B103: FACTORS INFLUENCING DECISION MAKING PROCESS OF TRANSPORTATION INFRASTRUCTURE PROJECT IN NATURAL EXTREME CONDITION: A CASE STUDY OF SEMARANG-SOLO TOLL ROAD PROJECT

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ABSTRACT

Transportation infrastructure is an important part of the economic growth and activities pattern in the urban area. Toll road is a priority in transportation development in Indonesia. A number of factors in a transportation project, such geotechnical situation and structural reviews that may effect time performance and decision making in relation to project risks (such as risk seeking, risk adverse, and skills requirements of the employers). It is important that these factors are identified and their impact on project performance is properly understood. This paper reports a research which attempts to model decision making factors based on mixed metodology. Semarang-Solo toll road project as the one of the biggest infrastructure project has many uncertainty natural extreme condition such as extreme slope stability, high embankment, reposisioning drainage, and

unpredictable cesar at some station. That situation cause the project managers take the risks to make a decision based on the design and some engineering adjustments at the location. The model decision making factors will be useful for project managers to make decisions under uncertainty of future risks in the toll road project.

KEY WORDS
Decision making, transportation system, geotechnical, structural, risk model

BACKGROUND

Semarang-Solo toll road was built on the grounds because of some reasons, high levels of traffic density average daily (ADT) of 42.468 pcu / hr with growth of 7% per year, the high accident rate, the rapid economic growth in the area of road corridor, and to support the policy of Trans Java Toll Road. The lenght of Semarang-Solo toll road planned 75.674 km, covering Semarang-Bawen 22.213 km and Bawen-Solo 53.461 km. Overall investment fund of Rp 7.641 trillion. The investment value, 51% is paid by PT Jasa Marga, while the remaining 49% or equivalent to Rp 3.6 trillion is part of Central Java provincial government that will be offered to other investors or third parties who have the financial capability and high financial. The reality shows that the ability of the government's infrastructure budget is only around 400 trillion, or about 20% of the total budget required. So the role of the private becomes very important and need priority. Infrastructure development priorities include the construction of the Trans Java highway, rail double track in Java, improving port efficiency and development 10,000 Watt power. (Kompas, 30 September 2010, p.18). Poor infrastructure in the economy will affect investment in general such as the phenomenon of capital outflow. Infrastructure as a connector road access and potential activities is a priority investment area that is promising in Indonesia. Toll road as part of the National Access to one of strategic issues in domestic investment that returns big chance (Rate of Return) for the population and movement across regions is quite large. Facts show that the net profit margin management of toll roads in Indonesia, 14.15% in 2004 to 21.1% in 2008 (Jasa Marga, 2009). Although the toll road investment is promising, over time there will be increases in population, density and limited land area of infrastructure development itself.

Semarang-Solo toll road become one of the priorities of the National program of development of Trans Java Toll Road along with other toll roads in Central Java. It has strategic significance for the development of the national road network in particular in Central Java and also for the development of road networks in the regional scale. The technical constraints of Semarang-Solo toll road Phase 1 Section III (the locus study) is the location of mountains and many impassable rivers and springs. This condition causes a lot of technical issues such as the construction of toll Cipularang, such as work flow of the river, maintaining ground water sources and pile high enough to reach 30 meters in the quarry was taken less than 1 km from the site.

A performance parameter of the success of the project is construction work. Based on data in the study area data showed that until week 56th show with a performance deviation of the physical volume growth on average per week about -0.66% and -37.06% of cumulative deviation. This indicates that project performance is very low. Many factors that caused that situation are: First , The Land acquisition not completed even though the project has been running. In the study sites there are 266 parcels of land covering 6 land acquisition phase since 10 November 2009 to January 2010 and until October 2010 is still there is land that has not been released as one of the locations in Beji Ungaran. Second, factor is about inefficient of decision making. The decision at the site did not complete that many decisions are delayed because they have to coordinate with their headquarters. Circumstances as described earlier have influenced the execution of the construction both in terms of structure and geotechnic. Many factors influence the decision making process related to structural and geotechnical aspects. Many decisions taken at the site because harmonize the natural conditions that are considered quite extreme.

METHODOLOGY

This study uses mixed methodology in attempt to obtain complete information about perception and risk decision-making method that should be taken by the field engineer. Perceptions of respondents obtained with brainstorming method and equiped with secondary data from project performance. Respondents from this study were taken from the engineer who has been involved in road projects and consistently in the field of work in accordance with managerial viewpoint, structures and geotechnical engineering.

CHARACTERISTIC OF PROJECT LOCATION

Semarang-Solo toll road is part of the Trans Java Toll Road is planned along the 75.7 km. The location of toll roads in Indonesia, as shown in Figure 1. Semarang-Solo toll in Phase-I was divided into 3 work packages. While the study sites are in Package III for Fields Penggaron-Beji (STA 8 +475 UP TO 14 +100). Other locations employment package Semarang-Solo toll road as presented in Table 1. follows.

Table 1: Description of Project Location Semarang-Solo toll road

Section I	**Section II**	**Section III**
Stasion: 0+000 – 3+525 Lenght : 3.525 km	Stasion: 3+525– 8+475 Lenght : 4.950 km	Stasion: 8+475– 14+100 Lenght : 5.625 km
Contractor: PT. Adhi Karya (Persero) Tbk	Contractor: PT. Waskita Karya (Persero) Tbk	Contractor: PT. Istaka Karya (Persero) Tbk
Duration project : 13 month	Duration project : 13 month	Duration project : 17 month
Supervisor :PT Tata Guna Patria, PT Virama Karya (Persero) Jo	Supervisor :PT. Cipta Strada	Supervisor : PT. Bina Karya (Persero), PT. Seecons, PT Global Profex, PT Pilar Pusaka Inti Jo
Main Bridge Structure: Tembalang Interchange, Banyumanik Bridge I and II, Gedawang Bridge	Main Bridge Structure: Susukan Bridge and Penggaron Bridge	Main Bridge Structure: Ungaran Interchage, Kali Tempur Bridge
Overpass (OP) /Underpass Structure (UP): Box UP: Klentengsari, Tirtoagung, Graha Estetika, Gedawang Box OP: Mulawarman	Overpass (OP) /Underpass Structure (UP): Box UP: Sendang Husada, Sendang Pakel Box OP: Kenanga, Gedawang III sta 4+900 and Gedawang sta 5+250, Panjaitan and Agung	Overpass (OP) /Underpass Structure (UP): Box UP: sta 9+100, Kalirejo sta 10+075, sta 10+650, access road Ungaran, Kali tempur sta 11+360, Merdeka Road, sta 13+430 Box OP:Sanjaya Pedestrian bridge sta 12+260

Source: TMJ,2009

Location of the study (Section III) is the most extreme locations compared with two other locations. The topography is hilly with steep slope. Type of soil and rocky mountain river with lots of debris flow characteristics in the wet season. The Situation of project as shows Figure 2. For the development needs of Semarang-Solo toll road, several areas affected by land acquisition. For the first phase of development, namely segment Semarang-Ungaran, Semarang City area through the Kelurahan Pedalangan, Padangsari, Gedawang, Pudak Payung, Sumur Boto Banyumanik located in the District, and Village located in District Kramas Tembalang. While the area in Semarang district that has elapsed is the village of Susukan, Kalirejo, Sidomulyo, Gedanganak, Leyangan and Beji is located in District Ungaran.

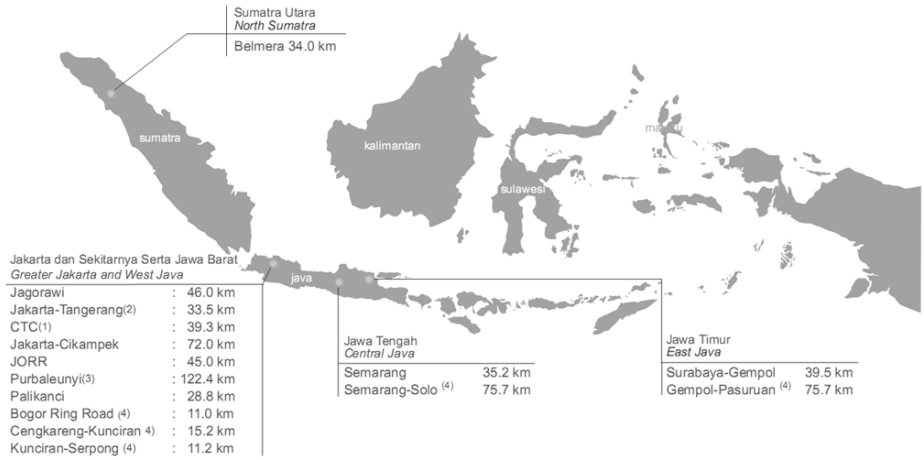

Figure 1: The location of toll roads in Indonesia (Jasa Marga, 2009)

Figure 2: Situation of the Project Location (Hermawan, 2010)

ANALYSIS AND RESULT

Factors Influencing Decision Making Process

Several behavioral factors influence the decision-making process. Some affect only certain aspects of the process, while others influence the entire process. However, each may have an impact and therefore must be understood to fully appreciate the decision-making process in organizations. Six individual behavioral factors-ethics, values, personality, propensity for risk, potential for dissonance; and escalation of commitment.(Gibson et al. 2006). 'Soft' management skills, described by Muzio et al. (2007) as 'micro-social' skills, may have been developed from early up-bringing (de Freitas et al. 2006) to life experience in the workplace. These skills are formed and re-formed through a continuous active interchange between individual conscious and unconscious processing of personal learning experience. Dainty et al. (2003) recommended moving beyond traditional measures of outturn performance, in terms time, cost and quality, for evaluating the performance of construction project managers. Instead, they proposed a range of measures revolved around management inputs (i.e. success factors) to overall project success, which include both 'hard' and 'soft' measures in order to provide a holistic impression on the competency of potential project managers. Later, they found that softer measures to be the most predictive of superior to average performance (Dainty et al. 2004). Despite the arguments outlining their importance, it is difficult to identify and get a consensus of 'soft' skills requirements, let alone measuring them objectively and systematically (Muzio et al. 2007). Also, 'soft' skills are much more difficult to teach and learn than 'hard' technical skills (Pant and Baroudi 2008). However, with increasing complexity of running modern projects, there seems to be an increasing need to equip project managers with the 'soft' skills and competencies (Müller and Turner 2010).

Factors that affect the acceleration of Toll Road Construction Project.

The cycle time of execution of a construction project there are several important stages. Judging from the sequence of their implementation could be identified into 4 (four) stages. From the results of in-depth interviews with respondent who have been involved in the construction of Roads and Bridges of government projects, obtained by the scheme as presented in Figure 3.

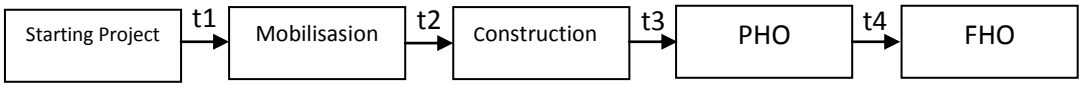

Figure 3: Time Factors scheme on A Road Construction Works (Source: Analysis, 2010)

At time t1 is influenced by the readiness of the project infrastructure that do not move like AMP, Batchingplant and Crusherstone; demand and administration office requirement and environmental research at the site. Time t2 is affected by the construction administration sepert reviews the design, implementation method and schedule of work tools so the impact on productivity (shown in Curve S). The process of construction to the PHO (t3) is influenced by field conditions, especially if there are items of work not specified in the contract or the emergence of a new volume of work were high costs that must obtain permission from headquarters. The process of PHO to FHO (t4) is influenced by technical factors and the public interest requires the construction must be used immediately.

Factors Influencing The Decision Making Based on the structural and Geotechnical perspectives

Extreme natural conditions on the toll roads Semarang-Solo cause delays. Although there are other factors that are also not less important, such as land acquisition and design review process. Extreme conditions as described earlier in this review two case studies of problems of structure and geotechnical problems.

Point of view of identifying the structure of the factors that influence decision making at the site among other data, the location of the structure, the selection of the type of structure, control the location, the bidding process, natural factors, traffic conditions and the addition of the structure as a result of design review which provides new problems. Scheme of the factors from the perspective of the structure in Figure 4. Factor data, especially data of land as the basis determination of dimensions greatly affect the manufacture of structure types from the project site is quite extensive. The data is also related to the location of the structure is quite steep so that the dimensions of the structure becomes very large disproportionate loading, it causes inefficient structure. Therefore, the inefficient problem then comes the selection of these dimensions of structure types in attempt to provide solutions for the contractor to accelerate work in the field as soon as possible. The essencial things within the process of decision-making on the field relates to the structure should include four things: a reason to change or adjust engineering construction, the structure is applicable, pay attention to the conduct of time could be imply the delays and cost factors affecting the volume.

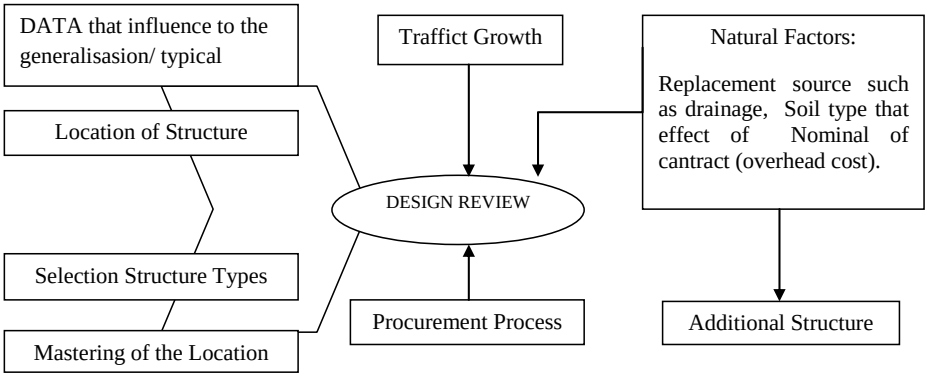

Figure 4: Structural Perspective (Analysis, 2011)

According to the geotechnical review of the factors that influence decision making (Figure 5) at the site include engineering experience from experts at the project site, the accuracy of the results of soil investigations, external factors such as level of expertise in the engineering field, the method of execution of work and mastery of the field factor due to conditions of the soil due to the natural phenomena that occur.

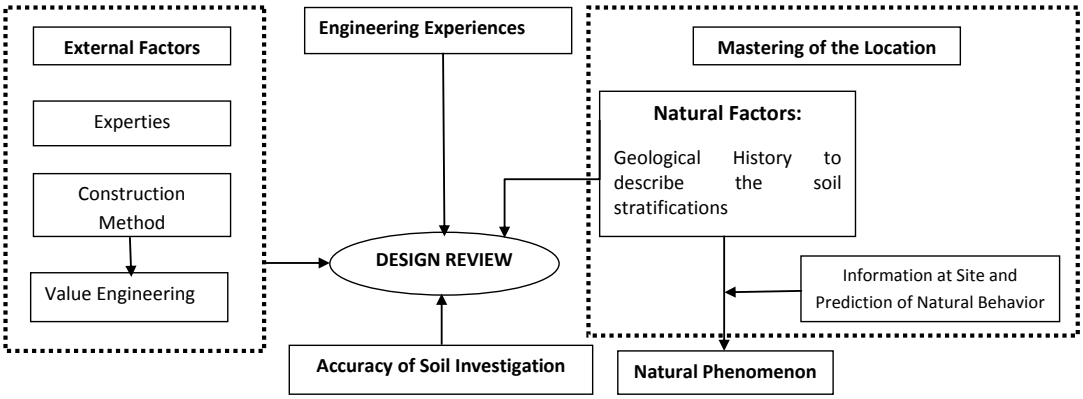

Figure 5: Geotechnical Perspective (Analysis, 2011)

Unlike the structural perspective, the geotechnical engineer is required for mastering a location base on local characteristics is more important that technology of soil investigations. Mastery of the location are more likely to intuition as an engineer. Intuition-as-expertise is an accumulation of conscious and unconscious learning over time, and often overlapped with the heuristics, whereas intuition-as-feeling is more dominant in the exploration of future uncertainty. In this case, the reasons behind decisions based on 'feeling' often can not be totally articulated, but the decisions are just felt right (Miller and Ireland 2005). Leybourne and Sadler-Smith (2006) pinpointed that intuition based on

expertise may drive improvised behaviour which is a product of non-conscious and irrational judgement. Improvisation is an important aspect of decision making with limited (or lack of) information and time. Whatever is decided there is always a risk. Risk and uncertainty characterize situations where the actual outcome for a particular event or activity is likely to deviate from the estimate or forecast value. Risk can travel in two directions: the outcome may be better or worse than originally expected (Raftery , 1994). It might seem reasonable to argue that the 'soft' skills acquired would need to be confirmed by real life events in the workplace. This phenomenon might well be explained by a 'confirmation for habituation' process in which the trainees matches (and mis-matches) between the experience of learning in the simulation and actual experience on construction site. Thus, the trainees seek confirmation(s) of their actions and/or decisions to enhance their confidence of their efficacy. The processes, mechanisms and enabling strategies of this longer term learning are the focus 'retention of skills acquired' theme. (Soetanto, 2010).

CONCLUSION AND FUTURE STUDY

Conclusion

1. The decision making process at the natural extreme conditions is not easy. The situation is not necessarily a constraint that unpredictable in engineering. Conduct engineer to rely on experience and intuition are very instrumental in determining the decision.

2. The learning process is the basis of the decision making process. Similarly, occurring in the study area. Engineering knowledge alone was not effective at the project site. Leadership and courage to take risks necessary after full knowledge factor.

Future Study

Mega projects such as infrastructure development like at the study area, sometimes requires a process of adaptation to natural conditions are quite complex. Challenges ahead for the project manager is to have the engineering ability and courage to minimise the risks for the sustainability of the project. Assesment and evaluation process can be done with a simulator or an artificial environment.

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