The interaction of BIM And FM through sport projects life cycle (case study: Sailia training site in Qatar)

Hayam M. Omayer\textsuperscript{a} and Omar Selim\textsuperscript{b}

\textsuperscript{a}Architecture Department, Cairo Higher Institute for Engineering, Computer Science and Management, Cairo, Egypt; \textsuperscript{b}Building Information Modeling Department, BIMarabia, Cairo, Egypt

\textbf{ABSTRACT}

‘It is all about the data’. In this context, ‘data’ refers to the massive amounts of information facility managers require for their work, including the frameworks that serve as the basis for successful and productive facility management (FM). The paper discusses building information modeling (BIM) and how this can be applied to facility management to address current industry challenges to BIM & FM Interaction. The research is dependent on transforming the interaction of more specialization in engineering by linking the different disciplines in a single project and using new technologies in a case study project. This construction project is concerned with the role of BIM and construction operations building information exchange (COBie) in sports facilities and operations and maintenance (O & M) information to view the benefits of BIM-based on the experience of the Arab world in the field of construction. The research presents a case study for the Technical Masterclass, Delivering the BIM/COBie & IFC in Revit according to the NBIMS-US COBie standard to support the facility’s management. The project is FIFA training facilities, Sailia Training Site. This case study project examines the role of BIM and COBie in facility and O & M information to demonstrate the benefits of BIM. The idea of BIM for facility management is implemented through COBie as a data transfer method.

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\textbf{KEYWORDS} BIM; facility management (FM); interaction; life cycle; COBie

\section*{Introduction}

Abdullah SA & Others described Building Information Modeling (BIM) \cite{1} as a set of interactions between policies, processes, and technology that result in an approach to managing the importance of building design and project information in a digital format or a virtual environment throughout the project life cycle. BIM encompasses more than...
just the sophisticated use of 3D models; it also influences workflow and project delivery [2,3]. The information and data required by facility managers to operate the building on a turnover basis differ from the design and construction information, according to Paul Teicholz and Lavy & Jawadekar. The information that is part of each phase of building planning, design, and construction is what facility managers’ desire from BIM. Many novel techniques for incorporating the BIM model into field activities prove quite effective [4,5]. The information saved in the BIM model is an excellent mine for facility operations, occupancy maintenance and changes, and building use. Suppose we need to address an air-conditioning problem, for example. In that case, your technician will most likely come to the location, assess the situation, and request the necessary drawings, specs, and tools to change or replace the unit. Once a complaint is received, the WRC or the technician can examine the BIM model to check if there is any equipment in the area that could be contributing to the problem, as well as have all of the required maintenance, repair, and specs available in the event of a repair or replacement. This is just one of the many benefits of BIM for FM. Still, the crucial point is that the facility manager must ensure that the model includes the initial planning, design, and all data added to the phases through construction, commissioning, and handover. The system’s value would be significantly reduced without this information.

**Research objectives**

The main research objective aims to indicate what BIM is and how this can be applied to facility management to address current industry challenges to BIM & FM Interaction, which are divided into secondary objectives as follow:

- Studying the interaction of BIM and FM and the tools and standards required for this interaction is only the beginning of sports project management.
- To realize the BIM and FM mission, research effective ways in the sports industry.
- Discuss the potential for significant benefits from this new BIM/COBie application and how these benefits can be realized.
- As the process proceeds from design to implementation, the research investigates and debates how the information is required by BIM/COBie, COBie Worksheet, and who gives what information in the application.
Research methods

The research is divided into two sections. The first section is a review of the literature focusing on facility management difficulties throughout the building’s life cycle, particularly in sports facilities. Additionally, examining the adoption of building information modeling (BIM) and facility management standards (COBie). The second section is applied research, which is the most successful method of acquiring reliable data and outcomes. The authors used FIFA’s Sailia Training Site as a case study for a sports facility to obtain accurate results.

Literature review

Facility management (FM) challenges through the building life cycle

Traditional approaches to FM adoption and use are challenging, with issues such as printed materials (drawings, equipment documents, contract files, and so on) submitted to the owner by project team members [4], lack of recognition, education, and training requirements; expert status; information standards, career guidance, quality assessment, and cost verification, among others [4]. The study is concerned with clarifying the main challenges facing facility management, which require the adoption of new solutions such as integration with modern technologies and progress in the management of facilities, especially sports facilities.

Facility management concept and definition

According to the International Facility Management Association’s (IFMA) definition [6], facility management is a multidisciplinary profession that integrates people, places, processes, and technology to ensure the built environment’s functionality. Additional organizations include the British Institute of Facility Management (BIFM, www.bifm.org.uk), the Facility Management Association of Australia (FMA Australia, www.fma.com.au), and, therefore, the International Association of Assembly Managers (IAAM, www.iaam.org) [7].

Facility management challenges

In brief, facility managers are always challenged to enhance and standardize the quality of their data, which is required to fulfill daily operational demands and to offer high-level management and data for organizational management and planning [8]. Most of these issues
result in lost productivity, efficiency, and effectiveness in cost and time. Entire Information Modeling (BIM), which strives to integrate the building life cycle, could improve and help solve these issues [9]. For successful and efficient building lifecycle management, it is necessary to optimize building utilization from a facility management perspective. According to the National Institute of Standards and Technology (NIST), after construction, 85% of a facility’s lifecycle cost happens. Taking all of the above definitions into consideration, FM is able to be summarized as ‘interacted management or integration of work to improve an organization’s performance’ [10]. It can thus be concluded that FM involves multidisciplinary activities that involve interactions between people, property, business processes, and technology, as proposed by the Center for Establishing Excellence [11].

**Sports facilities management**
A sports facility is a building, i.e. an area (a constructed space, a section of it, or an organized area) dedicated to sports activities that may include additional space (for sanitary, a wardrobe, a repository, an audience, and many other purposes), and also connected equipment (construction and sports equipment). Sports facility planning, design, building, and daily operations; management of training and business processes; leadership of those activities; and control of a diverse variety of participants, processes, and sub-elements of these systems [12]. In order to expand and strengthen the sports sector, BIM and facility management must work together in this scenario. It is incredibly crucial, significantly, as the Asset Information Model improves and develops.

**BIM as an approach to leverage facility life cycle data**

**Building information management concept**
BIM is a technology for managing building information over its entire life cycle. It is sufficient to support data on maintenance and construction [13]. The use of BIM technology in the construction sector is not a new concept [14]. BIM portrays the building as an interconnected database of coordinated, internally consistent, and computable data [8]. This integrated database could hold a lot of building data, such as material quantity, installation date, subcontractor responsibilities, facility material type, cost, timetable, and so on. As a result, because the
BIM model can be utilized as a single source for all building data, it has a lot of promise to streamline the process of gathering and to store project data [15].

**Facility management and BIM**

The overall goal of BIM in facility management is to use facility life cycle data to provide safe, healthy, effective, and efficient working environments [16]. Because it can give and store so much information about a building with the proper information, it may function and be used profitably for FM [17]. Furthermore, the information storage might be repurposed for the building’s operation and upkeep rather than being rebuilt. FM-BIM component interaction allows BIM data to link facility design, construction, and refurbishment to operations management [18].

**BIM technologies support & FM systems interaction**

According to Roper and Payant [19] and Tai, S [20], the industry’s profitability has been improved. Through the BIM ability to reduce waste of materials with better estimation, scheduling, and ordering the ability to avoid time delays, detect construction scheduling clashes, ‘clash detection’, and minimize west effort by avoiding massive rework, time and cost savings through faster and more accurate plan changes, drawing development, and tasks such as code checks and materials sourcing. Improves schedules and ensures greater accuracy of designs [21]. BIM data was to be gathered, transmitted, and linked with facility management systems, according to Aziz, Teicholz, and Linderoth [4,7,22]. These experiences clearly suggest that team members and FM managers are struggling to interact with BIM FM and that the learning process is low. These data would have to be entered into the system if the FM staff used Computerized Maintenance Management Systems (CMMS) to handle maintenance, which would be a time-consuming and error-prone task. It is frequently discovered that the information required is not readily available or that repeated journeys to the file room are required. This method is pricey and increases the capacity of the building [23]. For these reasons, a more advanced method is necessary that leverages BIM/COBie data while
also including the extra data required during FM processes. This data is created during the design, building, and commissioning phases, and it provides a compelling incentive for facility managers to be involved.

**BIM/COBie process**

COBIE) is an international standard for transferring data on managed assets. This is an open standard for exchanging digital data between the design and construction stages and the facilities management systems [24]. According to the GSA BIM Facility Management Guide, COBie is a neutral, IFC-based data exchange standard that outlines the transmission of information between the construction and operation stages of a project (2011). COBie aims to address these issues by defining a unique container for these pieces of information that is delivered in an electronic format with a standard, open, and reusable structure based on the IFC schema (ISO 16739:2013), enabling facility managers to manage a concretely useful and usable set of information, according to J. Karlshoej [25]. Throughout the design and procurement phases of the COBie process, the contractually needed data must become more completed, culminating at the handover point. The COBie worksheets are ordered in such a way that each one begins with a unique data element.

![Diagram of COBie's content structure](image)

**Figure 1.** COBie’s content structure [25].
The color-coding of the Space Worksheet example is shown in Figure 1, which reflects the type of information found for each of the Worksheets, as well as the specific data columns [4].

COBie is a part of the National BIM Standard in the United States. Information is exchanged from one process of the facility lifecycle to the next as a common practise. The purpose of the information exchange is to provide facility managers with information on the need to maintain and operate their facilities. COBie distinguishes itself from other standards because it establishes information flows that allow information to be placed in an effective fashion. When information about an air handling unit is submitted into COBie, for example, the data can be imported and exported into COBie compliant software, which can then be used to take action via automated reports [26]. COBie advantages include reducing data loss and related expenses connected with the physical transfer of project information after the project’s conclusion and increasing the possibility of getting relevant information in a timely way [19]. While not every attribute data must be included in the BIM, the required data should be delivered via compliant files. COBie will be able to connect the required space, zone, and equipment data to the Record BIM elements. A shared primary key will be allocated to the BIM objects and their related properties in COBie and the model. Team members should now document how they adhere to COBie’s standards in their BIM process [19].

Figure 2. Sailia training site 3d models from Revit (BIM). Source: the authors.
The case study

The research presents a case study for the Technical Masterclass, Delivering the BIM/COBie & IFC in Revit according to the NBIMS-US COBie standard to support the management of the facility. The project is FIFA training facilities, Sailia Training Site 115. The owner: the supreme committee for the delivery & the legacy. In Al Sailia, Qatar, for the FIFA World Cup (Qatar 2022) with a total area of 600,000.00 square meters. Additionally, each location’s comprehensive infrastructure includes dressing rooms, a press conference space, a food and lounge area, information technology and communications networks, as well as broadcast and media capabilities. The project is designed to meet FIFA stadium safety and security regulations and the requirements of the UEFA guide to quality stadiums for the FIFA World Cup (Qatar 2022 as shown in fig (2).

The project challenges

Megaprojects, such as the Sailia training facility, present several difficulties that require a new management technique that enables project managers to overcome them, even more so when sports projects are subject to global standards. For examples of difficulties that BIM has aided in overcoming:

- On-site, the primary concern was the deluge of paperwork and pdf files, which made it difficult for facilities managers to work or make decisions.
- The project spent an average of three months documenting project equipment, primarily mechanical and electrical, in terms of stomach type, location, maintenance dates, and spare component replacement dates.
- Unfortunately, the CAD files are not robust since they cannot be customized with parameters and cannot be connected to other files.
- Due to the unavailability of some suppliers at the start of the project, not all information was accessible. Nonetheless, the task was finished cohesively, and the material was updated throughout time.
- It helps in establishing that weekly meeting with facility managers are necessary to discover particular what is required.
**Project BIM delivery plan**

This part details the specifics of the Project Team’s implementation plan for delivering the Project BIM. All stakeholders should participate in BIM activities through authoring, reviewing and developing BIM models throughout the project life cycle. Information exchange of each stakeholder can be scheduled to avoid delays in support and miss coordination of the design management processes. The BIM Delivery Strategy uses BIM along all design stages to minimize waste, improve the design process, and enhance spatial coordination. Modularity planning in design is one of the main factors to prevent unnecessary time-consuming in design period time and effort. Also, facilitate document and design management to ease the process of construction planning for prototyping and prefabricating. This happens by Design Prototype shared volumes and linking them to all training sites volumes.

**Model element definition matrix**

The model element definition matrix (MED matrix) shall document the project team’s agreement on the level of definition for various building components. The MED matrix is organized as per CSI uni format 2010 Level 4 categories. The MED matrix defines, ‘Level of Definition, for an element in two parts, level of information and level of development.

![Figure 3. Clash zone and Clash detection using Navisworks. Source: the authors.](image-url)
**Level of information (LOI)**

The part 1 of the MED Matrix documents the Level of the information (LOI), which is the information required for a model component. Data shall always be linked to the corresponding model component as parameters and attributes. Attributes and Parameters shall have sensible names which follow a consistent and logical approach. Unless dictated by a technology route mandated by the SC, all information of the model components shall be retrievable in the authoring and reviewing the software environment without resorting to third-party tools. For clarity, Project Team Members shall not introduce the dependency on third-party tools for accessing data in the model environment.

**Level of development (LOD)**

The Stage of LOD 400 (Manufacturing) The Model Elements are modeled as detailed assemblies which accurately represent the shape, the size, the quantity, the location and the orientation with the complete manufacturing, the assembly, and the detail information. Additionally, extra detailed information may be associated with Model Elements. For LOD 500 Stage (Record Documents), the Model Elements are represented as constructed assemblies that accurately represent the size, shape, location, quantity, and orientation of the elements. The model should be configured to serve as the central data storage for integration with building maintenance and operating systems. Additionally, the extra information might be associated with the simulated parts.

**BIM outcomes delivery plan**

Each stated the outcome is important from the point of designing, constructing, and operating a world-class facility that each project is set out to be. Each individual outcome shall be discussed as an integrated team and associated with the delivery methodology, and the quality assurance plan shall be documented. There is a well-built relationship between project stages and deliverables at each stage. BIM Activities for Training sites will start with the planning and the execution at the predesign stage and the end with successful BIM project delivery.
Figure 4. Project performance measures for BIM/FM interaction model, based on the agreed BIM outcomes to fulfil the objectives.

Source: The authors.
### Table 1. Findings of the research study as a result of BIM & FM interaction.

| Programs                                      | Traditional (CAD) | BIM/COBe                                      |
|-----------------------------------------------|-------------------|-----------------------------------------------|
| Developing and Communicating Coordinated and Compliant Design |                   |                                               |
| Drawing Documentation                         |                   |                                               |
| Design Reviews and Client Engagement          |                   |                                               |
| Design Schedules                              |                   |                                               |
| Specifications & BOQ                          |                   |                                               |
| Cost Planning                                 |                   |                                               |
| Accessibility Studies                         |                   |                                               |
| Structural Analysis                           |                   |                                               |
| Lighting Analysis                             |                   |                                               |
| Energy Analysis                               |                   |                                               |
| Computational Fluid Dynamics (CFD) modeling   |                   |                                               |
| Other Building Services Engineering          |                   |                                               |
| Clash Detection                               |                   |                                               |
| Health & Safety                               |                   |                                               |
| Security Planning                             |                   |                                               |
| GIS Integration                               |                   |                                               |

| Description                                                                 | Traditional (CAD) | BIM/COBe                                      |
|-----------------------------------------------------------------------------|-------------------|-----------------------------------------------|
| Developing and Communicating Coordinated and Compliant Design               |                   |                                               |
| Drawing Documentation                                                       |                   |                                               |
| Design Reviews and Client Engagement                                        |                   |                                               |
| Design Schedules                                                            |                   |                                               |
| Specifications & BOQ                                                        |                   |                                               |
| Cost Planning                                                               |                   |                                               |
| Accessibility Studies                                                       |                   |                                               |
| Structural Analysis                                                         |                   |                                               |
| Lighting Analysis                                                           |                   |                                               |
| Energy Analysis                                                             |                   |                                               |
| Computational Fluid Dynamics (CFD) modeling                                  |                   |                                               |
| Other Building Services Engineering                                         |                   |                                               |
| Clash Detection                                                             |                   |                                               |
| Health & Safety                                                             |                   |                                               |
| Security Planning                                                           |                   |                                               |
| GIS Integration                                                             |                   |                                               |

(Continued)
| Table 1. (Continued). | Traditional (CAD) | BIM/COBie |
|------------------------|------------------|-----------|
| Legacy Planning        | Legacy Planning  | Not available | BIM can be utilized to carefully plan the legacy use of the tournament assets. |
| Construction Planning  | Constructability Reviews | Difficult to review, particularly the project that has a complex nature or an unusual nature | Available in five standard phases: 1) structural, 2) building envelope, 3) interior architectural, 4) mechanical, electrical, and plumbing (MEP), and finally 5) site work. |
| Logistics Planning     | Difficult to provide Logistics Planning, lack in data. | BIM Models will be available for the development of a logistic planning model display the progress of construction activities, and present a significant opportunity to enhance the management and delivery of construction projects |
| Construction Sequencing (4D) | Not available, only the traditional process. | Through 4d construction sequence, comparing with actual rates. |
| Progress Monitoring    | Not available, only the traditional process. | Modularity in design is the base for Modular Construction by adding the concept of modular BIM elements. |
| Modular Construction   | Not available | The elements are modeled as formed assemblies that are accurate to size, shape, position, amount, and orientation. |
| Design for Manufacture and Assembly (DfMA) | Not available, that need to build a model over again, and waste of time, cost, and effort. | It involves using computer-aided design (CAD) |
| Virtual Prototyping    | It entails the use of computer-aided design (CAD) | |
| Field BIM              | Accessing BIM Models on Mobile Devices | Available 2D CAD for 2d drawings using phones, laptops, tablets. | The user would review designs, perform a checklist, identify a problem, or engage in site-based activities that are information-rich. |
| Site Inductions        | lake in data that needed for site inductions | BIM can significantly increase site safety. It can also help in preventing severe accidents on site. |
| Setting out Using Models | 3d CAD | BIM is modifying the setting-out on site. Setting-out is a process that BIM directly enhances. |

(Continued)
Table 1. (Continued).

| AIM and COBie          | Health & Safety Files | BIM/COBie                                                                 |
|------------------------|-----------------------|---------------------------------------------------------------------------|
|                        | Not available         | The health and safety file can provide a powerful management and information tool. |
| O&M Manuals            | Lake and inaccurate reports and manuals. | All the history of the building is recorded in detail, such as design, construction, operating instructions, and maintenance. |
| FM Integration         | Not integrated        | Integrated                                                                |
| ‘As Built’ BIM Models  | Not available, only 2d drawings | Through collaboration with field sent PDFs with remarks and modifications will be implemented in the BIM model. |
| COBie (v2.4)           | Not available         | The owner-operator obtains structured and consistent asset information on which to make decisions for post-occupancy. |
| Asset Information Model| poor because AIM will need to be updated regularly | The information contained within AIM will be updated regularly to ensure All upgrades, modifications, remodels, management, and decommissioning will be recorded. |

Source: The authors.

BIM/COBie implementation stages

3D model from Revit (BIM) & civil 3d stage (LOD 350 stage model). The Figure (3) Shows the project by Revit & 3d civil programs by BIM technology in 3-D models. It provides and presents the project details for the construction component clearly and easily for stakeholders. LOD 300 model shall be audited to comply with BIM forum standards. Items to be included in LOD 350 shall be identified.

Clash detection stage (LOD 350 & LOD 400 stage model)
The Figure 3 Also explains the clash zone and the clash detection. The clash detection reporting shall be conducted using Navisworks, managed along with Revit Interference for checking clashes in the design, sent back to the client for rectifying the clashes and implementing the solutions to the updated the model, and reducing the time and cost stages.
Construction Stage (LOD 400 & LOD 500 stage model)
Approved LOD 350 model shall be upgraded according to receive shop drawings. Items to be included in LOD 400 shall be identified. The coordinated LOD 400 Model shall be updated on a monthly basis. Items to be included in LOD 500 shall be identified.

AS built drawings
The coordinated LOD 400 BIM model shall be approved prior to the final production of the final As-built documents. The interim shop and coordination drawings will be provided to support construction progress when needed by the client and the GC.

Add COBie for the project stage
The final step includes a classification manager for Revit and the ability to configure the classification system to discover elements for categorization and assign appropriate classes.

Discussion
This case study project concerns the role of BIM and COBie in facilities and O&M information to view the benefits of BIM. The study discusses the interaction between BIM and facility management and how to apply it through COBie as a data transfer method. Figure 4 and Table 1 explain the main findings of the research study as a result of BIM & FM interaction.

Developing and communicating coordinated and compliant design
The case study’s implementation of BIM & COBie resulted in significant success in generating, communicating, and documenting coordinated and compliant design via design schedules, clash detection, and cost planning.

The design schedules
All project schedules are required as a part of the documentation provided within the framework of the BIM authoring environment. BIM Author can maintain one schedule per component category in a format
that presents the requested information in the MED Matrix (only). Furthermore, all project schedules must remain in the BIM Model during the exchange of information. In addition to native format, Milestone issues are shared in Excel, and the Schedules shall be named in a consistent and logical manner and documented.

The clash detection
The clash detection procedure highlights identifying clashes that are documented. This is implemented by combining all the relevant models inside an Autodesk Navisworks project file. The design team will be able to run clash detection exercises, improving the design process's overall efficiency and preventing future coordination problems.

The cost planning
As the BIM develops, data are assigned to objects – number of items, volume, etc. This information can be exported for use downstream in estimating the overall cost of the project. The DC and MC can export BIM data in a unified format so that the estimators may import the data into their cost estimating tool. In addition, workshops shall take place to manage due diligence in the overall cost management of the project. Cost reports, analysis method, Native models, Cost database is considered as cost planning process input Quantity take-off, Cost estimate is considered as process output.

Legacy planning
Base, tournament and legacy phases can be implemented in the design using the most appropriate and efficient methods available in the authoring software.

The construction planning
BIM can be used for efficient planning and construction monitoring. Constructability reviews and logistics planning shall be carried out in a 3D environment. Project BIM is used to illustrate the statements of the construction method. Construction sequencing (4D) is simulated by linking the program to the model components. The possibility of digital manufacturing is explored well in advance. When identified, the principles of Design for
Manufacturing and Assembly (DfMA) shall be applied to Project BIM. The approach shall be documented by the contractor in the relevant sections of the BIM PMP.

**The constructability reviews**

Constructability Review is the process that uses a team with extensive construction knowledge to make sure that the project design is buildable, but it is also cost-effective, biddable, and sustainable with reduced overruns and delays. The scope of the constructability review is adaptable to the unique requirements of each project. It is advised to conduct constructability reviews in five separate phases: 1) structural, 2) building envelope, 3) interior architectural, 4) mechanical, electrical, and plumbing (MEP), and finally 5) site work.

**Field BIM**

The Model Use explains how 3D models and associated resources are accessed in the field.

**Accessing BIM models on mobile devices**

The user would evaluate designs, e-mail clarification requests, mark drawings/models, fill a checklist, identify a problem, or undertake information-rich, site-based activities through a tablet, laptop, smartphone, or wearable equipment.

**Site inductions**

Building Information Modeling (BIM) focuses on the productivity and financial benefits it may bring to the building sector. Nonetheless, BIM can make a significant contribution to the avoidance of serious on-site incidents.

**Asset information model (AIM) and COBie**

**O&M manuals**

The Operations and the Maintenance Manual includes details of the construction, the history, and the maintenance of the building, instructions for its operation, maintenance, warranties, and guarantees.
**COBie**

COBie improves the handover of the information. To improve the monitoring and management of public assets, it is advised that public clients seek particular data from the supply chain. The defined information defines the COBie, giving uniform and organized asset information beneficial for post-occupancy decision-making by the owner-operator.

**Asset information model (AIM)**

The AIM is a centralized repository of validated and authorized information on the built asset used during the building’s operating phase. It is a phrase that can refer to a single asset, a pooled asset system, or an organization’s complete portfolio of assets. The information contained in the AIM will need to be updated on a regular basis to ensure that any repairs, maintenance, refurbishments, upgrades, or decommissioning needs are reflected.

**Conclusion**

The research discussed the interaction of BIM with FM systems in the sports project life cycle and how this can be applied to facility management to address current industry challenges and demands more efficiently and effectively than traditional methods. Referring to Table 1, the main benefits that resulted from the interaction included:

- Develop and communicate collaborative and compliant design, avoid clash detection, enhance construction planning, constructability reviews, cost planning, security planning, O & M manuals, etc.

- The correct information collected is in the relative proper timing, where each member knows what is anticipated from them. It'll guarantee that there will be a fruitful beginning to the operation and upkeep of the facility after the venture.

- It was clear from the case study that it is crucial to understand the procedure and the standard by which information is exchanged as to how the model can be delivered. Starting with the purpose of providing the COBie data, it needs and takes into consideration the IFC schema, its framework, and the potential relationship between
the complexities of the items, and the user can determine a more efficient method of modeling to obtain the best results in the final COBie file.

- The sports facility manager can use the information provided by BIM/COBIE and other technologies and programs in all instances where the facility’s management requires it to improve and develop the potential for BIM & FM interaction, such as problem-resolving using COBIE files.
- Sport project management and sports facilities in the sports sector require the acquisition of very high performance, not only for O & M but also from early stages, which are gained through BIM & FM.
- Every structure, service, or facility is required to operate and manage professionally, efficiently, and effectively. Certain activities should be carried out in each building (planning, design, management, construction, media relations, and security, for example), provided that qualified information is obtained and that conditions in sporting facilities are improved concurrently.

**The suggested future work**

As the subject of this paper, several issues demand scientific inquiry and definition and therefore require additional study, including the following:

- Using BIM as an approach influences the different stages of the design, construction, and management of sports facilities.
- Investigate the critical role of sports facility management in developing a country (city) and the future of the sports industry, particularly in Arab countries.
- Adopting possible directions for further development of sports facilities in Egypt so that Egyptian sports will keep up with global trends, starting with planning, design, construction, operation, and facilities management.

**Disclosure statement**

All data collected by researchers and no conflict of interest.
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