

# Critical Assessment of Programme-Based Conflict Resolution Model Applied to Multiple Stakeholders Within The Context of Industrialized Building Production and Life Cycle Supply Chain System

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**Abstract:** The building production system has been analysed by the dichotomy “employer-contractor” relationship, which failed to take into account of the role and function of multiple stakeholders within the life-cycle supply chain. This is further observed in the current conflict resolution model, which, in my argument, struggles to contribute to industrialize the building production and achieve better efficiency and effectiveness as expected. The purpose of this paper is to critically assess the issues of current programme-based conflict resolution model, and discuss alternative models how they can be modelled and applied to the construction projects. The conclusions of findings are; First, the current model is framed around the contracts and dispute resolutions based on the legal concept of “claimant and respondent” where one party(s) advances a claim once and the other(s) objects, as such it fails to reflect the nature of construction projects where multiple stakeholders are involved concurrently and for a long period of life-cycle of buildings. Second, an alternative is “Six-stakeholders model” which represents the multiple stakeholders and clarifies the flow of obligation-liability-monetary relationships among participants for a long period of life-cycle of buildings. Further, with reference to both historical and recent cases, a reflection and insight into pros and cons of programming method is added, especially as to why this method is considered to have become a mandate of the modern construction management, and how academics and practitioners should deal with it more cautiously and prudently.

**Key words:** Building production system, Stakeholders’ relationship, Programme-based conflict resolution

## 1. BACKGROUND and INTRODUCTION

To improve the “efficiency” or “effectiveness” of the building production system has been repeated and sometimes systematic “cries” within and outside the construction industry. A number of academic researches, and industry or professional papers have identified two problems; first is dichotomy relationship between the client and contractor, second is their incentives around the

management of resources; namely labour, material, information and money. As such, taking into account of the historical development of “mass production” and “information technology”, the conceptual models of “team working” and “supply chain management” have been developed and applied to the construction industry, within the new time frame of “building life cycle”. However, the current conflict resolution model, which, in my argument, struggles to contribute to industrialize the building production system and achieve better efficiency and effectiveness as expected.

English-model of the current conflict resolution is based on the dichotomy of claimant and respondent, where one party makes a claim and the other party defends, either in the court or alternative dispute resolution such as arbitration, adjudication, mediation or negotiation. This model is also applied to the construction projects, such as to the contract relationship between the client and designer, or contractor and supplier. However, it fails to deal with concurrent and multiple relationships among the stakeholders of one project.

Likewise, the concept of programme has been introduced to define the efficiency or effectiveness, where efficiency is measured as the cost against programme, and effectiveness is measured as the value against the programme. Here, assumption is made that the cost or value is measurable or convertible as monetary figures. Further, the programme is also measured as the increase of cost or loss of value as a result of delay of construction. However, it is still not clear how this programming model can be applied to the building life cycle, and why the delay of construction amounts to the additional cost or value loss especially if the interest cost is not taken into account.

The achievement and contribution of this paper are to identify the root cause of construction disputes, and how it can be resolved or mitigated, by introducing and applying two different models.

## **2. LITERATURE REVIEW**

### **2.1. Disputes and dichotomy relationships as background**

In construction industry, although many reports have discussed the efficiency and effectiveness of constructing properties and buildings, the value of property or building did not attract much interest. For example, UK governmental reviews of the construction industry (Bossom report (1934), Simon report (1944), especially Latham report (1994)) which were mainly initiated post to economic recessions, highlighted the problems of efficiency; such as fragmented culture and adversary contract practices prevalent within the construction industry. As a recommendation, these reports stressed the requirement of integration, referring also to long-term relationship, design-build, manufacturing-oriented lean management (Koskela, L.,1992) and supply chain management (Cain, C.T 2003). However, recent articles still highlight major problems around large projects and companies such as Crossrail (NAO,2019) and Carillion (NAO,2018). It is even cynical that the government and Construction Leadership Council still stressed the need of harmony and win-win during this difficult time in 2020 caused by the wide-spread virus COVID-19 (HM Government, 2020. CLC,2020).

### **2.2 Value and cost of projects as measured by Client, based on multiple relationships**

On the other hand, the measurement methods of investment and development projects, such as cash flow and risk assessment models have been developed post to 1950s’ (Crosby.N, 2019) in order to support large institutions to make decisions. Further, the use of financial viability appraisals in planning decisions is critically analysed (Crosby, N.and Wyatt, P. 2016) and the method of development appraisal is proposed reflecting those findings (Crosby, Wyatt and RICS, 2019).

However, the discussion of the definition of value has a long history. For example, Modern methods of valuation of lands, houses and buildings (Lawrance, D.M., 1943) has already stated that “To the economist “value” means the exchange worth of a commodity in terms of any other commodity” and “In the modern world the relative values of commodities and services are measured in terms of money”. Further, it listed four methods of valuation and discussed the details of “The Residual or Development Method” how it should be applied in practice.

One thing to highlight is that International Valuation Standards (IVS, 2020) defines the value as “the judgement of the valuer of the estimated amount consistent with one of the bases of value set out in IVS 104 Bases of Value”. Although IVS further defines “market value” and others as one of “bases of value”, it should be noted that it argues that it is the valuer who chooses the bases of value and how it is applied (note 3.1-3.5).

In addition to the focus on efficiency on short-term, recent researches stress merits on long-term (Eriksson et al, 2013), although it is argued that the merits and value are perceived differently among practitioners and still difficult to define (Wandahl,2015). One approach is to study the value for a public body who acts as clients initiating public projects (Volker,2018). However, although procedural and performance values can be evaluated as the various factors influencing the value, this does not answer what the value is for management purposes.

As such, the value for money is often treated as if cost efficiency (Marinelli,2018) which is to reduce the cost against the value of infrastructure and building projects, and not necessarily to increase the value itself. Further, rather than discussing the traditional model of objectives consisting the time, cost and quality, or performance (PMPA) or maturity (PEM), a model to assess the success of project or success of project is discussed (Radujkovic,2017). However, the analysis of success or its influence factors does not necessarily define the objectives of project, as such the relationship between successes and objectives still requires a careful further analysis.

### **2.3 Programme is the root cause of disputes, but why?**

A conclusion within the PM academy that it is difficult to define the objectives of projects rather than quality, cost and time, lead its focus on problems of particular methods or type of projects. Thus, empirical methods to analyse problems of the major construction projects provide basis of potential research topics (Morris, P.W.G. et al, 1987, Dalcher, D., 2012), and mathematical methods of the risk assessment clarify the attributes of risks and importance of decision making (Edmundas Kazimieras Zavadskas et al, 2010).

However, the risk management modelling focuses on the identification of risks, and does not clarify the risk management process of clarifying objectives, identifying risks, and proposing mitigations (Tepeli, E., 2019). Further, focusing on problems in the front-end of projects does not tell the relationship between the management and achieving targets (Williams, T., et al ,2019).

Likewise, researches focusing on one of objectives such as the quality, highlighted problems and difficulty to implement and manage the quality system (Hoonakker, P.L.T.,2010) and stressed the important factors affecting the quality; such as human resource management, customer satisfaction, and construction specific factors (Jraisat, L.E.,2016), without necessarily defining what those factors are. This makes it difficult for managers to apply the model to the actual projects.

Thus, popular focus is the programme, where the organizational capability of mega projects is categorised into contextual, core and motivation capability, consisting of 24 factors (Yi Hu,2014). From a legal aspect, it is argued by a construction judge that the construction disputes are related with the programme, especially the assessment of delay analysis by experts (Akenhead, R., 2015), where it is argued that the legal principle of “good will” is applicable even in England to mitigate the delay problems arising from the English adversarial system. However, a fundamental question

remains as to the background why this programming method has become such a major focus of the modern construction management.

### 3. RESEARCH METHOD

The research method of this paper is three folds. First, out of 10 building development projects in which the writer of this paper was involved between 2008 and 2020, five projects were chosen (Figure 1). Focus of this paper is Case 1, however, four other projects are listed here for comparison purpose. Second, a Dichotomy model (D-model) and Six-stakeholders model (SS-model) were explained. Third, applying these models, three case studies and reflection on programme-based conflict resolution model were provided, and its conclusion was stated.

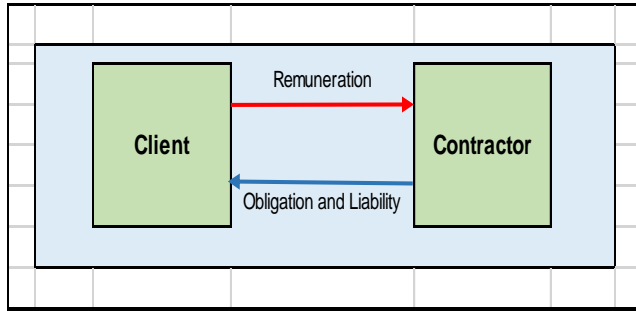
Project outline			Project	Case1	Case2	Case3	Case4	Case5
Buildi	1	Location		London	London	London	London	Manchester
	2	Approximate Floor area	m2	10,000	15,000	1,000,000	3,000	10,000
	3	Floors		6	6	10	3	23
	4	Use		Office	Office mix	Resi mix	Retail mix	Hotel
	5	Type of development		New	New/Fitout	New	Fitout	New/Fitout
	6	Acquisition		2008	2015	-	2016	2015
	7	Planning Permission		2008/2009	-	-	2017	2019
	8	Construction		2011	-	-	2018	2019(on hold)
	9	Practical completion		Yes	No(sold)	No(cancelled)	Yes	No(on hold)
	10	Operation		Yes	No(sold)	No(cancelled)	Yes	No(on hold)
Team	1	Client		○	○	○	○	○
	2	Projet monitoring		○	×	×	×	×
	3	DM		○	○	○	○	○
	4	PM		△	×	○	○	○
	5	CM		○	×	×	×	×
	6	Architect		○	○	○	○	×
	7	Contrator		×	-	(○)	○	(○)
	8	Trade contractor		○	-	-	-	-
	9	Insurer		○	-	-	○	(○)
	10	Tenant		○	-	-	○	(○)
Evaluation		Value management		5.00	7.00	6.00	5.00	7.00
		Cost management		7.00	7.00	6.00	1.00	5.00
		Programme management		8.00	8.00	7.00	1.00	4.00
		Quality management		8.00	8.00	7.00	5.00	7.00
		Project success(subjective)		⊙	○	△	△-×	○
		Score out of 10 points(subjective)		7.00	7.50	6.50	3.00	5.75
		Scope out of 10 points(objective)		7.00	8.00	6.00	2.00	6.00

Figure 1. Project outline of five projects

Note: Evaluation values mean “scores out of 10” for each four criteria and overall project. Please also see reference [50].

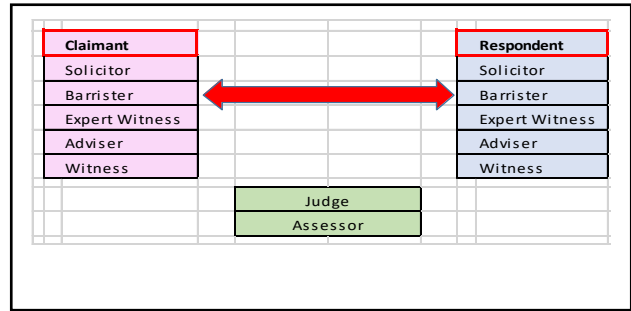
#### 3.1 Dichotomy model (D-model)

Dichotomy model (D-model) is to analyse the relationships of construction projects. A typical relationship is Client and Contractor, where two parties agree to construction agreement; A client provides remuneration whereas a contractor provides obligation to carry out the design or works and owe liability (Figure 2). When a dispute arises, Client demands performance of obligation or payment of liability, likewise the contractor demands payment based on client’s duty to pay remuneration. When the dispute escalates to court for settlement, both parties appoint a legal team of advisers, and the delay analysis is prepared by single expert witness unless both parties agree to a joint expert witness. During this court process, judge acts as a third party representing neither side as such this is extremely adversarial as the representative (typically barristers) of each party “fights” over the issues in front of the judge (Figure 3). The critical point, however, is that the dispute is settled financially anyway where one party is ordered to pay to the other party, and that it is rare for one party to be ordered to perform non-financial obligations (specific performance). As such, the financial assessment of the delay and conversion to financial amount is critically important for the expert to establish.



Note: In this model, contractor can include designer, construction company and suppliers

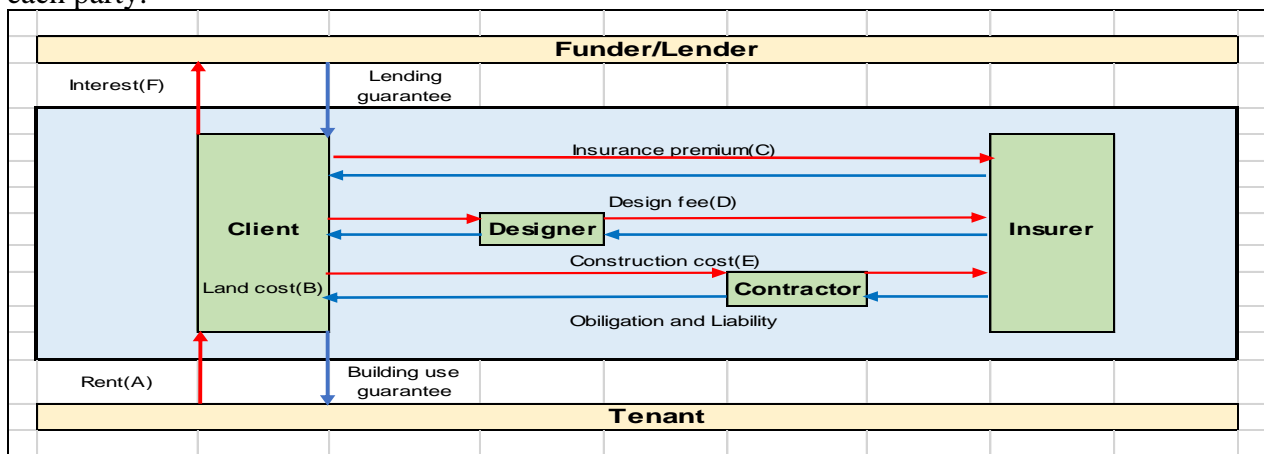
**Figure 2.** Client and Contractor relationship of construction project



**Figure 3.** Claimant and respondent relationship over disputes at Court

### 3.2 Six-stakeholders model (SS model)

Six-stakeholders model (SS-model) is also to analyse the relationships of construction projects. A typical relationship is Client, Designer, Contractor and Insurer where four parties separately or jointly agree to form the delivery team, whereas Funder/Lender provides capital to Client and receives interest, and Tenant occupies building space and pay rents to Client (Figure 4). When a dispute arises among delivery team, Client can discuss with Lender, Tenant and Insurer (not only with Designer and Contractor). When the dispute escalates to court for settlement, Client is still be able to mitigate its loss by negotiation with Lender, Tenant and Insurer, as such Client is able to avoid adversarial legal proceeding against designer and contractor. The critical point, however, is that any financial loss arising from the delay can be mitigated if the Lender waives the interest rate, or Tenant does not occupy the buildings space immediately post to practical completion, or Insurer bears the loss. The financial assessment of how to measure the delay and convert to financial amount is still important for the expert to establish, however, Client and delivery team has more opportunity to work through together to deliver the project, meanwhile mitigating loss relevant to each party.



Note: In this model, lender is financial institutions including banks, and tenant is any occupier of the building who pays rent to Client. Insurer provides construction insurance, building insurance and latent defect insurance to the client. Further, insurers provide employer's insurance, professional indemnity insurance and other insurance to designers and contractors.

**Figure 4.** Six stakeholders' relationship of the construction project

#### 4. APPLICATION and CASE STUDIES

##### Case 1: Measurement of remuneration when we apply D-model

When we apply D-model to Case 1 above, the cause, escalation route and mitigation types of disputes between Funder and Client can be presented as below (Figure 5). In this case, the remuneration of Client is calculated as the percentage of profit of the project, as such, when the market rent changed as a result of financial crisis in 2008(Lehman shock), a dispute arose whether the change of market rent should be allowed to update the appraisal. Three points can be highlighted here. First, although Client has the duty of care to provide a reasonable estimate of the market rent, it is not clear whether Client has breached or not under this circumstance. Second, although the decrease of market rent is a loss for the Funder, the loss has not yet realised as the decrease is an estimate of the future rent after 27months when the construction completes and the property is put for letting. Third, regardless of whether or not there is a breach on the part of Client and actual loss suffered by Funder, the relationship between Funder and Client is long-term where Funder holds a part of shares of Client, as such there is more opportunity for both parties to work together for agreeable settlement rather than escalating the dispute more formally. Subsequently, the dispute was settled between the parties to allow the reasonable estimate of market rent to be reflected to the development appraisal and the percentage of profit share of the Client to be increased to maintain the required level minimum profit for Client to be achieved as a commercial transaction in the market.

Legal principle	Dispute type	Contract clause	Item			
			Remuneration	Content	Standards	Timing
Intention	Formation	Definition, Sign	Bond	Parties	Curriculum Vitae	Agreement
Remuneration	Remuneration	Remuneration	Sharing	Client obligation	Interim certificate	Payment
Offer/Acceptance	Scope	Appendix	Appraisal	Design & Work List	Industry practice	Delay
Terms	Interpretation	obligation	Fee amount	Task list	Duty of care	Execution
Terms	Interpretation	Liability	Liability amount	Force majeure	Foreseeable loss	Defect
Perform/Terminate	Perform/Terminate	Termination	Penalty charge	Grounds	Breach/Completion	Stage PC/Whole PC
Mitigations			Payment timing	Long term relation	Insurance	Liquidity Damage

Note: Red yellow box(appraisal) shows the cause of dispute, and red arrows show the escalation route of the dispute, whereas red blank box (long term relationship) shows the type of mitigation of dispute.

**Figure 5.** Application of D-model to Case1 and analysis of causes, escalation routes and mitigation types of disputes

##### Case2: Measurement of remuneration when we apply SS-model

When we apply SS model to Case 1 above, the amount of remuneration (shown as red arrows of Figure 4) is calculated as A, B, C, D, E and F (Figure 6). Three points can be highlighted here. First, the life cycle rent is capitalised as the net present value(A), however life time cost is not reflected here although it could be included in cost-construction(D) as estimates. Second, cost of land(B) and interest(F) consists 72.5% of total cost, whereas cost of design(C) and construction(D) consists 27.5% only of total cost. It is further noted that cost if interest(F) is driven by two factors; interest rate(F-1) and programme (F-2, F-3 and F4). Third, assessment of project can be carried out as Profit(P-1), Profit ration(P-2) and Income ratio(P-3). This indicates that there a potential wider scope for the mitigation of loss under SS model, rather than the settlement between two parties

under D model. This is because SS model takes into account of 6 arrows (A, B, C, D, E and F) whereas D model deals with 1 or 2 arrows only (C or D).

Six arrows of six stake holders' model						
	item	Payer	Payee	amount	unit	Notes
A	Rent-life time	Tenant	Client	146,478,950	£	Annual rent÷ Yield- Void period
B	Cost-land	Client	Client	77,896,618	£	Land cost
C	Cost-design	Client	Designer	6,952,934	£	GIAXdevelopment and design unit cost
D	Cost-construction	Client	Contractor	30,058,825	£	GIAXconstruction unit cost
E	Cost-insurance premium	Client	Insurer	450,882	£	Construction costxpercentage
F	Cost-interest	Client	Lender	20,933,460	£	Costxinterestxprogramme
Elements of six arrows						
	item			amount	unit	Notes
A-1	Net Internal Area			76,943	ft2	excluding common area
A-2	Rent			90	£/ft2	excluding service charges and rates
A-3	Annual rent			6,924,870	£	NIAXRent
A-4	Yield			4.3	%	risk rate of county and inflation etc
B	Gross Internal Area			103,290	ft2	including common area
C	Cost-design			67	£/ft2	development and design cost
D	Cost-construction			291	£/ft2	construction cost
E	Cost-insurance premium			1.5	%	ratio against construction cost
F-1	Cost-Interest			5.0	%	interest rate on lending
F-2	Programme-land/plan/design			27	month	until construction start
F-3	Programme-construction			27	month	construction start to completion
F-4	Programme-void/rent free			21	month	completion to rent commencement
Assessment						
	item			amount	unit	Notes
P-1	Profit			10,186,231	£	Value – Cost
P-2	Profit ratio (against cost)			7.5	%	Profit÷ Cost
P-3	Income ratio (against cost)			5.1	%	Annual rent÷Cost

Note: programme is for construction commencement till mid-point of construction period

**Figure 6.** Application of SS-model to Case1 and interpretation of its development appraisal

### Case 3: Assessment of construction project when we apply SS model

Likewise, when we apply SS model to Case 1 above for the life cycle of 12 years, the amount of profit (as such the gain or loss of the project) is calculated as 8.345, -10.62, -5.806, and 6.700 Mil £ (Figure 7). Three points can be highlighted here. First, both value and cost fluctuated over the life cycle of 12 years as such the achieved profit (gain or loss of the project) depends on the timing of measurement. Second, the project commencement was delayed by two years (incurring additional interest on the land cost), however, the achieved cost of interest was 15.21 Mil £ which is less than forecasts both in 2008 and 2010. Third, achieved construction cost (25.19 Mil £) consists of 21.9% of total cost (115.06 Mil £), and cost of land, design and interest consists of 78.1%. This indicates that assessment of gain or loss arising from a dispute needs not only the careful analysis of both forecast and achieved figures, but also the weight of construction cost and construction programme against the total project cost and total project programme. This is because settlement of disputes arising from the construction cost cannot be said necessarily to solve or contribute to the issues how to improve the profit for Clients.

Development appraisal			DM forecast	DM forecast	DM forecast	DM minimum	Notes
Item	year		Plan	Plan	PC	Current	
			2008	2010	2012	2020	
Net Internal Area	sf		55,273	55,136	56,198	56,198	
Rent	£/sf		119.5	95.0	95.0	97.5	
Yeild	%		4.60	4.60	4.75	4.50	
Gross Internal Area	sf		86,298	88,837	89,304	89,304	
Programme-construction	月		24	22	22	22	
Value	Mil £		126.23	110.22	109.25	121.76	
Cost-land	Mil £		59.22	59.22	59.22	59.22	
Cost-construction	Mil £		28.59	26.12	25.19	25.19	
Cost-development/design	Mil £		11.50	14.28	15.44	15.44	
Cost-interest	Mil £		18.58	21.22	15.21	15.21	
Cost	Mil £		117.89	120.84	115.06	115.06	
Profit	Mil £		8.345	-10.62	-5.806	6.70	
Profit ratio	%		7.1%	-8.8%	-5.0%	5.8%	

Note: construction commencement was delayed from 2008 to 2010 by two years, and practical completion was 2012. Subsequently, the property was fully let before 2015 and “upward only” rent review was conducted before 2020.

**Figure 7.** Application of SS model to Case1 and assessment of profit (loss or gain) of construction project

## **5. REFLECTION ON PROGRAMME-BASED CONFLICT RESOLUTION MODEL**

### **5.1 Timing of measurement: life cycle consideration?**

Three questions of timing arise. First, it is not clear when the measurement should be taken to assess the loss and gain (of a party or project) arising from a construction dispute. It is clear that developers measure the project, and that that is prior to purchasing the land and prior to commencing the construction. However, it is rare to measure the project when the building completes or lease starts or income generates during the operation, except for measuring the actual cost (and expected cost) as cash payments. This concludes that the measurement is used mainly for the short-term investment or development decision making, and not necessarily for the long-term management of the properties or dispute resolution.

Second, the security of income is only for 10 or 15 years for the typical commercial lease terms in practice, and the cost during the operation stage is not even considered within the development appraisal or construction cost plan, although the cost of operation of communal area (which falls within the responsibility of the client/owner) is estimated as the property management budget (typically as £7-10/sf of service charges for new buildings). This concludes that this model is highly reliant on the continuity and stability of the market and its practice, where the decrease of rent is not assumed, and the service charge and dilapidation liability stay with the tenants even in the future.

Third, the typical life span of a building is designed to be 50 or 60 years (exceptionally up to 100 years). However, the building facilities which consist circa 20% of the total building cost do not last or sufficiently function for more than 25 years. This is because typical UK lease period in Central London is less than 25 years, as such clients and building owners are required to incur the capital expenditure mechanically or economically (to find good tenants) to replace building facilities. However, this cost liability in the future is not reflected into the development appraisal or cost plan, whereas the income in the future is fully reflected. This concludes that the model needs to deal with the loss and gain of income and cost equally for the same duration of life span, or otherwise to state its assumptions of the life span clearly.

### **5.2 Delay of programme: its financial impact?**

It is said that the delay of programme is everywhere, which is the manifest evidence of the inefficiency and ineffectiveness of the construction industry. There are two issues here, which are about the measurement of the programme as the cost in the development appraisal, and the measurement of programme as the foreseeable loss in the legal interpretation.

First, the appraisal recognises the programme of planning & design, construction and lease (void and rent-free periods), however, that is all reflected into the cost of interest. As such, if the cost of interest is disregarded, there should be no issue of programme from the aspect of appraisal, because it does not affect the value, cost, profit nor profit ratio. Further, Case1 shows that it is 27 months for planning & design, 27 months for construction and 21 months for void and rent-free period, total of which becomes 75 months. As such, even if the cost of interest is measured by the appraisal, it is arguable why the construction programme needs to be treated as the main source of problems of development. This is because the construction programme of 27 months consists of only 36% of overall development programme of 78months, from the cost of interest perspective. Moreover, from the leasing perspective, it is a practice to allow for 6months or longer void period which is



the time between the practical completion and commencement of tenant's occupation. This means that even the construction is delayed by 6months, it does not affect the tenant's occupation of the building space, as such there should be no issue of rent paid to the client of the property.

Second, many legal papers discuss that the key issue in the construction sector and courts is the delay-analysis, which is tended to be more exercised by the construction adjudicators or experts, rather than judges themselves. Two issues here, one is that expert is not necessarily a joint-expert and that a single -expert representing each litigant may be appointed to support each claim. This causes the issue of discretion relied either by construction adjudicators, experts or judges. Two is that, from the perspective of Client, the legal principle of foreseeable loss arising from the breach of contract is arguably considered unreasonable or irrelevant if the analysis of non-loss claim is limited to the litigants without considering relationships among project stakeholders. To explain this, the process of construction is always to start from the bottom to top of the building, therefore foundation work is subsequently followed by the frame, envelope, services, finishing, and tenant's works. As such, the question of delay-analysis should not be limited to whether the earlier stage of work (e.g., foundation) affects the later stage of works (e.g., finishing works) based on the critical path, float, LD or EOT methods. Rather, the question should be whether a particular delay affects the flow of income back to Client, and whether Client suffered any actual financial loss and he took reasonable endeavours to mitigate it.

### **5.3 Interest cost: to be considered or not?**

The interest cost is calculated based on the full (100%) lending, assumed interest rate at the time of assessment, and timing of payment. Three problems are here. First, the funding is typically 30% equity and 70% lending to avoid thin capitalisation and other taxation issues, and the cost to raise the capital is disregarded in the appraisal. Second, the interest rate fluctuates over the period of project without the security of long-term fixed rate available in the financial market. Third, it is not clear when the interest should start and finish. One argument is that it starts from the acquisition date when you start to pay the interest on the land, but the question remains when it should stop whether at the time of practical completion, commencement of lease, end of rent-free period when the income generates, or end of project life.

Considering the large size of interest cost against the total project cost, and also the evidence of disregarding the interest cost by some of Client when analysing the performance, it is argued that the measurement of interest cost requires more consistency and clear assumptions being stated, especially when its assessment is conducted to mitigate and resolve construction delay disputes.

## **6. CONCLUSION**

The conclusions of findings are; First, the current model is framed around the contracts and dispute resolutions based on the legal concept of "claimant and respondent" where one party(s) advances a claim once and the other(s) objects, as such it fails to reflect the nature of construction projects where multiple stakeholders are involved concurrently and for a long period of life-cycle of buildings. Second, an alternative is "six-stakeholders model" which represents the multiple stakeholders and clarifies the flow of obligation-liability-monetary relationships among participants for a long period of life-cycle of buildings. Further, with reference to both historical and recent cases, a reflection and insight into pros and cons of programming method is added, especially as to why this method is considered to have become a mandate of the modern construction management, and how academics and practitioners should deal with it more cautiously and prudently.

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