Modelling Uncertainty Factors in Environmental Issues on Late Delivery for Construction Industry: A Propose

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Abstract. A very limited research of fixing uncertainties in environmental issues (EI) actually encountered biggest problems for company, especially in late delivery (LD) of project completion for construction industry (CI). Uncertainty could be happens causes by many factors which known or unknown, statically to totally ignorance. Many factors of uncertainties have been modelled in previous research by ignored factors in EI. However, in the real cases all the factors must be manage even it is in-deterministic. Therefore, the modelling of uncertainty factors in EI for CI is very important to be studied, and it will be considered to be used as guidance for decision makers while they are facing with the problems that related to uncertainties. The uncertainty of EI can split into 2 categories; acts of God and acts of humans.. Preliminary result of conceptual model for uncertainty factors in EI is presented according to previous case study.

Keywords: Modelling, Uncertainty, Environment Issues, Construction Industry.

1 Introduction

In deflation economy condition nowadays, construction companies are keen to achieve project substance goal such as profit (budget of cost and time) and client-satisfactions. In other words, they need to minimize the total project cost and the project completion time in order to get an optimum profit in any construction projects. It is a very crucial for company to achieve high customer satisfaction preventing the bad-performance in LD. They have to strive with many issues and causes that can lead to potentially loss in profits and become as non-achievement in their quality performances. The problem becomes more complicated for the large project as uncertainties (in project outcomes) is dependent on the project size scale. The uncertainties that occur either in planning, designing, scheduling, constructing or production of product, will impact to bad performance such as LD on construction schedule for construction project development. Most of the researches for uncertainty issues deal with the field of industry where all the parameters are considered known and can be measured. Common factors such as

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machine failure, resource breakdown, material and labour shortage always relate as issues in manufacturing industry. On the other hand, the problems are different for CI. The construction work is often effect by the soil condition, unpredictable weather, accident, lack of labour skill and erosion. The uncertainty issues in real plants need to give more attention since many of the parameters that are associated in the whole project's timelines are basically unknown and immeasurable. Therefore, the model of uncertainties for each company need to be specialized and the investigation about the causes and the effects that underlying a major problem to that company has to be identified uniquely. The details and deep research are important and needed for measuring and ensuring of good performances. Objective of this paper is to propose the methodology to develop the uncertainty model as a guideline for the construction industry (CI) to deal with the uncertainties, especially in EI on project completion (late delivery). Following these introductory remarks, is Section 2 that provides the definition of uncertainty in CI and the ideas of how to determine causes and previous classification factors of uncertainty in CI. Section 3 represented the conceptual model of uncertainty factors, and the model was assumed as initial findings for this research. Section 4 discusses on propose methodology to develop the model of uncertainty in EI, follow by last section for conclusion and future research.

2 The Uncertainty

The uncertainty can be defined as an expression of the degree to which a value is unknown. Uncertainty can be resulted from lack of information or from disagreement about what is known or even knowable. Uncertainty also refers to measuring the degree of differences between the models and the real systems' values respective or between the estimation of variables and their true values. The uncertainty can be caused by the errors associated with the model itself and the uncertainties of the model inputs [1]. Different people were interpreted uncertainty differently. In CI, uncertainty also can be referred as complexity and risky of environmental.

The concept of uncertainty will be used as guides to company and researcher for the first step to understand the behaviours and characters of uncertainties that happen in their company or project development. The three-dimensional concept; nature, level and location important to be determined before any model of uncertainty has been developed or applied. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures or qualitative statements that normally by estimation. A range of values calculated by various models is the example of quantitative measurement and reflecting the judgement of a team of experts for a qualitative statements approach. Uncertainty experts agree that there are different dimensions of uncertainty related to model-based decision support exercises, and [2] has chosen to distinguish three dimensions of uncertainty, which are location, nature and type/level. Through the uncertainty concept, the ideas how to characterise the uncertainty can be learned.

The location of uncertainty is an identification of where uncertainty manifests itself within the whole complex model. In simple word, location means the place of the

improper or a factor of causes comes from. Then, nature is questioning of whether the uncertainty is due to the imperfection of our knowledge or is due to the inherent variability of the phenomena being described. It also has to define whether it can be reduced or not. Level of uncertainty is the knowledge that knows about the uncertainty along the spectrum between deterministic knowledge and total ignorance. CRES report meeting ministry of Climate and Energy, Geological Survey of Denmark and Greenland has discussed about the level of uncertainty and found out 5 types of uncertainties, which are statistical, scenario, qualitative, recognise ignorance and epistemic arrogance [3]. Figure 1 shows the level of uncertainty.

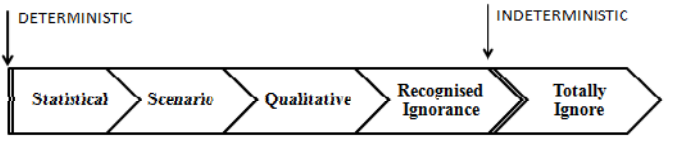

Fig. 1. The Uncertainty; From "Know" to "Un-Known"

Uncertainty generally can originate from many aspects and causes, such as machining failure, labour skills, material shortage, irregular cash flow, bureaucracy and red tape, severe weather condition, unpredictable local condition, acts of God – disaster, erosion, and etc. However, same causes could not result the same effects according to differentiate field of industry. Some of industries such manufacturing which involve in-building operation could be ignored all the causes of EI such as weather condition. However, in CI area, most of their works are in open-air environment that needs to chew over EI as a very big issues and major challenges to the project development. Several researches were distorted the terms of level/type of uncertainty to our human language to make it easy to understand. The type of uncertainty classified according to its sources (location), which are design, procurement, material handling, operation residual and others [4]. While, [5] has identified 5 types of uncertainty which are technical, acts of God, financial and economical, statutory clearance risk, and organizational risk. Every researcher has their own classification, causes, effects or factors of uncertainty because of the difficulties in generalise the uncertainty fix to all industry. All the causes have to identify based on single case study that match with the industry. Besides, high probabilities of the un-tackled uncertainty existed because of in-deterministic or un-known factors. Consequently, we split them to 2 categories of in-deterministic level (previously totally ignore) for EI which are acts of human and acts of God - unpredictable weather, disaster, and etc.

3 Factors of Uncertainty in Environmental Issues – Preliminary

Clearly known, uncertainties were a problematic issue causing border line in exploit profit to organizational. It is factorable, reasonable, vulnerable and unstable. Many of researchers put their own factors of uncertainty and try to solve it depends on what kind of that uncertainties. In addition, [1] have defined several factors of uncertainty

according to problems tackle by several researchers. Yet, it is not enough if we assumed only the listed factors of uncertainties that always facing in industries, either manufacturing, construction or other types of industry. For example, in [1] research paper, he presented that [6] stand for quantity uncertainty while [7] confront of resource breakdown as the uncertainty factor, whereas [4] defined severe weather and soil condition as the factors of uncertainty that not listed. More factors, reasons and causes that give impacts on project construction performance are discusses in [9] particularly weather conditions which leading uncertainty in the planning stage. Causes and factors are different for each different location of cases. Thus, the research and investigation should be customized based on the company's requirements uniquely. Figure 2 shows the premilinary factors according to our observations and conversations with construction engineers and contractors. In other cases, company that facing the same causes and factors can be applied the same model of uncertainty into their business.

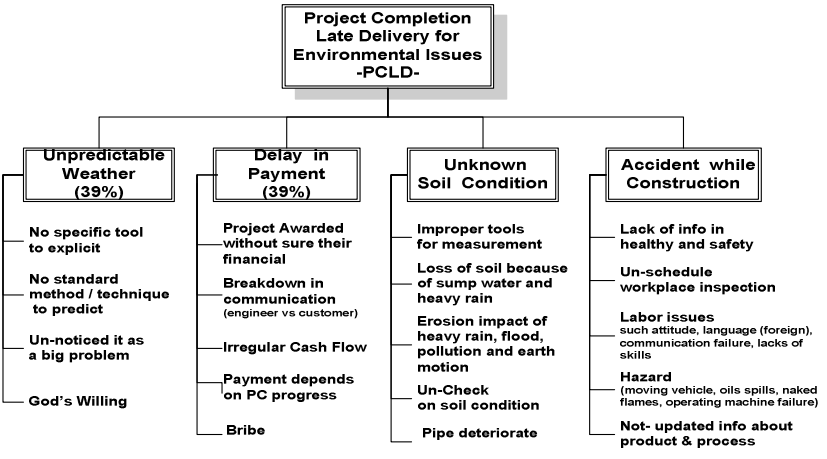

Fig. 2. Initial Factors of Uncertainty in Environmental Issues – Conceptual Model

In this research, model of uncertainty for LD will be developed considering model-based decision support specialized to the pipeline CI/our case study company. The model would operate as guidance for CI in managing and handling uncertainty of project development. As for the result, the project development will be delivered on or in time as scheduled. This uncertainty model should constructive with decision-making support by communicating the uncertainty using science engineering/project management interface. Model-based decision support use to get the systematic and graphical overview of the essential features of uncertainty in relation. It is also clearly shown through Walker's uncertainty matrix [2].

4 Proposed Methodology of Uncertainty Model

Uncertainty Matrix (UM) is the one of 14 popular techniques and tools represented by [9]. UM is adopted via [2] to get a systematic and graphical overview of the essential

features of uncertainty in relation to the use of models in decision support activities. But, the model is still confused and frequent lack of mutual understanding as noted in their research publication paper. Inspire by this UM approach, this development of modelling will takes into account the factors that are rarely been existed in EI according to 2 types of uncertainty as mentioned previously; act of God and act of humans (Also refer to Figure 2 as factors in this research). The proposed research methodology encompasses of four main stages, namely requirement definition and specification, diagnosing and conceptualising, modelling and constructing, implementing and validating as shown in Figure 3. Tasks and activities that might be performed amongst the phases are include of understand the key factor determination and definition of objective, scope and collecting of data, defining the most effective and efficiency technique for identifying the factors facing in EI in CI, diagnosing and analysing causes and effects, construct a business model, develop the model of uncertainty – do modelling, and implementing, testing, verification and validating the model at company.

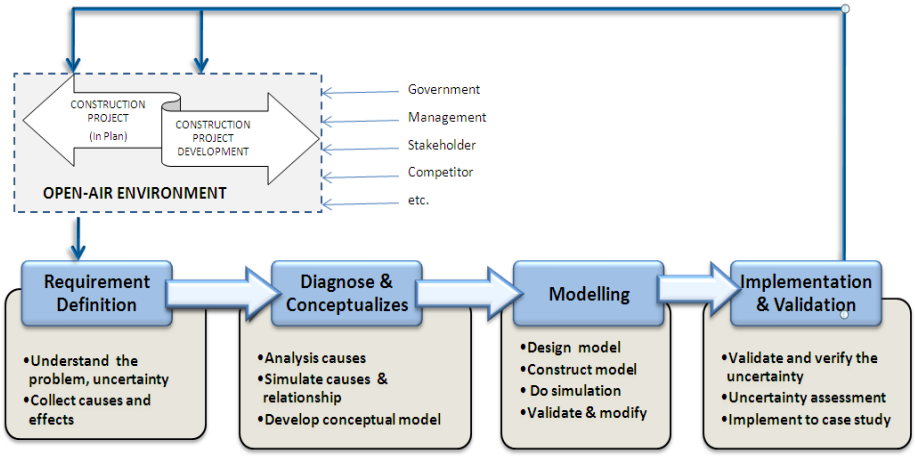

Fig. 3. The Methodolgy Research

A process modelling will involve several phases and many activities need to as well as identification of actors. A typical modelling study will involve many actors either in the management team or construction team. Thus, four different types of actors will be involved in the development of the environment uncertainty model. There are manager, stakeholders/public, reviewer, and modeller directly or indirectly. The five associate roles are collaborating in future works, hence while designing and constructing this model. The decision maker consist of 1.*The manager or user* (person faced with the problem *or* decision and take action then responsible for the consequences), 2.*The intermediary* (person who helps the user, perhaps as a more substantial "staff assistant" to interact and make suggestions), 3.The *builder or facilitator* (assembles the necessary capabilities from the generator to "configure" the specific the model with which the user/intermediary interacts directly), and 4.*The technical supporter* (develops additional information system capabilities or components when they are needed as part of the generator).

5 Conclusion

The terminology and classification of uncertainties represented with the aim of research to make researcher or manager clearly acknowledge and make out their problem. The concept of uncertainty gives an assistant for the researcher to get more understanding about the underlying factors of uncertainty in modelling the CI. It is very important to identify the nature, level and source (location) of uncertainties to structure the relationship of the causes and effects, and clarify the factors. The investigations of the causes have to determine uniquely based on the selected case study and all the collectible data need to be conceptualise by comprehensive analysis. Not all cases can use the existing models or tools because of the fluctuate parameters (causes and effect) and many elements that needed to be considered. The conceptual model was developed to provide the initial findings for this research. Additionally, the methodology of proposed uncertainty model is discussed in details as guideline of the researcher. Furthermore, the actors and their roles towards the development of the model also presented. Next, the structure of causes and effects for the uncertainty can be constructed using a simulation and testing. Later, the modelling process will take over and we assume this research willpower give their contributions in decision making model-based implement for CI.

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