

Automatic Integration of CAFM and ERP System using Application Programming Interface (API)

Shiela B. Duquez

School of Industrial and Engineering Management
Mapúa University
658 Muralla St., Intramuros, Manila 1002, Philippines
sbduquez@mymail.mapua.edu.ph

Grace Lorraine D. Intal

School of Information technology
Mapúa University
658 Muralla St., Intramuros, Manila 1002, Philippines
gldintal@mapua.edu.ph

Abstract

Application Programming Interface (API) has been largely used in most of the technology platforms available in the market nowadays. It has become vital for a business to utilize the capabilities of an API in integrating various systems they have in place. In this study, the researchers propose an automatic integration of two widely used systems in the Facility Management industry, the Computer-aided FM and ERP software using API. The development of the new system model has been analyzed using various systems analysis tools such Root cause Analysis, and Swimlane Workflow Diagrams. The project has proven to be highly beneficial for the company because can offer reduction in IT expenses, reduction in time required to complete tasks within the system and can deliver better data integrity and reliability.

Keywords: Computer-Aided Facilities Management (CAFM) • Enterprise Resource Planning (ERP) • Application Programming Interface (API)

1. Introduction

SBD Company is currently implementing a software system called FSI Concept Evolution, which is a Computer-Aided Facilities Management (CAFM) tool to aid in management of all facilities maintenance activities. To facilitate the procurement and finance side of the business, SBD uses a different software, which is an Enterprise Resource Planning (ERP) software, called Microsoft Dynamics 365. Aiming to track and record all company processes and transactions, and the goal to be a fully digitized company, SBD has been using both software to manage mentioned aspects of the company. With the aim to capture full data from both systems, a manual integration was implemented to record the same details in both systems. Because of this, each of the individual software has generated its own separate expenses and has generated its own individual person-hours for one task, causing redundancies in effort and cost. Furthermore, redundant entries paved way for redundant mistakes in data entries.

With the aim to resolve the mentioned issues, numerous management meetings and discussions were conducted between IT, operations, and senior management. As a result, an IT implementation using Application Programming Interface (API), a software intermediary that allows two applications to talk to each other, was approved for implementation to automatically integrate CAFM and ERP related to PR/PO Cycle and Invoicing and Payment Cycle. The API to be used is an FSI web service which is capable to talk to the ERP system given the correct security token to trigger and enable data transfer from FSI to Microsoft Dynamic 365 and vice versa.

The project's goal is to save time and effort in managing the full cycle of facilities maintenance processes starting from the request for a particular job, procurement of resources, completion of the job, invoicing until payment of the job completed. The automatic integration will provide a smooth process flow and will integrate all functions from operations, procurement up to finance.

1.1 Company Background

SBD Company is local liability company operating in Abu Dhabi, United Arab Emirates. It's portfolio of services include Advisory Services which offers Building Engineering Advisory, FM Business Consultancy, and Facilities Management. Sinyar also offers Management Services, which include Facilities Management Operations on behalf of the Client, Project Management on Properties and Real Estate Project Reviews.

SBD's clients are refined organizations who require top quality services from various real estate portfolios. SBD is committed to providing the highest quality support and services, providing their clients with peace of mind that their properties are in good hands.

SBD has a selection of experienced team of professionals who are dedicated, passionate and responsive to the needs of the clients. Team members have a deep understanding about the ever-changing dynamics of the industry.

To manage the Facilities Maintenance business of the company, SBD has implemented a CAFM system. SBD purchased a CAFM system called FSI Concept Evolution. And to manage the procurement and finance aspects of the company, an ERP system is implemented. Microsoft Dynamics 365 was bought to be used within the company.

SBD Company developed their Vision and Mission statements around core values selected and approved by the company Senior Management. Company core values are Loyalty, Growth and Improvement, Accountability, Teamwork and Integrity, and Excellence. These core values are the foundations of SBD's success and future achievements. They have set SBD apart from competitors and helped turn SBD into the company that we it is today. Figure 1 shows the Organizational Structure of SBD Company.

1.1 SWOT Analysis

Table 1 shows the strengths and weaknesses of SBD company and the external factors affecting their operations.

Table 1. SBD SWOT Analysis

<p>STRENGTHS</p> <ul style="list-style-type: none"> Stakeholders' political and economic relevance in UAE. Availability of resources to support new business ideas and projects. Ability to group hospitality and AFM services in one seamless integrated solution with sister company. 	<p>WEAKNESSES</p> <ul style="list-style-type: none"> Ability to recruit the right talent fast enough due to required high-level security clearances. Simultaneous implementation of similar technologies causes redundant processes undertaken by employees. Complexity of some corporate processes as compared to the company's development stage.
<p>OPPORTUNITIES</p> <ul style="list-style-type: none"> Capitalize on shareholder's ability and willingness to support business development. Ability to provide new services to existing client platform. Leverage new generation technologies (AI, Cloud, Blockchain etc.) to improve service delivery and provide new solutions to clients. Solid demand for services in the company's market segment. Hospitality and AFM services together are a unique selling proposition. 	<p>THREATS</p> <ul style="list-style-type: none"> Corporate structure does not evolve at the pace of business. Pressures to accept more business that can be handled reliably. Stakeholders support may languish rapidly is recurrent failure occurs.

2. Review of Related Literature

The integration automation will allow automatic transfer of master data from FSI to ERP. The automatic integration of CAFM and ERP systems in the terms of PR/PO, Invoicing and Payment Cycles was developed based on published studies and books related to CAFM, ERP, and Application Programming Interface (API). In recent years, the use of application programming interfaces (APIs) has largely replaced technologies such as electronic data interchange and custom-written integration programs for development of new system interactions. APIs are now the de facto industry standard for integrating data and functionality across diverse application ecosystems (Sturm, 2017). The operation and maintenance stages account for the largest proportion of whole life costs of the building process. The costs of operations and maintenance represent 50–70% of the total annual facility operating costs and 85% of the entire lifecycle costs are spent on FM (Wai Wong, 2018). The study of Aziz in 2016 discussed the ICT evolution from past

over 40 years in FM and highlighted Building Information Modelling (BIM) as the latest technology. Reviews the use of enterprise resource planning (ERP) applications. ERP applications can provide organizations with relatively consistent process information reporting systems, but they often impose ways of structuring processes that are at odds with preferred ways of doing things (Hamon, 2019).

3. Methodology

SWOT Analysis was used to determine SBD's Strengths, Weaknesses, Opportunities and external Threats affecting the business. Having identified those factors, the authors came up with the improvement of the processes.

Data gathering was conducted through interviews with key personnel such as employees from Facilities, Procurement and Finance Department. Current problems and issues were raised and used as part of the Root-Cause analysis which is another tool that the researchers used to come up with the possible solutions that will resolve the issues or problems. Table 2 shows the result of the Root-cause analysis.

Table 2: Root-cause analysis

Problem	Possible Cause	Suggested Solution
High occurrences of data entry errors. CAFM operators are selecting wrong activity, cost center and other details while creating PRs and POs in FSI and ERP.	Lack of Training	Training will fill in the information gap and equip the CAFM operators with correct knowledge to complete the tasks. Check completed data entries for mistakes and conduct on-the-spot demonstrations

Business Process Analysis was also used to determine the pain points in the current process of invoicing and payment process. Figure 1 shows the flowchart of invoicing and payment. It is demonstrated that a duplication of actions is done in FSI and ERP. Creating and logging a task work request requires data entry to both FSI and ERP. And it is also showing manual duplication of data from ERP to FSI for the PO details. Another manual step is the generation of Proforma Invoicing (4). All these mentioned steps are the pain points in the current workflow which are considered bottlenecks of the process.

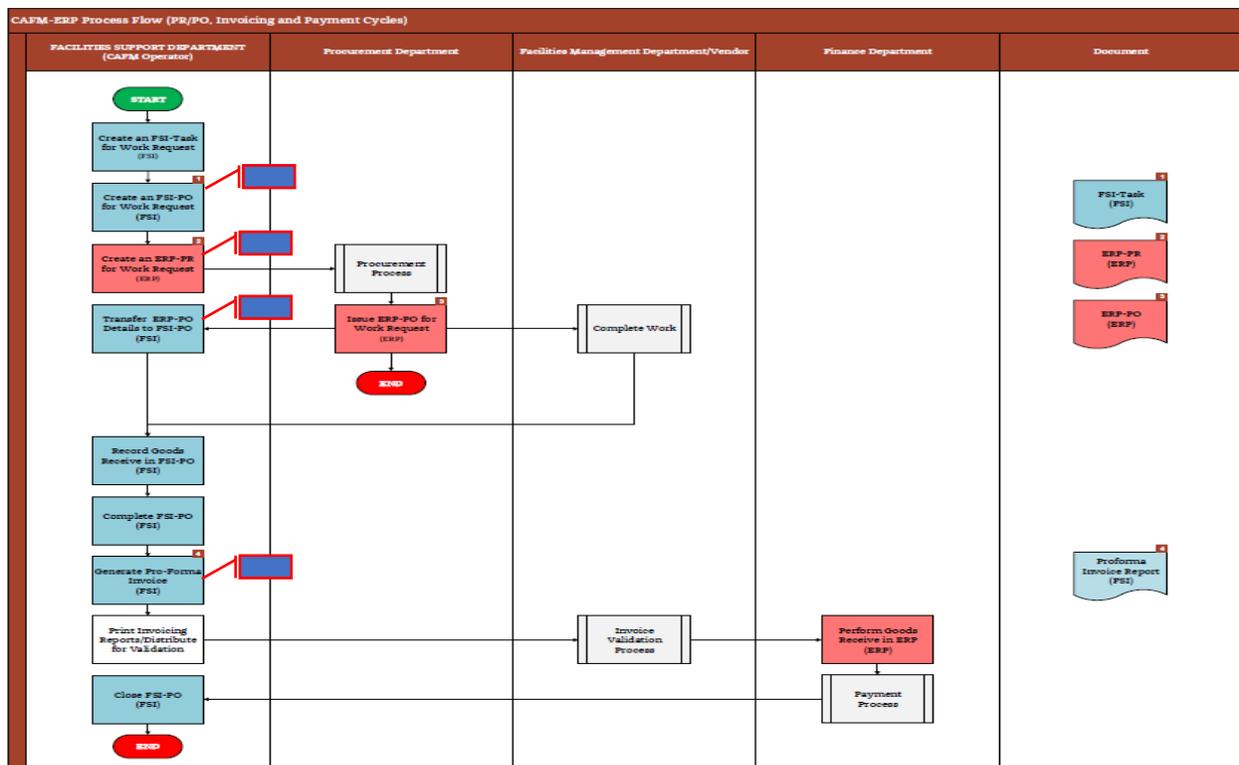


Figure 1: Flowchart of the current Invoicing and Payment process

4. Results and Discussion

4.1 System Design

4.1.1 Proposed Invoicing and Payment Process

The proposed improvement the implementation of an automatic integration process for CAFM and ERP systems to facilitate facilities management, procurement, and finance tasks automatic data transfer from FSI to ERP. The proposed new process flow chart is significantly different from the current process flow chart. Many process steps have been eliminated because the two systems are already integrated and are communicating bilaterally and transferring data automatically. Figure 2 shows the flowchart of the proposed invoice and payment process..

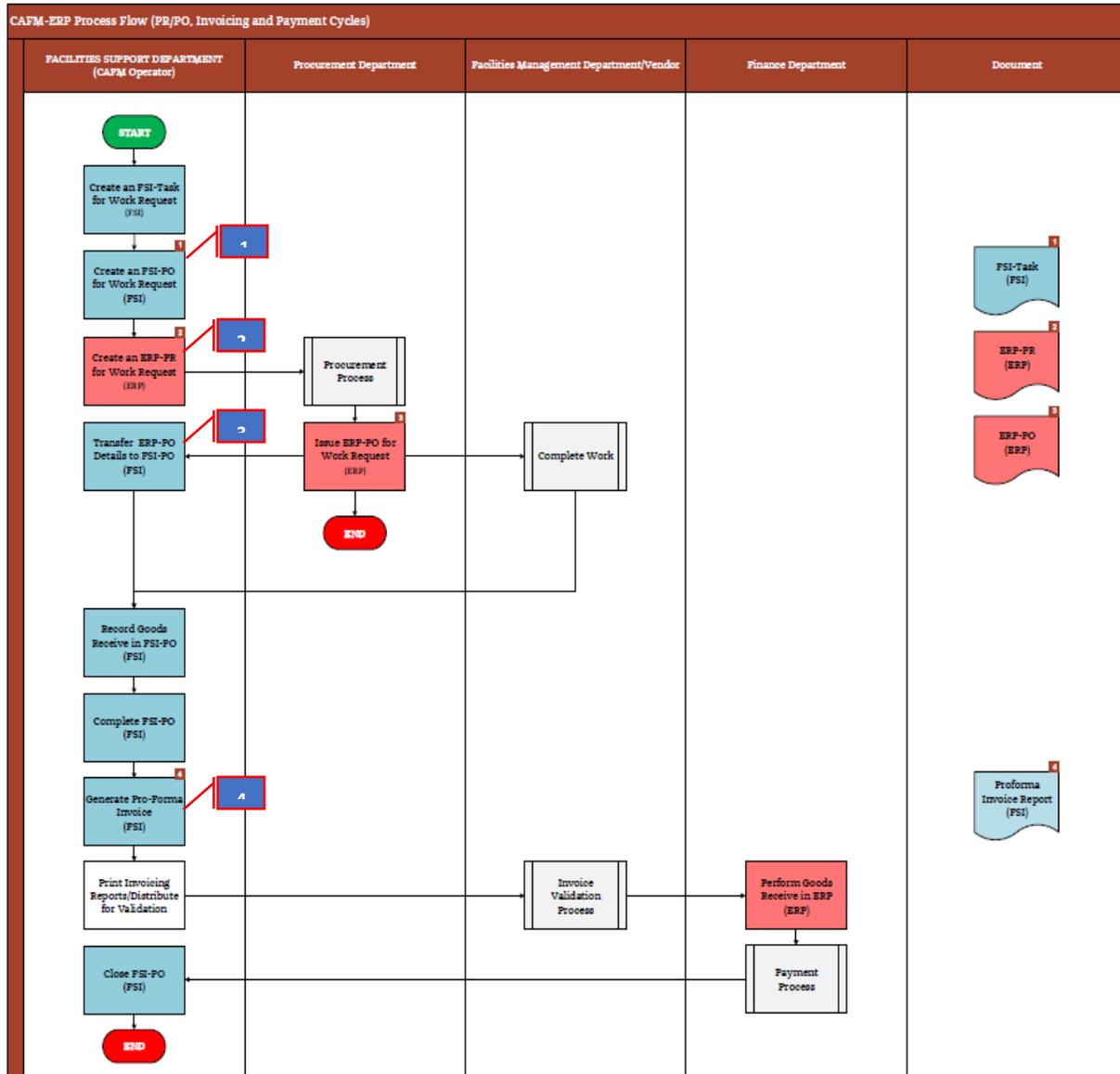


Figure 2: Flowchart of the Proposed Invoice and Payment process

4.1.2 Internal Outputs/External Output/Graphs/Dashboards

The new system design will produce an integrated CAFM and ERP system that can talk bilaterally and automatically update data according to an event or action defined to trigger initiation of communication between the systems. The master data integration flow will be designed as per Figure 3.

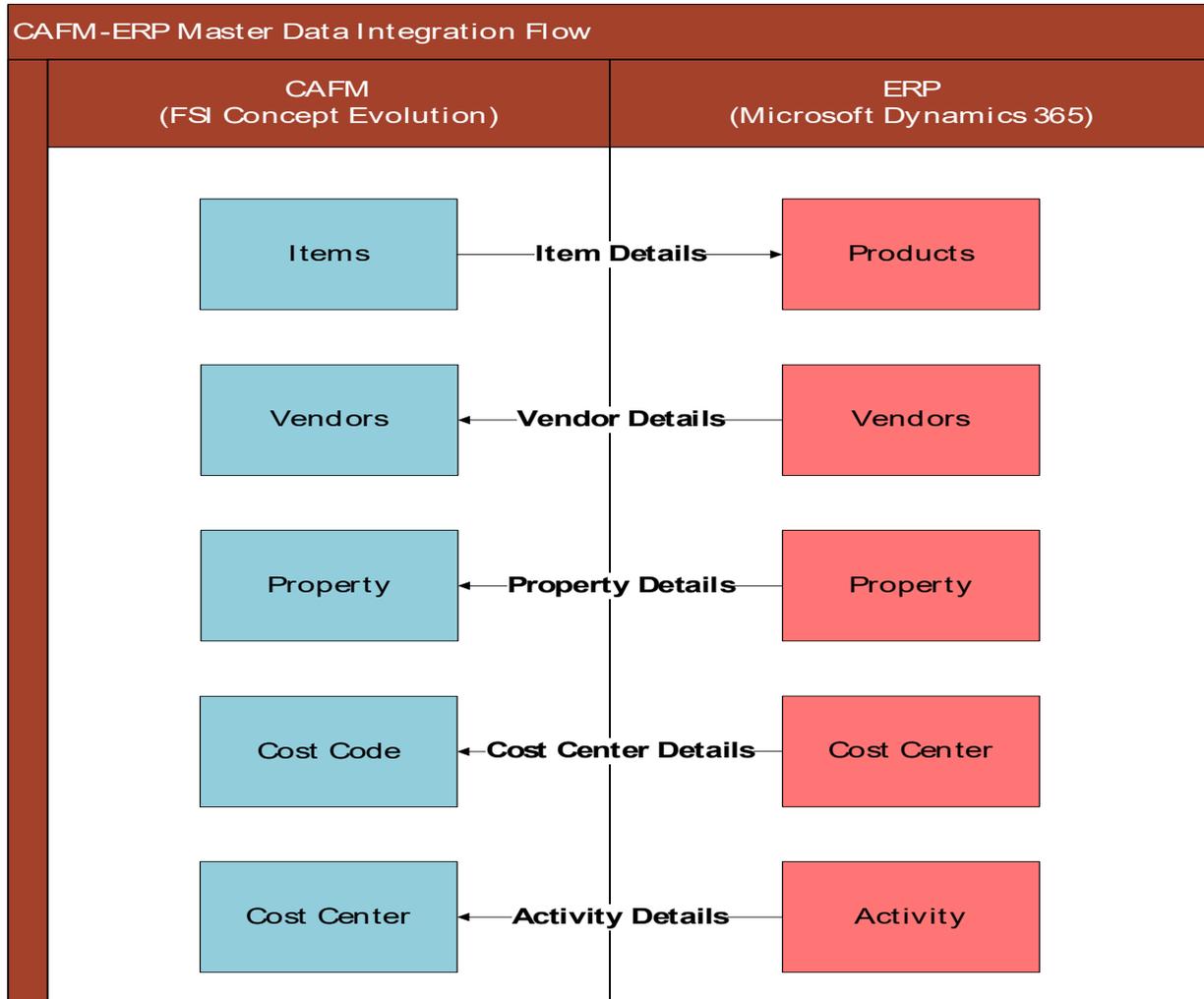


Figure 3: Master Data Integration Flow

4.1 System Evaluation

Following the guidelines throughout this template will also improve the accessibility of your manuscript and increase the audience to evaluate the new system, we will use the identified issues as a base for checking the advantages the new system can offer. The evaluation will focus more on the main actor of the system, which is the CAFM Operator. Table 3 summarizes the comparison of the current and new proposed system.

Table 3: Comparison of Current vs. Proposed System

Identifier	Current System (Manual)	New System (Automated)	Results Benefits
Amount of time to complete data entry for full process cycle.	There are 9 process steps required to complete cycle.	There are 3 process steps required to complete cycle.	A significant number of steps were removed from the new system therefore saving resources.

Occurrence of erroneous data entry.	Data entry is done in both systems.	Data entry is done in CAFM system only.	The probability of data entry mistakes is reduced by 50% since data will need to be entered only in CAFM.
Software license and accounts expenses.	Two accounts are purchased per CAFM Operator, one for each system.	Only one account is purchased per CAFM Operator since he/she will only access CAFM.	The license account expenses are reduced by 50%.

5. Conclusion

Based on the summary of the evaluation of the advantages of the new proposed system, it is revealed that the use of API in system integration automation can offer a significant improvement in the system. It will support the company's goal of integrated data without the causing the company to spend more than necessary. The new automated system also revealed to be most beneficial to the company because it can allow streamlined process with lesser man-hours required for a full process completion. Another important advantage is the automatic integration can produce more reliable data with less errors due to encoding mistakes. Overall, it can be concluded that the new proposed system can be very effective and is a very good system to implement.

References

- Rick Sturm, Carol Pollard and Julie Craig. 2017. Chapter 11 - Application Performance Management (APM) in the Digital Enterprise. Chapter 11, 137-150. ISBN 9780128040188
- Johnny Kwok Wai Wong, Janet Ge, Sean Xiangjian He. 2018. Digitisation in Facilities Management: A Literature Review and Future Research Directions. Automation in Construction Volume 92, 312-326. <https://doi.org/10.1016/j.autcon.2018.04.006>
- Nor Diana Aziz, Abdul Hadi Nawawi, Nor Rima Muhamad Ariff. 2016. ICT Evolution in Facilities Management (FM): Building Information Modelling (BIM) as the Latest Technology. Procedia - Social and Behavioral Sciences Volume 234, 363-371. <https://doi.org/10.1016/j.sbspro.2016.10.253>
- Samwel Matende and Patrick Ogao. 2013. Enterprise Resource Planning (ERP) System Implementation: A Case for User Participation. Procedia Technology Volume 9, 518-526. <https://doi.org/10.1016/j.protcy.2013.12.058>
- Paul Harmon. 2019. Enterprise Resource Planning–Driven Redesign. Business Process Change (Fourth Edition). Chapter 16, 393-415. <https://doi.org/10.1016/B978-0-12-815847-0.00016-9>

Biographies

Shiela B. Duquez is is currently enrolled in Mapua University for a Master's degree in Industrial Engineering.

Grace Lorraine D. Intal is a full time faculty member in Mapua University. She is teaching Information Systems core courses in the School of Information Technology and Information Systems courses in the School of Industrial Engineering.