit to the work order all within the issuing software simplifies the documentation process. When it is time to perform a work order audit, an integrated work order auditing tool can randomly select the required number of work orders to audit. Because the permits are attached to the work order, it is much simpler to verify that the process of performing the work was done correctly without digging through folders for paperwork.

One of the benefits of having an integrated platform is that it provides a common space for reviewing all requests. Alerts from other systems such as the BAS, sensors or energy management platforms, requests and complaints from building occupants, or even work assigned from client-owned systems can all be routed to a common mobile interface so that managing the work is simple. Operators break free from the computer in their offices and are able to walk the building floor.

The value of having a single instance for all locations is that all of the data will neatly and simply aggregate together, benchmarking asset performance, capturing large data sets needed to leverage ML, verifying that standards are being followed and collecting above-unit insight across operations.

Digital twins promise three-dimensional (3D) views of all assets within a building, providing all of the pertinent information needed to plan maintenance programmes,

review alerts and optimise energy. When integrated within a CMMS/IWMS platform, digital twins are a great extension. When not integrated, they create a lot of duplicative work and overhead; much like outdated computer-aided design (CAD) drawings, the digital twin needs to adapt along with the CMMS/IWMS platform and vice versa — anything less becomes costly.

Data-driven cleaning

Data-driven cleaning has been a growing trend in the facilities management industry for several years, even before the COVID-19 pandemic. The general idea is to use data to determine when to clean a space. This data can be used for real-time dispatching of cleaning technicians as conditions are met and/or for optimising schedules based on actual demand and quality standards. A strong programme can optimise cleaning schedules and potentially lower the costs of a cleaning programme through the elimination of unnecessary visits. The different types of data that can be used in a data-driven cleaning programme include sensor data, cleaning activity tracking data, cleaning schedules, benchmarks, space details, cleaner details, inspection results, floor plans and occupant satisfaction data. When used together, a high-performing, highly optimised programme can be created.

Sensors, including people-counting, door swing and occupancy, allow for useful real-time data in the built environment for establishing traffic patterns and triggering cleaning activity. The temptation could be to use simple Boolean triggers to create a cleaning alert. (Boolean[2] uses commands like and, or, not, etc., to connect keywords or phrases in a query.) For example, after 25 people enter a given space, a system sends an alert to a day porter to clean that space. At first, this may seem like a logical approach; once enough people use a space exceeding a predetermined threshold, the platform automatically triggers a work order.

The problem with this approach is that it does not account for the numerous real-life variables that come into play (see Figure 3).

- How does one determine if 25 people is the right threshold?
- How does time play a factor in the decision? For example, how much time has passed since the last cleaning?
- Is there a maximum or minimum time gap threshold that also needs to be considered? What about black-out periods where one does not want a cleaner dispatched to the space until the period has expired, such as a restroom near a cafeteria during high-traffic times?
- Does proximity to other high/low traffic areas affect that decision?
- Is the time of day considered? Is 25 still the correct threshold for second or third-shift operations?
- Where is the cleaning technician at that moment in proximity to the location where the alert is generated?
- Has the space been cleaned, due to a schedule or customer request, since the counting sensor was reset?
- How is the traffic or time elapsed since the last cleaning affecting quality assurance (QA) scores?

The questions go on. The point is that decision making when driving activity is far more complicated than just leveraging one variable. The more access the triggering logic has to relevant environmental details, the more trusted and effective the solution will be.

CMMS/IWMS platforms contain a lot of useful information that can be used to answer the questions: ie should the service provider clean this space now and is the cleaning schedule appropriate for this space? These platforms already leverage a building's floor plan and space attributes such as space type, size, established cleaning programme and VIP status. These platforms can also create and assign tasks or work orders.

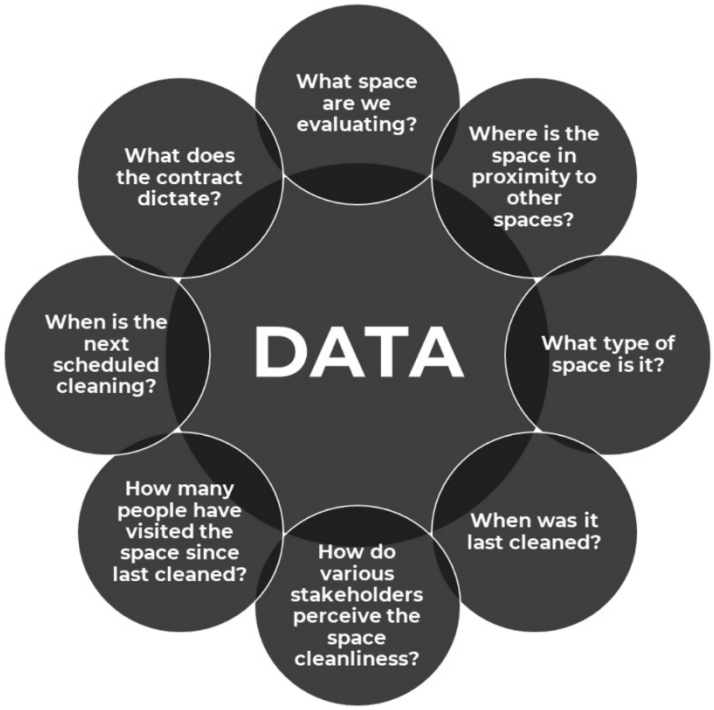

Figure 3 Data variables
Source: ESFM: Lilly, C. and Rossitter, A.

In a fully integrated solution, existing data (as was established in the 'Janitorial support' section) can be leveraged in addition to the ability to manage other details such as triggering thresholds, blackout periods and minimum/maximum cleaning intervals customised for each space. Instead of leveraging a standalone Boolean-based solution to trigger a cleaning activity that relies on sensor data alone, there is an opportunity to create a business function within the CMMS/IWMS platform that polls the real-time sensor data via application programming interfaces (APIs), checks it against planned and recently performed activity, verifies whether or not there is an appropriate dispatch and then recommends whether to act. If action is triggered, the solution dispatches a cleaning technician using the same hand-held device they use to track and manage all of their other activities. The threshold no longer resets after it hits a specific point. Rather, the information is calculated in real time from the last time the space was cleaned, allowing for the collaboration of scheduled activity, requested activity and triggered activity. People counting moves from being the sole trigger for a cleaning activity to one of many data points combining to inform smarter decision making.

Going a step further, how does one go about actively managing the thresholds of thousands of spaces with any degree of reliability? It should go without saying that the same threshold does not make sense for every location. Furthermore, asking operators to configure every space is a tall order.

What if instead, ML self-heals those thresholds? That is the beauty of modern technology: it can. Just as a journal article author can improve their writing process by running an application like CoPilot, Microsoft's AI tool, to make real-time suggestions for clearer writing, developers are able to utilise ML and AI to help run facility operations better.

The key to successfully incorporating AI and ML into a technology solution model is good data. This includes three data components:

- *Master data*: Data about the space, building, contract, etc.
- *Transaction data*: Cleaning history, inspection score history, etc.
- *Correlative data*: Time since last cleaned, number of people passing through a space since last cleaned, personnel performing the work, etc.

With enough data and the *right* data, a model can be built that recommends ideal thresholds for each space and refines itself over time.

The challenge of variables in data-driven cleaning is familiar to many IFM practitioners. The goal is to automate and use advanced functionality to improve operational delivery, for both hard and soft services, but obstacles get in the way. Where some see challenges, others see opportunities — for example, leverage one purpose-built solution in order to benefit a secondary process.

THE BUSINESS CASE

This paper has covered a lot of ground explaining why leveraging a fully integrated platform to run a services operation makes *operational* sense, but what about the financial sense? Will a fully integrated platform pay for itself? The short answer is yes. Below are some areas where ESFM has seen a meaningful bottom-line impact after making their technology investments.

Sales growth

Clients who choose to outsource their facilities services to an IFM provider expect that the provider uses sophisticated systems and processes that optimise service quality and drive efficiencies in their space. Winning new customer business is complicated to attribute to any one factor. Technology plays a role, but so do the people, the pricing, the culture and the fit with client needs. ESFM has experienced 15 per cent annual growth each of the past three years in part because of its compelling technology solution that delivers on service quality and driving operational efficiencies.

Client retention

ESFM enjoys an industry-leading client retention rate of over 99 per cent. Technology plays a large part in retention because it makes it easy for operators to measure what 'good' looks like in regard to maintenance plans, key performance indicators (KPI) target hit rates, continuous feedback and operational efficiencies support. Furthermore, senior leaders are never surprised when meeting with clients because they can see all the KPI reporting, financial reporting and sentiment feedback in advance of meeting with clients, allowing them to have early insight into when performance is not meeting expectations. This enables them to address issues prior to escalation or being confronted by a client.

Operational efficiencies

There are three main areas that can be counted on for driving operational efficiencies when investing in technology:

- *Client reporting*: Historically, FM operators have spent between 5 and 15 hours per week gathering, aligning, massaging and preparing data for client review meetings. With a fully integrated system, standard processes and a quality business intelligence tool, they no longer need to spend any time preparing content. Instead, operators can focus their time on utilising the insights provided to run their operations well and leverage that same content in their client review meetings.

- *Request management:* Requests for service can come from a variety of sources, including e-mail, text message, phone calls, taps on the shoulder while an employee is working, legacy CMMS platforms, Internet of Things (IoT) technology alerts and single-purpose application alerts. Interfacing with so many service request methods puts a large drag on productivity and may require a full-time dispatcher. Funnelling all requests, regardless of origin, to one interface can reduce the cost of processing a request by 70 per cent or higher based on ESFM's direct experience.
- *Labour efficiencies:* Data-driven cleaning initiatives have been cited as driving down the cost of cleaning by 5–25 per cent[3] depending on the environment, contract and level of technology implemented: people-counting sensors, IoT sensors, door swing counters, etc. Labour savings are also found in hard services by increasing work order closure and first-time fix rates by right-sizing proactive maintenance activities.

Employee development

One of the sneaky benefits of having an integrated platform is that it helps push out standardised processes for all employees to leverage. This is a great resource for developing unit managers who are learning how to run an operation, without intensive training or having to figure things out on their own. Managing is an important responsibility, and having the tools and processes to leverage that set up rising leaders for success helps elevate high-potential employees and expedite their development journey. This reduces the high cost of employee turnover and eliminates the need to overhire experienced leaders.

HOW TO GET STARTED

A great way to start a journey toward leveraging a single fully integrated platform is to build a chart that lays out features required to support a service line offered, in a grid format, and then identify whether those features are being supported by an integrated platform, a standalone application or not currently supported at all (see Figure 4).

CURRENT SOLUTION PORTFOLIO

FEATURES	PURE JANITORIAL	SOFT SERVICES	HARD SERVICES	REMOTE SITE SUPPORT	CAPITAL PROJECT MANAGEMENT	ENERGY MANAGEMENT
REQUEST MANAGEMENT	No Solution	ESFM^X	ESFM^X	3rd Party Solution	N/A	N/A
OCCUPANT ENGAGEMENT	No Solution	ESFM^X	ESFM^X	No Solution	N/A	N/A
SOP ALIGNMENT	No Solution	ESFM^X	ESFM^X	No Solution	N/A	N/A
GYM MANAGEMENT	N/A	3rd Party Solution	N/A	N/A	N/A	N/A

Figure 4 Sample service line

Source: ESFM: Lilly, C. and Rossitter, A.

Then, based on one's strategic goals, prioritise the features that need to be covered by the IWMS platform.

ESFM started its journey by focusing on supporting multiple clients on one software as a service (SaaS) instance to simplify company level reporting (client segmentation), creating a unique occupant engagement experience to simplify the process of engaging with operators (occupant engagement) and by creating an integrated audit, inspections and surveys (AIS) platform that allows for the capture and management of qualitative information. Client segmentation and occupant engagement capabilities were built through custom development. AIS was built by both licensing an available risk management module and then using development resources to shape it to the company's needs.

Once the needed features were added and deployed, ESFM focused on data-driven cleaning initiatives that included development efforts in integrating IoT sensors, building a ML model to optimise schedules and manage people-counting thresholds, creating a shift planner (duty lists management interface) and integrating with a technology partner that allows operators to passively track cleaning activities.

As each new feature or capability was being built, the corresponding reporting content was added to ESFM's business intelligence tool so that users could immediately realise the benefits of the new data that was made available to drive client value and provide leaders clearer insights into their operations.

While evaluating the journey to a fully integrated platform, it is important to note that singularly purposed applications often go deeper into functionality than what one is able to accomplish with an integrated approach. Weighing the benefits of integration against the depth of a singularly purposed application is an exercise that will need to be performed, as the analysis and trade-off evaluation will differ for each company.

CONCLUSION

One of the biggest obstacles to leveraging data to make informed decisions, drive automation and/or achieve synergy from workflow automation is the common use of many siloed solutions in IFM. Integrations are expensive and require data cleansing and alignment to be effective. Justifying such an expense can be difficult, leading many organisations to miss the opportunity to integrate while others over-invest, putting more resources than necessary into integration.

To avoid either of these pitfalls, corporate real estate decision makers should start with asking how to incorporate new functionality into their core CMMS/IWMS platform rather than finding another service provider to offer yet another standalone software solution. At the very least, confirm the supplier's ability to integrate within the organisation's core platform before finalising a commitment.

ESFM took different approaches to different problems. In some cases, it was as simple as adding an existing, available module to its IWMS platform and configuring the module accordingly so it integrated with other functions. In other cases, such as when no module existed that could solve a specific problem, the company leveraged its internal development team to create a module with that functionality in-house. In both cases, all of the data from the new functionality was made available to every other function within the IWMS platform, allowing all operational data to integrate for more advanced business logic, above-unit insights and simplification for operators.

In order to get the full value out of emerging technology, there needs to be good, easy-to-align data that can be leveraged as sources for building models. This helps operators identify what to clean or what to repair and when, all based on relevant, correlative data. For decision makers, this gives confidence that technology and

labour resources are both optimised and efficient.

References

(1) Snapp, S. (August 2012), 'How to Understand The History of MRP and DRP', Brightwork Research & Analysis, available at https://www.brightworkresearch.com/the-history-of-mrp-and-drp/ (accessed 22nd April, 2024).

(2) Awati, R., 'What is Boolean?', TechTarget, available at https://www.techtarget.com/whatis/definition/Boolean (accessed 22nd April, 2024).

(3) Tork, 'The Value of Data-Driven Cleaning for the Facility Services Industry', Whitepaper, available at https://tork-images.essity.com/images-c5/367/364367/original/tork-tork-vision-cleaning-whitepaper-2021-9-essity-idml-en-gb.pdf (accessed 22nd April, 2024).