Project planning system improvement in residential development project: A risk analysis

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Abstract. Project planning must be an integral part of the housing construction industry so that project performance can be achieved more efficient and have an impact on schedule performance. A clear and detailed understanding is needed of what is within the scope of the project and what are the risks identified in the project planning phase. Project planning is expected to be able to provide solutions to detailed work structures as well as flexibility to be able to adapt to the environment of unique project activities and to accommodate the project's organizational system and business changes or improvements made by the company. This study aims to parse the risks in project planning of residential development projects by identifying 10 knowledge areas and 24 planning processes in the 6th edition of the 2017 PMBOK (Project Management Body of Knowledge) using qualitative risk analysis approach to create an understanding and to mitigate the high risk factor. Referring the research results, a preventive action in each of the high risk indicator has been prepared to be integrated in the planning guideline (standard operating procedure). This risk analysis performed to be used as a strategy to improve the residential development schedule performance.

1. Introduction
Uncontrolled urbanization and the lack of adequate housing for low income communities are two issues that occur in almost all developing countries [1]. The residential property industry has a very important role in providing decent and affordable housing for the community, especially for housing development companies. Another important thing is, in the planning phase, feasibility analysis is often considered an important factor for project success. Around 30% of the global economy currently uses project-driven management, which emphasizes that project-based efforts have become common and valuable to organizations [2]. The main difference between "construction" project activities in general and housing development projects is that housing construction projects are part of the property industry, where developers must acquire land, take care of legal aspects, and building permit before they can carry out residential construction and completeness. The main resource in the housing development process is land, and the central role is carried out by landowners [3]. Typical organizations in small and medium scale property businesses with limited resources generally implement business-driven project planning and implementation with little regard for project management aspects. Individuals in companies like this do many things at once (multi-task), so projects are managed by people where project management is not their main discipline [4]. Some large construction companies often set up their own project assessment methodology and manage the risks associated with the residential development projects,
while medium or small sized construction companies do not have enough capabilities to analyse and assess a residential development project objectively [5].

It is found that, relative to other industrial sectors, organizations belonging to the construction sector obtain a high quality of project planning and the highest success rate. The importance of project management in the construction sector has rapidly increased in the last few decades. As a result, project managers, estimators, and planners should strive to continuously improve their project management capabilities [6]. Real estate development is a speculative and entrepreneurial activity. Factors such as unknown future demand, risks and uncertainty are key elements of real estate development. The major findings of the empirical study indicate that: the developers approach towards the management of risks tends to be characterized by a lack of formalization and co-ordination and largely rely on individual judgment and experience; risk management is not regarded as a continuous and dynamic process [7]. Each risk has a reason, which leads to a result [8]. In general, real estate or property developers will use long cycle of project delivery. It causes the risk of real estate development increase for the changes of the state’s investment policy, financial policy, and other macro level changes as well as the regional and national level changes, which are all internal and external factors [9]. Risks and uncertainties are occurred in all real estate development projects, particularly in the complicated real estate project [10].

Project management processes are grouped into initiating, planning, executing, monitoring and controlling, and closing. Planning process group is required to establish the scope of the project, refine the objectives, and define the course of action required to attain the objectives that the project was undertaken to achieve [11]. Residential development project will start from the land acquisition, land permits into the delivery of the project as single house sold to the customer, while the other aspect of the project at construction still progressing such as residential facilities, landscapes works, roads, waterways, electricity installations, etc. The overall project will end after all constructions items and commercial aspects meets on the project closing state. Once risks are identified, risks must be evaluated and assessed in terms of the likelihood of events and impacts. This is necessary because most activities have a limited amount of resources that can be used for risk management, so companies can concentrate on the most important risks and become priorities [12]. Risk management is a process that includes 7 core processes: (1) Plan risk management; (2) Identify risks; (3) Perform qualitative risk analysis; (4) Perform quantitative risk analysis; (5) Plan risk responses; (6) Implement risk responses; (7) Monitor risks. PMBOK defines risk as an uncertain event or condition, if it occurs it will affect the objectives of the project, both in time, cost and quality of the project. Perform qualitative risk analysis process as part of the project risk management, is the process of prioritizing individual project risks for further analysis or action by assessing their probability of occurrence and impact as well as other characteristics. The key benefit of this process is that it focuses efforts on high-priority risks [11]. In previous studies it has been found that the most significant factors affecting the success of the construction sector are related to schedule, cost, quality, and customer satisfaction. In a business-driven project context, which typically performed by small to medium scale residential development business, the impact of poor planning of the project would drive the project execution with poor directions, biased project activities and its changes would be difficult to control in a proper way in a timely manner, so the main objectives of the project cannot or difficult to achieved as scheduled.

2. Methodology
This research using qualitative approach to achieve a schedule improvement in residential development project planning quality. The objective of the research guided through RQ: (RQ1) To identify measuring indicator of project planning and the risk factor; (RQ2) To identify the highest risk factor from the project planning activity that has highest impact to the project schedule performance; (RQ3) To improve project planning quality using the result of (RQ2) by integrating the high risk factor in to the planning standard operational procedure (SOP). Here, in Figure 1. The research flow conducted to implement this study.
2.1. Questionnaire and data collection

The respondent of the survey is owner, employee, and other professional in residential developer company. The project category ranges from development of 10,000 m² to 100,000 m² of land and the project value ranges from $1 million to $10 million USD. In this study there are 5 (five) questionnaires have been developed which delivered by 3 phase of data collections to 5 experts, 40 targeted respondents, then back to expert validations:

• Phase I, initial questionnaire delivered to 5 experts with 15 years’ experience in the industry to validate the planning process indicator in residential development. The validation process contains expert response to agree/disagree to the planning process indicator prepared.

• Phase II contains two survey, first (pilot survey) distributed to 10 respondents with minimum experience 5 years and or at the managerial level in the developers to obtain respondent feedback about the risk factors content and also grammatical check. Second (respondent survey), 30 questionnaire delivered to obtain data for qualitative analysis. Distributed to respondents with experience of at least 3 years in the developer’s company.

• Phase III of data collection is the last validation by expert aimed at soliciting expert responses related to the research result of risk analysis while discussing the risk causes, preventive actions, and its impact to the project schedule/time performance in residential development.

There are 62 planning processes according to PMBOK have been validated accompanied by 94 potential risks that linked to the project planning activity. A sum of 94 risks variables in the planning process validated in 3 steps questionnaire and discussion with experts. Then, the questionnaires containing 94 potential risks questions was delivered to respondents to gain the risk rating by calculating risk probability and its risk impacts value. Through statistical tests found 58 valid and reliable risk variables to be used in a qualitative risk analysis.

2.2. Risk rating analysis

Data collection was carried out using questionnaire survey to understand the perception of the practitioners to the risk factors. Once the probabilities and impacts are determined, the risk score can be calculated with following:

\[ R = P \times I \]  

Where \( R \) = risk factor, \( P \) = probability and \( I \) = impact.

The probability and impact matrix or risk level matrix illustrates a risk rating assignment for risk factors, the data collected using Likert scale. The probability value of the occurrence of risk and impact multiplied to produce a value that used to rank the risk value based on risk matrix as follows:
Table 1. Probability and impact risk matrix.

| Impact  | Probability |
|---------|-------------|
| 0,05    | 0,90        |
| 0,10    | 0,05        |
| 0,20    | 0,04        |
| 0,40    | 0,03        |
| 0,80    | 0,02        |

3. Results and discussion
The result of this study are as follows:

- Answer to RQ1 there are 94 potential risks validated by the expert then refined in the pilot survey and also discussion with residential developer’s employee involved in project development activities.
- Answer to RQ2, it is found 58 a potential risk in the project planning which consist of 6 highest risk affecting the schedule performance of the project, as Table 2 shown below:

Table 2. High risks in project planning process.

| Project planning activity | High risk variables impact to schedule performance | Risk rating | Ranks |
|---------------------------|--------------------------------------------------|-------------|-------|
| Develop project management plan | Declining in people purchasing power or increasing in house price and other macro-economic factors | 0,211 | 1 |
| | X4 Land dispute | 0,187 | 3 |
| | Length of time required in project permits arrangements | 0,180 | 6 |
| Plan scope management | Lack of funds for completion of work performed | 0,187 | 4 |
| | X20 Invalid bill of quantity, increasing resources price | 0,192 | 2 |
| Collect requirements | Errors in determining project costs | 0,181 | 5 |

- To answer the RQ3, the high risks found in the RQ2 then validated back to the experts and discussing the context and position of the risk in the planning process. A regular residential development planning process standard operating procedure (SOP) has been prepared by observation and archive analysis on specific company experienced handling 100,000 m² of land development. Then the dominant (highest risks) identified are put into parts of the planning process activity to improve by mitigating (to prevent) the risks, as shown on Figure 2 below:
We applied the dominant risk factor to improve the planning process standard operating procedure. As the Figure 2 shown above, the X4, X7 (part of the Develop business plan or project feasibility study activity) as a part of the highest risks identified in this research. By adding the preventive action to the risk identified so that is expected to reduce the risk probability and impact value to the project time or schedule performance. Also to the X9 (part of the Project budget planning activity) were added with its preventive action decision check (Yes/No) before the process could continue to the next stage of the planning process.

4. Conclusion
Based on the results it could be concluded as follows:

- To identify the planning factors that is different from one to another project, depending on many factors, however, if the high risk factors are categorized from the risk source; external factor (macroeconomic), internal (corporate systems), and projects (project management), it can be concluded to have a common high risk factor as found in previous research that is related to finance, project costs, and land permit/legal works. Which is part of the project integration and scope management in the PMBOK.
- This study developed 24 indicators of the planning process and resulting in identification of 62 housing planning processes with 94 risk factor. After going through the stages of survey and statistical tests found 58 risk factors that have an impact on schedule performance. Using qualitative risks analysis found 6 highest risks to be used to improve schedule performance in project planning standard operating procedure (SOP).

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