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Developing A Holistic Project Time Management Framework Utilizing Fundamental Supply Chain Management (SCM) Tools to Overcome Delay in Malaysian Public Sector Building Projects

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Abstract: Project delays have been an incessant dilemma worldwide and also for the Malaysian public sector projects. Past three Malaysia Plans (RMK8, RMK9, and RMK10) have experienced ridiculously high delay rates. Surprisingly, these poor delivery records have not led to much research on the topic locally especially those concerning past Malaysia Plans. Beyond that, despite "blame-games" being a common picture when delay occur, past studies has been short of detecting their latent contributors to make delay easier to manage. Condemnations targeted on the industry have encouraged "calls for change" and many proposed Supply Chain Management (SCM) as the way to go about. SCM has been proven to reduce delays nevertheless, level of applications are still very poor and past studies lacked holistic approach. This paper presents an on-going research aimed at developing a holistic project time management framework utilizing fundamental Supply Chain Management (SCM) tools to overcome delays in Malaysian public sector building projects. Data collections would include qualitative methods in form of expert opinion interviews and also a series of focus group sessions towards gathering vastly experienced industry practitioner to contribute towards the development of final research framework. The ultimate outcome is expected to provide a holistic guide on utilizing wide-range SCM tools towards mitigating various facets of delay contributors and with proven success from past SCM tool applications leads to a cautious optimism that it could benefit project time performances in Malaysia as a whole.

Keywords: Supply chain management, construction industry, delay, time management, Malaysian construction project.

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1. Introduction

Time overrun is no alien to the construction industry of any country and; this includes Malaysia (e.g. Shehu et al., 2014; Olanrewaju, 2017) thus, it has incessantly been stressed as a central issue of the Malaysian construction industry (see Sambasivan & Soon, 2007; Shehu et al., 2014). On the public sector side, no particular difference could be spotted with delay being a major problem in their projects as well; continuously occurring for almost two (2) decades now. In fact, statistics have been so horrifying when reference were made on the time performances of projects under the past three (3) Malaysia Plans – 78% delay rate during the Eight Malaysia Plan (2000 to 2005) (Abd. Karim, 2008), 80% delay rate in 2009 which was within the Ninth Malaysia Plan (2006 to 2010) (Joshi, 2009) and 235 and 191 sick projects respectively in 2011 and 2013 which falls within the Tenth Malaysia Plan (2011 to 2015) (Jatanora et al., 2016); thus, making the industry one of the poorest performing sector for the county's economy (Khan et al., 2014).

It cannot be doubted that delay research has mushroomed over the past decades, made obvious based on the existing literatures. Focus on Malaysia has also followed suit (Sambasivan & Soon, 2007; Shehu et al., 2014; Riazi, 2014; Riazi, 2018) however, there is still a dearth of research elucidating delay contributors of distinctive Malaysia Plans apart from a Ph.D. thesis by Riazi et al. (2014) which looked into the case of Ninth Malaysia Plan (2006 to 2010) Building projects with particular focus made on delay factors that were resulted from pre-construction deficiencies alone. No research has yet to look into delay factors as a whole on any of the Malaysia Plans and; poor time performances in the Tenth Malaysia Plan (see Jatanora et al., 2016) strengthens the need for further elucidation in the area. In fact, not only did the Tenth Malaysia Plan failed miserably in term of timely completion but it was also far from achieving its "Zero Delay" target – further signaling the urgent need for it to be addressed effectively.

1.1 Malaysian Construction Industry & Inaugural Malaysia Plans

Apart from the launch of Master Plans and Transformation Plans, the Inaugural Malaysia Plans has been one of the main economic endeavor initiated by the Malaysian government towards progressing the country to become a developed nation by year 2020. Each Malaysian Plan covers a period of five (5) years with the latest and currently on-going being the eleventh one covering developments from year 2016 to 2020. While each of the Malaysia Plans were accompanied by strategies to achieve the best of targets fixed in place, a major problem in many of them were poor project time performances which consequently led to problems such as delayed facilities for the public, loss of public funds, tarnished reputation, litigations and many more. In fact, delay rates from the Eighth, Ninth and Tenth Malaysia Plan were tremendously high as reported by Abd. Karim (2008), Joshi (2009) and Jatanora et al. (2016) respectively which signified just how far the industry currently is from being a well performing industry.

Realizing the below-par performances of construction industry, the government started up-taking newer initiatives which encouraged "public-private" collaborations towards driving the nation forward. The first proper design and built project was initiated in the 1980's via the construction of Kuala Terengganu Hospital (see Seng & Yusof, 2006) and then other newfangled initiatives were further promoted via the National Privatization Plan (Netto, 2006). However, a problem spotted in many of the government initiatives were that they were not implemented properly which led to it being either ineffective or only offer limited benefit. One such case was the Private Finance Initiative (PFI) which deviated from the "international PFI framework" (Jayaseelan & Tan, 2006) and outsourcing practices; which was not based on the proper concept (Boston, 1995), but merely as means of reducing workloads (Abdul-Aziz & Ali, 2004) thus, it was short of proper judgements. Beyond that, the government did also launch the Malaysian Construction Industry Master Plan (CIMP) 2006 to 2015 as part of their initiative to become a "world-class" industry by 2015; but even that plan lacked innovative approaches (Hamid & Kamar, 2010) therefore making industry revolution quite impossible. Despite appearing to promote evolution and modernization of the construction industry, the country has generally been not quite receptive of contemporary practices evident from the poor uptake of few well proven revolutionary practices. One such as example is the use of Knowledge Management which has been very minimal (Abdul Rahman & Wang, 2010), domination of traditional practices in Industrialized Building System (IBS) projects (Nawi et al., 2018; Nawi el al., 2014) and low Supply Chain Management (SCM) know-how (Riazi & Lamari, 2013). Poor SCM practices has also made integration between IBS players quite impossible (Kamar et al., 2009).

1.2 Project Delay

Delay, in its simplest way, could be defined as circumstances that involve additional time to complete projects regardless of who is to be blamed for it. Be it the client, contractor or "*force majeure*" as the cause of extra time, a delay is a delay; and that who were to be held accountable is only needed to determine whether an Extension of Time (EOT) or Liquidated Ascertained Damages (LAD) is to be imposed. The great importance of timely completion has therefore been a popular subject for research worldwide over the past decades. In fact, the incessant delay dilemma has led to research even until recent times such as those from Durdyev et al. (2017) in Cambodia, Batool & Abbas (2017) in Pakistan, Aziz & Abdel-Hakam (2016) in Egypt, Amoatey et al. (2015) in Ghana and many more.

Time is of the essence, not only in construction projects but also in any other projects because failure to achieve the pre-set targets leads to a diverse range of losses for all parties involved. It has been widely understood that time constitutes a major aspect of determining whether or not a project is successful, the other two being cost and quality (Chan & Chan, 2004). While profit may be the main concern for private sectors, the consequence of delays could be worse for government sectors since the public funds and accountability are at stake. However, the unique nature of the industry makes achieving time targets not a very straight-forward task since multiple internal, external, predictable and non-predictable factors are involved and need to be addressed effectively.

1.3 The Concept of Pathogen for Delay Studies

The concept of Pathogen for construction failure-related studies was initiated as means of extracting the very roots of variety deficiencies in projects. The concept which has in the past been used on few construction research such as for accidents (see Gibb et al., 2014; Reason, 1990), errors (see Busby & Hughes, 2004), disputes (see Love et al., 2008) and even delays (see Riazi, 2014) typically scrutinizes the latent factors that lead to such failure events in the aim to avoid its recurrence by targeting the very roots of the problem.

The need for a Pathogen-Oriented research for delay studies is evident since the abundance of past research has yet to show a significantly positive outcome to the problem; and that delay is still a very common dilemma worldwide especially on those of developing nations such as Malaysia; thereby signifying the need for a shift in approaches from those that have been used in past decades. A common picture detected as a result of delay was "Blame Game" scenario (e.g. Al-Khalil & Al-Ghafly, 1999; Al-Kharashi & Skitmore, 2009; Agyekum-Mensah & Knight, 2017), a culture that are not acceptable in a "team-oriented" setting which almost always leads to negative outcomes such as conflicts. Beyond that, other research has also spotted that past delay studies lacked identification of underlying reasons (AlSehaimi et al., 2013) and that the analysis and classifications used were lacking comprehensiveness (Chai & Yusuf, 2015) thus, further justifying the poor influence they have made on delay occurrences in projects worldwide.

Effective identification of contributors to time overrun is vital to put a halt in future prevalence (AlSehaimi et la., 2013) therefore, recognizing pathogens, the principle step for process stability (Love et al., 2008) is important so that they are identified early. This ensures solution can be targeted right on the very source of it thereby resolving any issues rooted to that particular pathogen whether or not the problems have happened or may happen in future. According to Riazi (2014; p. 21), "*not only the identification of latent factors of delay could avoid the risk of implementing similar mistakes over and over again, but also allows mitigation to be carried out from the root cause*". Pathogens as defined by Busby & Hughes (2004, p. 428) was linked to three (3) qualities namely "*They are a relatively stable phenomena that have been in existence for a substantial time before the problem occurs, Before the problem occurs, they would not have been seen as obvious stages in an identifiable sequence failure, They are strongly connected to the problem, and are identifiable as principal causes of the problem once it occurs*". While the use pathogen concept for construction failure-related research could be considered rather new however, it has in past been applied by few studies (e.g. Reason, 1990; Love et al., 2008; Love et al., 2010; Love et al., 2012; Busby & Zhang, 2008; Aljassmi et al., 2013) as well as on delay research by Riazi (2014). In overall, most of the past studies adopted the approach used by Busby & Hughes (2004) despite them studying different scope of project failures (i.e. Riazi, 2014) than those of Busby & Hughes's.

1.4 Supply Chain Management (SCM) as the Savior

Supply Chain Management (SCM) is a revolutionary management philosophy originated from the manufacturing industry and was introduced to the construction industry in the 1990's mainly via two (2) famous UK Government Reports namely the Latham Report (1994) and the Egan Report (1998). Fragmentation was identified as a culture deeply embedded in traditional practices (Egan, 2002; Abadi, 2005) which also dominated construction practices in Malaysia (see Nawi et al., 2010; Hamid & Kamar, 2010) and many other developing countries. Hence, SCM was promoted as means of transforming the construction industry to achieve better success

and overcoming fragmentation by encouraging all parties to engage as a "real team", ensuring that effective communication, coordination, collaboration and integration are practiced. Riazi & Nawi (2018; p. 1672) defined SCM as "*a modern managerial philosophy which stands firmly on the need for continuous integration of two or more project parties from initiation to handover and throughout those phases value shall be achieved via joint initiatives, pooled resources, pain/gain sharing, mutual trust and a long-term perspective on relationship towards the accomplishment of a fixed set of mutual objectives*". SCM holds on "Joint Effort", which is "*a collaborative endeavor that aims to create an integrated project delivery by including elements of effective teamwork towards achieving both short-term and long-term outcome that benefits all parties*" as among its core components (Riazi et al., 2019; p.1098) which as a result overcomes fragmentation and makes a team setting more efficient and productive.

Besides the two (2) famous UK Government Reports, the agenda of promoting SCM to replace old methods have also been mooted by other researchers (e.g. Strategic Forum, 2002; Love et al., 2004) since the complex nature of today's industry demands higher level of collaboration and that no one can remain self-sufficient. Beyond that, many studies have also proposed initiatives to apply SCM in construction projects for instance - the proposal of SCM Maturity Model by the Supply Chain Council (see McCormack et al., 2004), seamless model (see Love et al., 2004) and web-based system named "SC Collaborator" (see Cheng et al., 2010). Nevertheless, most initiatives were not exhaustive enough and covered limited issues (i.e. see Love et al., 2004; Riazi et al., 2011) thereby missing on many important traits of SCM as well as the focus on overcoming specific industry deficiencies (i.e. delay).

SCM has been promoted to boost the construction industry performances which include timely delivery of projects. The working philosophy and tools within SCM has the potential to overcome delay from many perspectives. In fact, there have been past application of SCM tools on real projects which achieved considerable success on optimizing time performances and reducing delays (e.g. Brady et al., 2006; Potts, 2009). Others also suggested that SCM suits well to public sector settings (e.g. London & Chen, 2006) even for Malaysia (Riazi et al., 2011) consequently creating a cautious optimism on the potential of SCM to be the savior of Malaysian delay dilemma especially those of public sector projects. Besides that, the fact that delay commonly occur due to a sequence of inter-related events that leads to it therefore, the need to address all of them creates a serious necessity for multiple effective approaches to deal with each of them whereby it can highly benefit from the wide-range of tools available within SCM.

2. The Planned Research Route

This study mainly aims at developing a holistic time management framework that utilizes the wide-range of beneficial Supply Chain Management (SCM) tools to overcome delays in Malaysian public sector building projects. In doing so, this research needs to undergo a number of step and processes which starts with the investigation on the nature of delay and their main contributors towards consequently formulating a pathogen-oriented categorization. Following that, fundamental Supply Chain Management (SCM) tools will be identified from literatures and be utilized for the development of final research framework. The final framework aims at overcoming distinctive pathogens of delay using the right SCM tools that directly caters them.

While it has been evident that delay have been a recurring phenomenon across few Malaysia Plans however, since the Tenth Malaysia Plan (10MP) (2010 to 2015) was the latest one that have ended and that; the plan also particularly aimed at achieving "Zero Delay" (see Abu Mansor, 2010) which it miserably failed (see Jatanora et. al, 2016) motivated this research to focus on projects during that era. In term of project type, an emphasis would be made on physical building developments since it made up the vast majority of projects during 10MP – i.e. 60% (see Abu Mansor, 2010). Besides, the need to introduce SCM in stages, as suggested by the SCM Maturity Model (see McCormack et al., 2004) supports the research route of focusing on applying SCM in the less complex building project first before reconnoitering further into more complex infrastructure projects.

Beyond that, this research will make a particular focus only on the Northern Region of the country namely the states of Pulau Pinang, Kedah and Perlis to ensure that a thorough and more focused investigation can be performed, rather than targeting all fourteen (14) states of Malaysia which would cause difficulties in attaining a convincing sample distribution that leads to unbalanced findings. Besides, different parts of the country may have dissimilar constraints thus, targeting them separately enables a detailed scrutinization to be performed and future studies could be extended to the other sections which could then be compared side-by-side to come out with a meaningful trend that could be utilized for future nation planning. In term of respondent groups, only the Grade G7 contractors, which is the highest grade in Malaysia are targeted. The shift of many construction activities from on-site to off-site has caused more complexity due to the involvement of more supply chains (Jones & Saad, 2003). Since bigger projects tend to be more complex and; are at higher risk of delay (Waldron, 2006) makes better sense for this research to focus on Grade G7 contractors that are involved with project above RM10 Million.

Towards establishing the final research framework, this research will be undergoing a number data collection and analysis stages. Firstly, while there are abundance of studies in relation to delay in construction projects, there

are not many literature on delay factors in Malaysian public sector, especially in recent times thus, an interview on few Malaysian construction industry experts with a minimum of ten (10) years' experience will be undertaken towards getting their insight, experience and opinion in regard to the factors causing delay in Malaysian public sector projects. In determining the expert groups, similar methods applied by Ismail et al. (2013) will be used. Due to dissimilarities that may exist within the Malaysian context such as locality, culture and governance, it is important that delay factors, other than those from other countries found in literatures, are identified especially since some of them may only be applicable to Malaysia, to ensure that a comprehensive survey questionnaire could be prepared for the next stage.

Next, the survey questionnaires, after being piloted to ensure appropriateness, will be used for the next phase of data collection. Unlike the common postal / online questionnaire surveys used in past delay research (e.g. Sambasivan & Soon, 2007; Al-Kharashi & Skitmore, 2009; Shehu et al., 2014), this research will opt for a "face-to-face" approach since; delay has remained a common occurrence up to today with very bad records within the Malaysian public sector projects (see Abd. Karim, 2008; Joshi, 2009; Jatarona et al., 2016). These circumstances could probably be due to the fact that postal / online surveys do not involve a "face-to-face" meet-up thus, disables the identification of who exactly answered the questionnaires. There is no way to confirm that the expected / qualified person answered them and should the respondent be an incompetent person, it could affect the accuracy of findings. Beyond that, a "non-face-to-face" approach also does not provide room for clarification should any respondent could not or had limited understanding on any part of the survey. This will risk responses to not be based on their proper understanding which in the end affect accuracy of outcomes. Due to the shortcomings from past research approach (i.e. delay still a common scenario) suggests that perhaps a different approach is required to enable findings to influence practices and thus, this research aims to improve outcomes by proposing a different approach from those taken by most of past studies. According to Szolnokin & Hoffmann (2013) who compared online, face-to-face and telephone survey method, "*Face-to-face surveys have several key strengths. These surveys are clearly structured, flexible and adaptable. They are based on personal interaction and can be controlled within the survey environment. Physical stimuli can be used and respondents are able to be observed (Holbrook et al., 2003a, 2003b; Alreck & Settle, 2004)*" (p. 58). This method enables tighter control on criteria of participants which are not quite possible using postal / online surveys. Also, trigger questions and clarifications could be made in attempt to ensure that responses are sincere and based on the right understanding of each aspect of the survey and that no misunderstandings exist. These advantages further support the use of this method which is expected to provide a more accurate result in respect of the main delay factors. To further ensure accuracy of results, all respondents must possess at least five (5) years' experience in construction industry and also experiences taking part in building projects under the Tenth Malaysia Plan. In term of sample size, the numbers required for an "interview-based" data collection will be applied since "face-to-face" surveys are more of an interview since there are direct contacts and the nature in which it is conducted suits an interview setting. In this case, a minimum of thirty (30) to sixty (60) participants will be targeted as per proposal by Morse (2000) for an interview. Finally, data obtained will be analyzed using the latest Statistical Package of Social Science (SPSS) software version towards establishing the main delay factors.

Once the main delay contributors have been finalized, this research will proceed with categorizing them into pathogens and sub-categories of pathogens (if any). For this purpose, Focus Group, which is one of two best-known group interview method - the other one is Delphi method (Fellows & Liu, 2008) will be adopted. "*The focus group method is an established rigorous technique for collective interviews aimed at eliciting and exploring in-depth opinions, judgement and evaluations expressed by professionals, experts or users/clients about specific topic*" (Morgan, 1997). It is also beneficial to produce a rich understanding of participants' experience and beliefs (Morgan, 1998) thus, this method allows for production of quality outcomes especially since scrutinizing and determining the correct pathogen and/or sub-categories of pathogens require higher level of skills due to the infancy of this approach in construction studies. Focus Group is designed as an opportunity for a group of people to confer with a meticulous purpose in mind (Stewart et al., 2007) and that group-setting discussions stimulate ideas, memories and experiences which is recognized by Lindlof & Taylor (2002) as the "group effect" where participants employ "*a kind of 'chaining' or 'cascading' effects; talks links to, or tumbles out of, the topics and expressions preceding it*" (p. 182). Participant vast knowledge, skill and experience will be vital on categorizing the main delay factors into pathogens and/or sub-categories of pathogens based on the concept used by Busby & Hughes (2004)'s study as well as its application in other failure-related researches. At the same time, they will also be encouraged to propose new ones should none of the ones from past applications fit the delay factors presented to them. In term of sample size, at least six (6) to twelve (12) members as has been proposed by Stewart et al. (2007) will be used and to ensure that they are the "expert" groups of the industry, again similar methods applied by Ismail et al. (2013) will be used; and their experiences should also include involvements in building projects under the Tenth Malaysia Plan. A minimum of two (2) sessions will be conducted to develop and confirm the pathogen groupings, while extra sessions shall be arranged as needed should two (2) sessions were not sufficient to finalize outcomes.

Lastly, another minimum of (2) focus group sessions, with criteria's being similar with the sessions for pathogen groupings will be undertaken to develop and validate the final research framework, and extra sessions added as needed. In the beginning, literature reviews will be used as means of gathering fundamental SCM tools from existing literature. Only then, they could be matched with the pathogens and/or sub-categories of pathogens to develop the final research framework. Considering the infancy of SCM in Malaysia, Focus Group is seen as the most suitable method towards developing a holistic time management framework that utilizes beneficial SCM tools to overcome distinctive pathogens of delay in Malaysian Public Sector building projects. It aims at taking advantage of diverse knowledge, skill, expertise and experience of participants towards selecting, discussing, justifying and collectively agreeing on the most appropriate and effective SCM tools for each delay pathogens and, eventually reach a superior decision.

3. Research Theoretical Framework

In coming up with the final research framework, the main delay factors would be established first and consequently, they will be categorized into distinctive pathogens and sub-categories of pathogens (if any). Consequently, the respective pathogens will be matched with fundamental SCM tools that are suitable to deal with them towards ultimately reducing delays. In the end, the final research framework will be in the form of - distinctive pathogens of delay (as the Independent Variable) that are matched with the relevant SCM tools (as the Dependent Variable); which could be visualized as per the two middle boxes within the dotted lines in Figure 1.

Fig. 1 - Research Theoretical Framework

Based on Figure 1, the pathogens (labelled as "PATHOGENS OF DELAY (IV)") are adopted from research by Busby & Hughes (2004; p. 429), which have also been implemented in many other construction failure-related research (e.g. Love et al., 2008; Love et al., 2010; Love et al., 2012; Busby & Zhang, 2008; Aljassmi et al., 2013; Riazi, 2014). Later, as the research progresses and that the main delay factors has been established, new pathogens may arise and; their categorization will be made based on the approach taken by Busby & Hughes (2004) in developing categorizations in their research. On the other hand, the SCM tools (labelled as "SUPPLY CHAIN MANAGEMENT TOOLS (DV)") in Figure 1 embodies only a number of tools that have been proposed or used in the past for use in construction projects – Joint Risk Management (see Potts, 2009); Early Involvement of Supply Chain (see Kumaraswamy et al., 2004); Framework Agreement (see Kumaraswamy et al., 2010); Quality Circles (see Salem et al., 2006); Champion / Driving Personalities (see Kumarsawamy et al., 2007); Collaborative Logistics (Huang et al., 2001); Interface Managers (see Cigolini et al., 2004); and Performance-based Incentives (see Douglas, 2005). More tools are expected to surface as this research progresses and whether or not they will form part of the final framework depends on the delay pathogens that are established later. Different pathogens may suit different SCM tools thus, this research would need to further explore them.

4. Conclusion

Overall, time is proven to be an essence in determining whether or not a project can be deemed successful and; the fact that poor time performances has been recorded in few of the past Malaysia Plans (i.e. 8th, 9th and 10th Malaysia Plan) signifies that these Government initiated plans can yet be considered to have successfully achieved its objectives. While numerous initiatives have been placed, they achieved limited success due to

conservative ideologies that are still rooted in the local construction industry practices. Therefore, SCM presents a great opportunity for the local construction industry to shift away from the outdated conventional ways of managing projects towards being more team-centric with greater focus on value rather than cost alone. There have been a number of SCM success stories from application of its tools in several developing countries which creates an optimism of the potential benefits it offers for the industry. Despite poor acceptance rates, possibly due to the infancy of SCM and "lean" practices; some awareness in regard to this revolutionary working philosophy has been evident among Malaysians. Another particular finding was that despite the existence of SCM research that look into the subset issues of the industry, there is still shortage of holistic approaches especially ones that focuses specifically on catering particular failures of the industry. The development of a holistic framework in this study would therefore contribute not only to the expansion of body of knowledge in relation to SCM studies but also in term of framework developments to address particular industry deficiency (i.e. poor time performance). The framework will also take a holistic approach whereby all subset issues related to delay will be addressed right from their roots – an aspect missing from past studies. The final framework is expected to provide a clearer guideline on proper implementation of SCM in projects towards better time management. It could also provide extended knowledge and understanding on the fundamental SCM tools that has the potential to overcome delays in future Malaysia Plans. The final research framework will provide wide-range of SCM tools matched precisely to the problematic aspects of projects whereby, it is anticipated to help the government in imposing relevant policies to tackle them via SCM. While only focusing on the 10MP, the final framework could serve as a basis for extending its applicability and benefits across a broader spectrum of projects.

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