Study on Residential Facilities Management Systems

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Abstract— There has been relatively little research undertaken on issues and problems related to facilities management systems. Many research works have outlined the the most vital challenges in facility management are controlling cost, coordinating teams, handling failures, maintaining aging equipment and facilities and time management. Most of the research and survey established the needs of the growing revenue, lowering and control operating cost. Other than revenue and cost control, many have neglected the collection of payment from customers. For any business to survive, cash flow or collection of payment is utmost important. Cash is required because it later becomes the payment for things that make the business run: expenses like paying salary to employee, stock or raw materials, rent and other operating expenses. It is understandable that positive cash flow is preferred. Positive cash flow means the business can run smoothly without worrying about being unable to pay overhead and other expenses. High positive cash flow is even better which allow business to make new investments (hire more employees, open another location) and further grow the business. Facility management in residential buildings has many challenges and problems such as damage, ageing property and unexpected maintenance. Property and facilities are experiencing wear and tear as well as ageing. Regular maintenance needs to be carried out by qualified personnel with good management tools. To enable the smooth running of day-to-day operations, management of time, coordinating staff and communicating with tenants are crucial to achieve target and be productive and efficient. Hence this work attempts to provide a software solution that can mitigate some of the issues highlighted with today's workplace becoming increasingly mobile and dynamic.

Keywords—facilities, management, residential, system, business

I.   INTRODUCTION

Malaysia being one of the developing countries with a fast-growing economy has a population of 32 million. The demand for accommodation and commercial activities is great. Majority of the buildings in Malaysia are commercial and residential buildings. Residential buildings are better-known as accommodation or for people to live in. Residential buildings such as: detached dwelling or single unit housing, semi-detached dwellings, attached dwellings or multi-unit housing and terrace dwellings. It is highly essential that they are managed and maintained efficiently. To manage the property and maintain the facilities, a third party-like property manager or facility manager will be engaged. Facilities management is very important for the successful operation of a business. All facilities in the buildings either commercial or residential are required appropriate facility management to ensure the installed facilities are function efficiently and safely. Overall functions of the facilities management include organizing the security maintenance and repairs of property. Facility manager is involved in much of the day-to-day operation of the buildings. Facilities managers are required to take care of the entire site, or a certain area of it, access the condition, determine if repairs are needed and ensure these repairs are carried out, in addition, facility managers have to ensure the building runs at optimum performance, hits targets and functions in line with a strict budget. They are also responsible for organizing waste disposal and management to ensure meeting the hygiene standards. Facility managers must have the expertise to deal with tenants for the collection of security fees and managing events.

II.   PROBLEM CONTEXT

There has been relatively little research undertaken on issues and problems arising in the management of facilities in residential buildings. Article from the blog INFRASPEAK on "What are the 5 Biggest Challenges in 2018 for Facility Management?" has outlined the following 5 biggest challenges in facility management: Maintaining the Integrity of the Specifications

- Controlling cost
- Coordinating teams
- Handling failures
- Maintaining aging equipment and facilities
- Managing time

Acording to the survey conducted by Unicom, the most pressing challenges in property management are:

- Hiring and maintaining quality staff
- Growing revenue
- Property damage and unexpected maintenance
- Time management
- Lowering operating costs

The delivery of services is changing rapidly within the service industry; internet-based service delivery, better communication channel and an increasingly evident use of Information Technology within buildings has a fast approach to managing services or business. New approaches are

required to deliver services so that facility management is able to raise standards, improve service quality and be more innovative.

Indeed, as already mentioned, we have entered into an age in which tools and technology, such as the Internet, are playing a pivotal role in the buildings. For this reason, as a constant review of what is available in the market is crucial so that system can be enhanced to cater for the need of the most recent situation and environment. And not as an independent document. Please do not revise any of the current designations. This all necessitates a software solution that can improve the process and increase convenience of the tenants and administrators on the facility utilization and activities.

III.   LITERATURE REVIEW

Facilities management is a type of management focus on delivering support services, managing operations and as well as maintaining building. Facilities management has become one of the most important practice and necessity to support human activities. In the new apartments or condominiums, facilities such as swimming pool, small convention hall, meeting room and gymnasium are commonly provided for residence to enjoy their activities. Facilities management plays a significant role to serve the numerous demands of residence as an increasing number of multi-unit residential buildings have developed throughout this decade. Based on [1] facilities management is a technique to enhance the quality, adding value to the building such as office and residential area by providing necessary support services to the people. This approach is to provide a sustainable operation environment to meet the needs in terms of strategy of the company. Good quality of services able to boost core value of the company and making sure the people are comfortable in the environment where they are.

Based on the statement given by [2] Malaysia demonstrated that facility management practices are insufficiently developed to able to operate property management. According to the authors of [3], the progress of facility management is unimpressive in South East Asia where competition among property managers and maintenance fees are increasing. The growth of facility management is slow due to lack of understanding of facility management, thus most of the buildings not being practice and neglect the use of modern technologies where information system may assist significantly in increasing efficiency and controlling the processes facility management electronically. Based on a product called SureMountain [4] it is a residential facility management system. Instead of having information system that manages the facilities reservation system and security fees payment, SureMountain aims to provide services such as cleaning and painting to ensure customer's estate running efficiently. Technical maintenance tasks including lighting and electrical work also available in SureMountain. SureMountain's initiative is to attract customers to invest heavily into their systems that will optimize equipment resilience and preventive measures.

IV.   TECHNICAL RESEARCH

For this Residential Facility Management System, either ASP.Net or Java will the language chosen to develop this software solution.

Active Server Pages (ASP), is a language developed by Microsoft that enable developers to build web application and websites. One of the features of ASP.Net is that developers can utilize both client side and server-side scripts in the development of web application or websites. Developers with the knowledge of C# and Visual Basic, they can take full advantage of this framework.

Java is a programming language that will able to work on any operating system. It is one of the most popular programming languages that are widely used in developing mobile applications. Most of the developers uses Java to write programs which employ popular software design patterns and best practices using the various components found in Java EE [5]. Table I shows why ASP.Net is suitable for development of this system over Java:

TABLE I.   COMPARISON BETWEEN ASP.NET AND JAVA

	ASP.Net	Java
Compatibility	Windows operating system	Multiple operating system
Cost	ASP.Net can minimize expenditure due to the system is rely on Windows-based software[7]	Java is not costly. But developers need to assess a good number of related software and supporting tools to choose the right mix of Java tools
Security	Microsoft take care of the security aspect	No security due to lack of professional support
Performance	.Net is compiled and then run on the system where they are deployed [8]	Does not require conversion to machine language until the code gets executed

Overall, ASP.Net is a better option to develop the Residential Facility Management System. ASP.Net is a programming language that is suitable to develop a web services with a high security, at the same time intuitive to use. HTML is still needed to design the webpage. CSS is used to make the layout of the webpage much more organize and attractive

V.   METHODOLOGY

For this Residential Facility Management System, multiple factors and consideration needs to be taken to choose the most suitable system development methodology. Table II. below shows the comparison between Rapid Application Development (RAD) and Waterfall methodology.

Based on Table I, Rapid Application Development (RAD) is the suitable methodology for this Residential Facility Management System. This project is a mediums-sized projects and there is no need to have large number of developers to develop this project. Since this is a small sized project, the cost may not be large unless there is a change of requirements. This project has to be face paced and to be completed within a short period of time. Due to client not understanding their full requirements yet, changes are expected to occur at any stage of development. RAD methodology is able to present a prototype for the clients to illustrate and demonstrate how the system will function. Prototyping is made based on the requirements given from

the clients. RAD has lower risk than Waterfall methodology because the prototype is presented to the clients after the progress. Whereas Waterfall methodology does not present prototype to the client but instead giving them a complete system. If the complete system does not meet the client's expectation, the developers has to make changes from the start of the Waterfall phase.

TABLE II.   COMPARISON BETWEEN RAD AND WATERFALL METHODOLOGY (MILLER, 2018)

	RAD	Waterfall
Project Size	Small and medium-sized projects	Small and large projects
Team Size	Needs to be small	Small to large
Cost	Variable, depending on the number of iterations	Fixed cost, assuming no changes
Duration	Short	Long
Changes	Can make any changes at any stage	Need to start at the beginning of the stage if any changes made to the project
Prototyping	Working model delivered as soon as possible	Delivered after the system is fully functional
Risks	Low risks	High risks

Based on the Table II, Rapid Application Development (RAD) is the suitable methodology for this Residential Facility Management System. This project is a mediums-sized projects and there is no need to have large number of developers to develop this project. Since this is a small sized project, the cost may not be large unless there is a change of requirements. This project has to be face paced and to be completed within a short period of time. Due to client not understanding their full requirements yet, changes are expected to occur at any stage of development. RAD methodology is able to present a prototype for the clients to illustrate and demonstrate how the system will function. Prototyping is made based on the requirements given from the clients. RAD has lower risk than Waterfall methodology because the prototype is presented to the clients after the progress. Whereas Waterfall methodology does not present prototype to the client but instead giving them a complete system. If the complete system does not meet the client's expectation, the developers has to make changes from the start of the Waterfall phase.

VI.   RESEARCH METHODS

Data collection is the process of gathering data with the intention of researching the relevant sources to find answers to the research problem. In this Residential Facility Management System, data collection is important to find out the whether the residence has any trouble with the facility management in their own residential area. Data collection is a method of collecting data that will ensure accurate and honest collection from the respondents.

Questionnaire will be chosen as a data collection method for this research project. Questionnaire are inexpensive especially using Google Form where researchers do not have to hire surveyors to perform any data collection method such as face-to-face interviews. Google Form is a free platform for

researcher to create questions and it can be done through online.

Since questionnaire are done online, user familiarity is higher for respondents to complete the questionnaire. Furthermore, questionnaire only contains close ended and Likert scale questions where respondents only select an answer from a question to save time.

By using Google Form, questionnaire allow easy analysis of results with statistics and charts. Statistic and charts serve the purpose of illustrating the final results of response from the respondents.

Online questionnaire ensures respondents privacy where platform such as Google Form make possible for private communication. This will allow respondents to select answers with less pressure and immediate responses. Accurate results are expected when respondents have the opportunity to complete the questionnaire anonymously.

Sampling techniques will be used to identify respondents from selected residential buildings. Special attention will be given to ensure that the identified residential buildings are fairly representing the needed data. Table III. shows the sample of residential buildings.

TABLE III.   SAMPLE OF RESIDENTIAL BUILDINGS.

Location	Number of Sample	Total number of respondents obtained
Main Place Residence, USJ 21/10, 47630 Subang Jaya, Selangor	30	25
Isola Serviced Residence, SS 16/1, 47500 Subang Jaya, Selangor	30	15
Saujana Residency, SS16/1, 47500 Subang Jaya, Selangor	20	10

The data collection is using quantitative methods focused on the distribution of questionnaires to obtain data and gather information on this research topic. The questionnaires are distributed to the respondents to identify the significance of facility management in residential buildings. The questionnaires are distributed to the facility manager of the building using Google Form. The facility manager will forward the questionnaires to the target group. Some of the sample survey analysis are shown below:
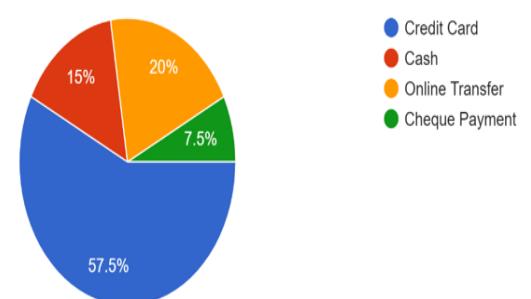
Fig. 1.   Maintenance fee
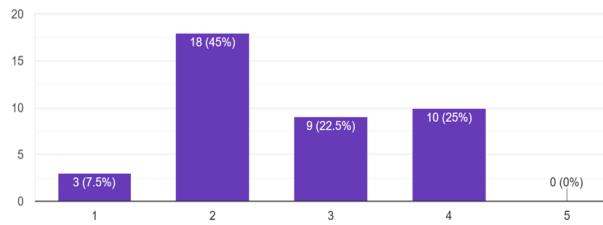
Fig. 2.   Satisfaction on payment methods
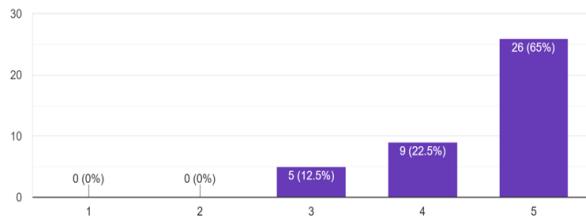
Fig. 3.   Acceptance Rate of Online Payment System
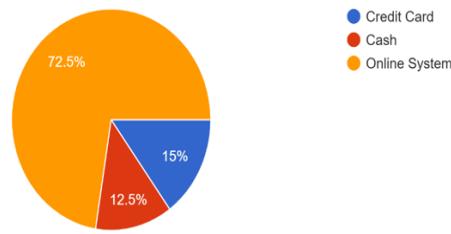
Fig. 4.   Payment Methods

From the study, there is a need for more innovative approach to complement the function of the facility management. To achieve the objective, the facility management team need to be more knowledgeable and improve skills. The skills include hard and soft skill. This will help to improve the relationship with tenants and bring about changes in the way the task and work process is handle by the facility management team.

To close the gap on communication, the Residential Facility Management System is recommended. The system will ensure effective communication between tenant and facility management. The system should include features where facilities can be booked, or reservation can be arranged by the tenant.

VII.   SYSTEM ARCHITECHTURE

For tenants, they are able to book facilities and pay management fees through the system. Facility schedule will be displayed for the tenants to look at the availability of the facilities. Once the facility is booked, tenants are able to view the bookings. Tenants are able to view the payments details after they pay the management fees. Latest news will be posted in the Tenant's Home page to inform about events or notice that may affect the tenants.

For administrators, they manage news to notify tenants the events or notice. Administrators manage facilities to provide schedule for facilities booking purposes. Tenants account will be registered by administrators to ensure the registry is systematically created. Lastly, administrators will able to view list of tenants registered in the apartment, facility bookings booked by tenants, view management fees paid by tenants and view news uploaded by themselves.
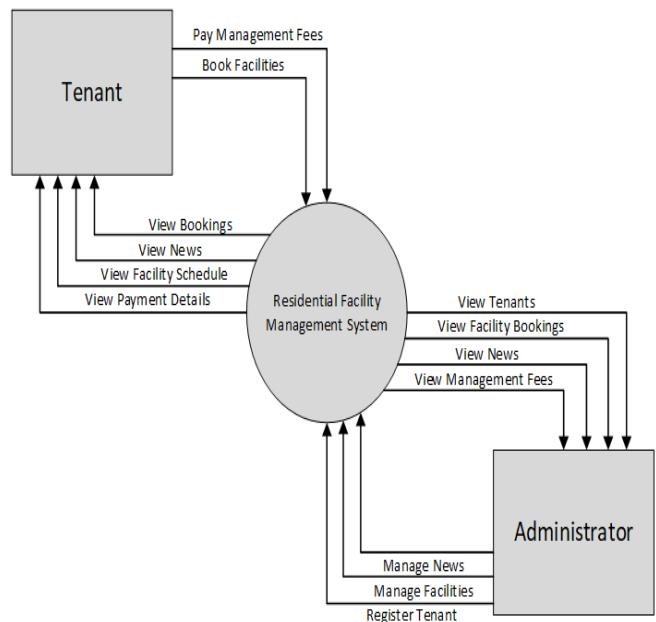

Fig. 5.   Context Diagram for Residential Facility Management System
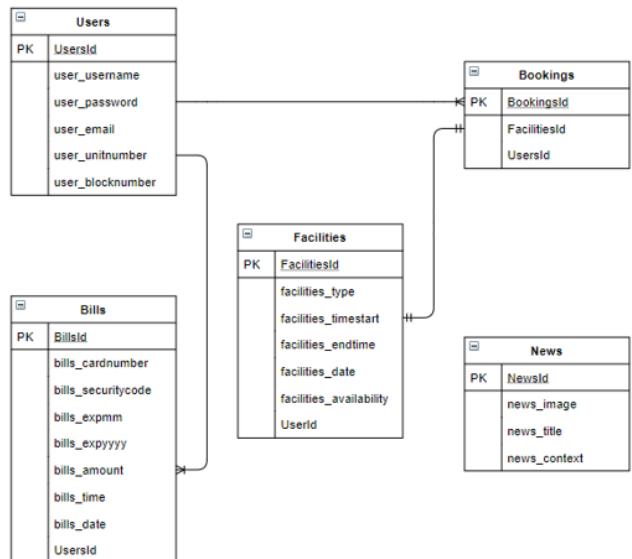
Fig. 6.   ERD for Residential Facility Management System

VIII.   CONCLUSION

The study has conducted at the building corridor where the tenants coming in and out. Some respondents did not give information due to their busy schedule. The main obstacles faced during this study is lack of cooperation by building

owners. Therefore, a suitable room or location is not given to enable the questionnaire presented to obtain more feedback. To conclude the Residential Facility Management System definitely have solved problems for tenants in various segment such as booking facilities and pay management fees. The Residential Facility Management System also can provide view facility bookings and view payment details like never before. Without the system, tenants have to either call, message or call the management office to get confirmation of the facility bookings and management fees payment. The system has also provided convenience and high productivity for the management officers to manage their work.

However, there are some limitations that should be noted. During the studies and research, only limited sample size had been considered to study whether the implementation of the Residential Facility Management System is feasible or not. The number of respondents took part in the questionnaires barely have enough sample size to justify whether the system will able to solve facilities booking and fees payment difficulties.

Additional studies and research would definitely help in the further enhancement of the Residential Facility Management System. Other than that, improving the overall text and fonts would produce attractive web pages. Some of the functions such as booking facilities, make payments for management fees, display booking facilities and payment details directly from the database should be considered in the future to make the system much more completed.

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