MOBILE APPLICATION TO INTEGRATED PROCESSES FOR IMPROVING PERFORMANCE OF PROJECT MANAGEMENT IN FURNITURE INDUSTRY

Sakchai Rakkarn[1] and Anand Dersingh[2]

[1]Master of Engineering Program in Engineering Management, Graduate School Kasem Bundit University, 1761 Pattanakarn Rd., Suanluang, Bangkok 10250, Thailand, sakchai.rak@kbu.ac.th

[2]Department of Computer Engineering, Faculty of Engineering, Assumption University 592/3 Soi Ramkhamhaeng 24 Ramkhamhaeng Rd., Hua Mak, Bangkok 10240, Thailand, anand.dersingh@gmail.com

ABSTRACT

This research intent a way of solution for operating processes management in the furniture industry, which is poor performance such as miscommunication, unfollowing, confusing information, redundancy processes, delay processes, incompleted process, etc. consequently, the business has lost at least 20% of sale volume. The research proposes the re-engineering processes by revising workflow and then building a mobile application. A new model has started with sale, design, procurement, mock-up, master production, purchasing, production, and site installation departments. Nevertheless, the total time is separated to calculate the lead time process and reduce redundancy process. All processes are determined by the policy and authorized person for tracking, responsibility and communicating as a single window. The remaining time, process completion, process progress, alert massage problem, and job management are available easily to account information on mobile application anywhere. Therefore, everyone clearly can operate process on mobile application of single information with the diffident accounts information. The implementation is done in 6 months and results can be improved with excellent performance with remaining loss of approximately 5-8%.

KEYWORDS: Mobile Application, Furniture Industry, Project Management, Loss Reduction

1. Introduction

Demographic shifts will affect demand for real estate fundamentally. The global real estate will be expanded by more than 55% from US$29.0 trillion in 2012 to US$45.3 trillion in 2020, according to the calculation. It may then grow further to US$ 69.0 trillion in 2030. This huge expansion in the investable real estate will be greatest in the emerging economies. The burgeoning middle-class urban populations in Asia, Africa, and South America will need more housing. The middle classes are projected to grow by 180% between2010 and 2040, with the highest proportion of middle-class people set to live in Asia rather than Europe [1]. Thailand is currently one of the most exciting hubs for contractors in Southeast Asia today, with a construction market value estimated at USD 41.4 billion in 2016. Under the same aspect, Bangkok's residential property market fore see the growth of up to 7 % in 2018. As for the single home and townhouse market in the outskirts of the city, the outlook is that the rate of expansion will be low, with traffic issue accounting for the main factor hampering growth. Also, single home and townhouse projects are generally far from the train lines. The condominium market thus has an advantage to being close to the train lines. The market for B-C grade condos will remain largely comprised of Thai buyers considering from unit size, facilities and amenities, and pricing. The fully furnished model is an impressive facility for all buyers and all condominium markets. Therefore, furniture industry is always in parallel growth with the development of real estate sectors.

Thailand’s furniture industry continues to be one of the strongest in the strongest in the region due to production quality, innovation and modern styling, and flexibility in material used. The quality of its infrastructure is better than most of its neighbors, having an advantage in terms of quality of roads, ports, electric and other infrastructure compared to CLMV (Cambodia, Laos, Myanmar, and Vietnam) and this gap is actually increasing. There are about 2,600 Thai firms producing furniture, most of them small or medium-sized. Only about 10 % of firms are medium-large [2]. Most of the furniture industry serves like the retailers with D.I.Y. products, there is only a few companies producing for the construction project (Build-in or fully furnished), because of the customized products and complicated processes. Especially, the market for A-B grade condos has been customized the design to fully furnished, kitchen, living room, bedroom, which are several of room types in each project. Thus, furniture manufacturing is a complicated project management, which is concerns about costing, timing, and quality through the supply chain. Several researchers

disrobe to apply and develop complex project management by converting it into smaller phases [3], reducing uncertainty [4], synergy among project activities and resources [5], avoiding unnecessary details [6], using application of software [7], and motivational techniques [8].

2. Problem Statement

Most of the furniture manufacturing for the market condominiums have faced with complex project management because they have many processes and customized designs and products. A case study in a large sized Thai furniture industry, has the biggest of built-in furniture production with condominium grade A-B, approximately 40 projects per year. The tradition major processes (Figure.1) included: sale, design, quotation, mockup bidding, revised design, mockup mass, bill of materials (BOM) and bill of quantity (BOQ), purchasing, production, warehouse, transportation, and installation, which each process has been complicated in details and hard to monitoring and tracking. As major and minor processes are not directly flowing respectively but there are several stepped over processes with concealed information and irresponsibility Finding, the activities and sub-activities have redundant activity, individually internal information, various updated version information, no clear lead time, no related information and inspection between processes, no master planning, uncontrolled schedule, etc. The data has been collected since 2016, finds all projects are over 60 % of extension time, 10 % higher costs, and 30 % higher repair parts. The analysis of major problems obviously comes from lack of integrated processes.

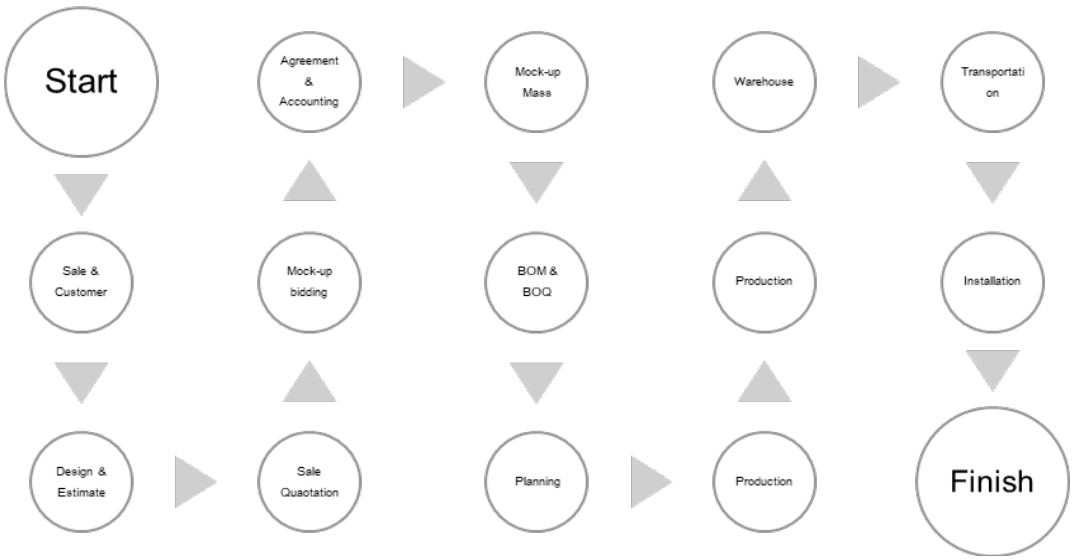

Figure 1 Traditional Processes and Individual Work

3. Approaches

This research proposes re-engineering with two concurrent methods comprised of integrated processes and mobile application. The implementation is not only the re-process, but also change the way to work of employees.

3.1 Integrated Processes

The concepts of integrated processes are applying by separating and decomposition processes [9] for reducing redundancy processes and then decomposition major process, lead time setting, and authorized setting. The objective function is the minimized total processes time as shown in equation (1).

$$Minimize\ T = \sum_{i \in I} t_i + \sum_{j \in J} max_{r \in R}\{t_r\} \quad (1)$$

where T is the total processes tim; t is a process time

I is a set of independent process; i is an independent process

R is a set of the redundancy processes; r is a redundancy process

J is a set of maximum time of redundancy processes; j is a maximum time of a redundancy process.

Thus, new integrated processes model is illustrated as Figure 2 by separating and the decomposing processes. Sale process involves with information of name project, status project (Bidding and In-Progress), code project, number of building, number of type, number of room, type of furniture (living room, kitchen, bathroom, loose furniture), value of project and date of kicked off project (In-progress status). The kicked of the project is the start point of time project, which is not included the bidding status. First state, sale time (t_s), design time (t_d), and procurement time (t_p) are started simultaneously as redundancy processes with processing time (t_1)= maximize {(t_s), (t_d), (t_p)} and then built mock-up bidding (t_2). Second state, the processing time of engineering (t_3), (t_4) = maximize {purchase (t_p) and accounting (t_a)} and mock-up mass (t_5) are operated respectively. The third state, the processing time of production (t_6) and warehouse (t_7) are operated individually. Final state, the processing time of (t_8) = maximize {transportation (t_t) and inspection (t_t)} and installation (t_9) are also operated respectively.

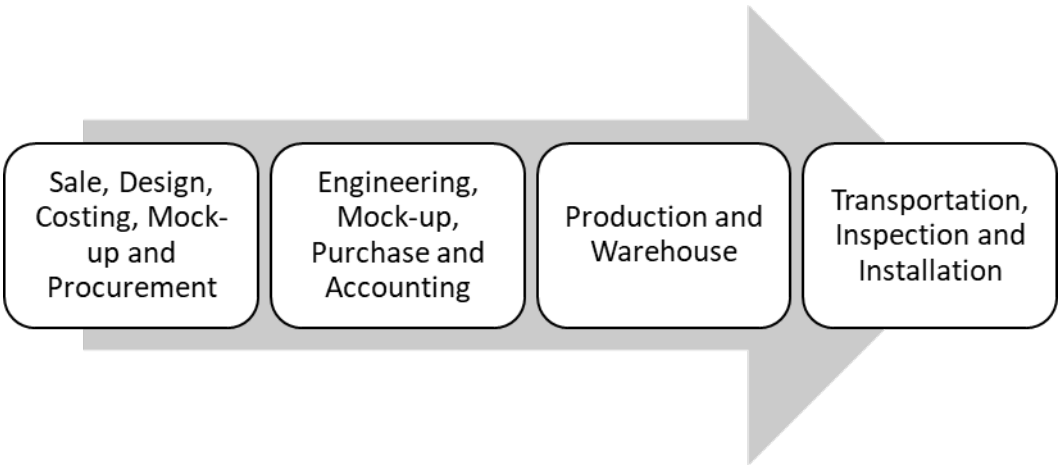

Figure 2 Integrated Processes

3.2 Mobile Application

The mobile application is applied to develop the process for monitoring and controlling [10-13]. Figure 3 below shows system architecture. In fact, this figure applies to all processes of the production furniture by which, at each station, there will be a worker with a smartphone and there is a visual system at the station. Every station communicates with the same web services and database. The mobile application is programmable with Android Studio with

JAVA language by interfacing SQL database and Microsoft Dynamics Ax. Visual control is designed by using three color alert policy (Green, Yellow, Red, and White). Red means the production less than 25 days, Yellow means the production between 25 and 30 days, Green mean the production 30 days or more, and White means no project kicked off yet. Moreover, each project can be monitored information, controlled lead time and reported installation with the visual color of the completed status room via the mobile application. Also, inspection process before installation has been checked in quantity and accuracy of each room via mobile application as Figure 4.

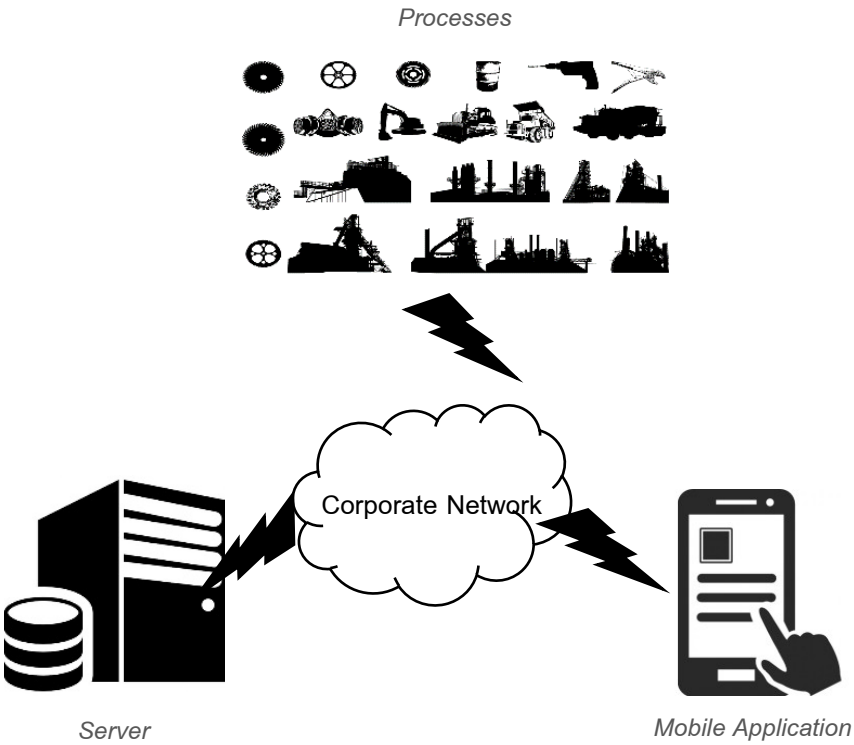

Figure 3 System Architecture

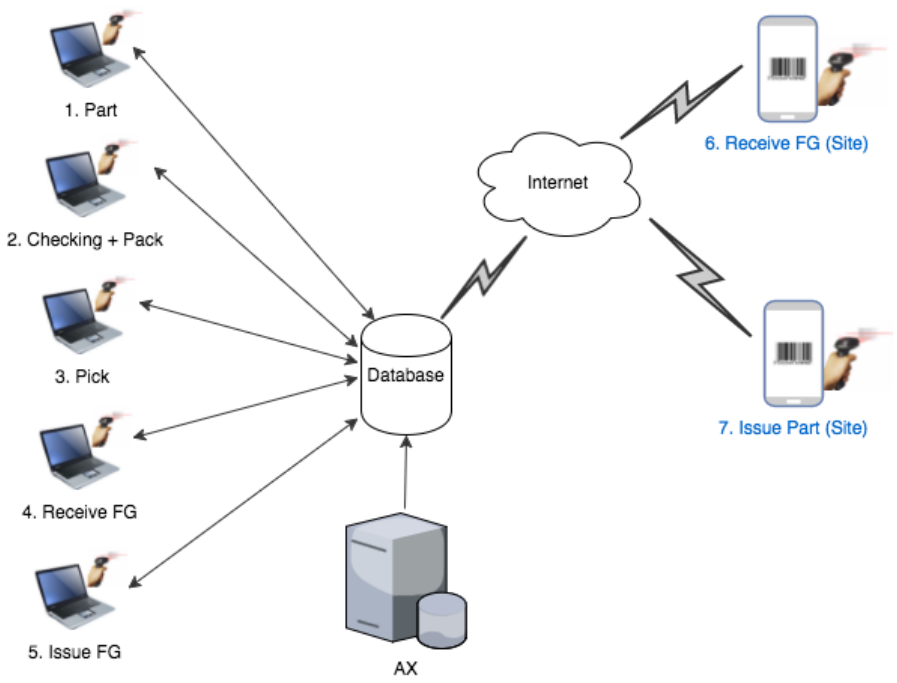

Figure 4 Inspection Architecture of Barcode Mobile System

4. Implementation

The implementation is divided into two phases, the first phase is implemented with the one-three modules in Figure 2 and second phase on the last module of transportation, inspection and installation processes with total 6 months. In the first phase, redesign process has been adapted several times and user-friendly platform application is also focused. Fifteen projects are applied for implementation in 3 months, it shows clearly lead time, relationship, single information and the remaining time of all process, which feedback is given to manager in each department for controlling and solving problems. Top management can see the status of all project and command to motivate in each manager perform well. After user acceptance testing in phase I, next processes are continuous to phase II that also emphasizes on checking the area of the site and visual status of each room of project for understanding easily to site management. Examples of application in each process are illustrated in Figure 5, Figure 6 and Figure 7 respectively.

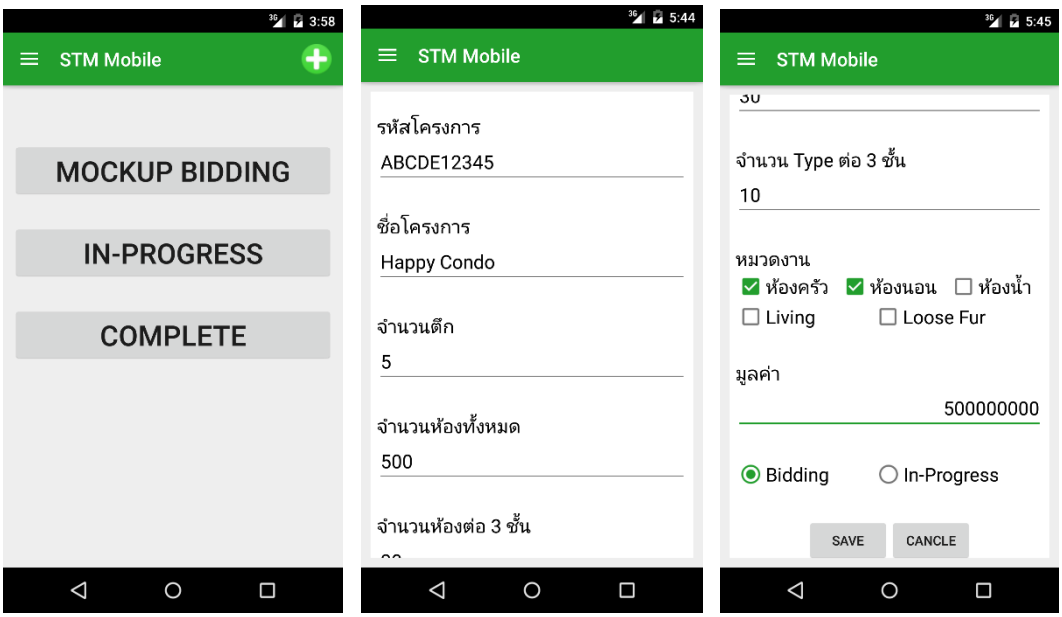

Figure 5 Sale Input Information in Application

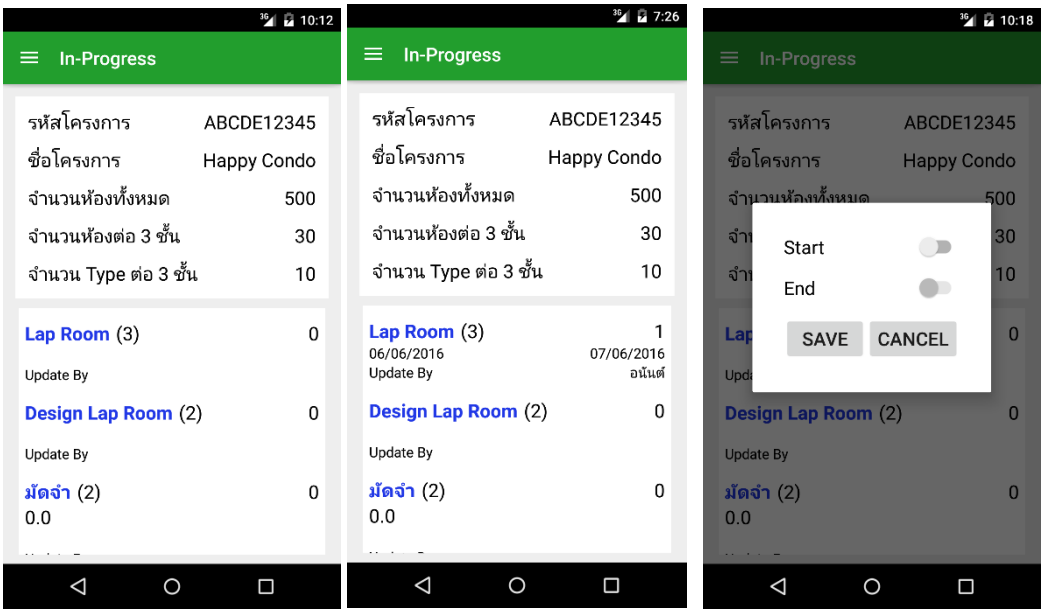

Figure 6 Control Lead Time in Process

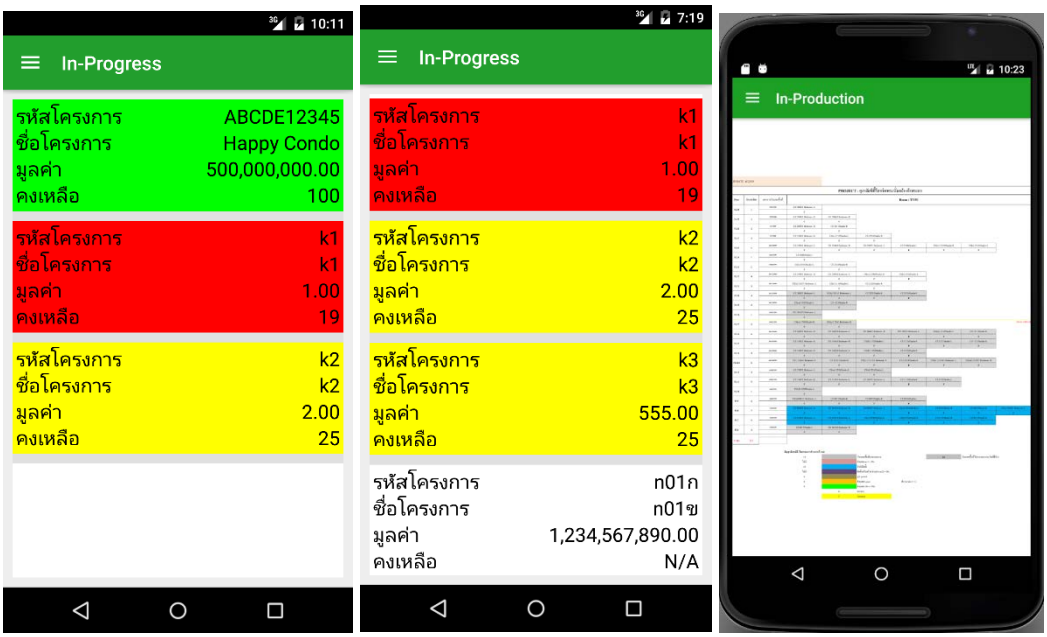

Figure 7 Monitor and Progress in Projects

5. Results

After 6 months of implementation with 40 projects, it is found that at least 70% of loss decreases continuously and more than 30 projects have enough remaining time for on-time delivery. Because all managers can be daily managed monitored and controlled with the application anywhere and anytime for monitoring and controlling, executive management also follows up with a big picture and master planning is decentralized to operate by visual information. Also, the application is very compatible with the site manager and foreman to mobility working. However, if a responsible person does not continuously inputted and control data, this application will be failed or unutilized as limitation of implementation. Moreover, the data completion of ERP System (Microsoft Dynamics Ax) is always every important for accuracy monitoring and control management.

6. Conclusion

A firm of furniture industry is trying to improve performance in project management of grade A-B condominium projects, which usually are the low performance with complex processes and mass customization products. The basically analysis problems find that loss of communication, lack of information, hard to tracking and controlling and lack of internal

cooperation. Therefore, the re-engineering is considered by using the separable and decomposition method. The new model of processes is created an integrated process. Moreover, using mobile application applies to new processes for creating lead time process, reducing redundancy processes and communicating all processes for monitor and control process. The results increase efficiency processes and reduce time and cost at least 60% of total loss or remain 5-8% from 20 % loss.

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Author's Profile

Dr. Sakchai Rakkarn, Director of Master of Engineering in Engineering Management Program. (Mobile: (+66) 094-9459988, Email: sakchai.rak@kbu.ac.th). He has graduated in Bachelor of Engineering (First Class Honor) in Industrial Engineering at Kasem Bundit University, Master of Engineering in Industrial Engineering at Kasetsart University and Philosophy of Doctoral in Systems and Control Engineering at Case Western Reserve University.

Dr. Anand Dersingh, Head of Computer Engineering in Faculty of Engineering at Assumption University. (Mobile: (+66) 084-919-6554, Email: anand.dersingh@gmail.com). He has graduated in B.Eng. (Computer Engineering), Assumption University, M.Eng. (Broadband Telecommunications), Assumption University and Ph.D. Computer Science, Dalhousie University, Halifax, NS, Canada.