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THE UNIVERSITY OF HONG KONG

FACTORS AFFECTING DEVELOPERS' DECISIONS IN CHOOSING FORMS OF REDEVELOPMENT IN HONG KONG

A DISSERTATION SUBMITTED TO
FACULTY OF ARCHITECTURE
IN CANDIDACY FOR
THE DEGREE OF
BACHELOR OF SCIENCE IN SURVEYING

DEPARTMENT OF REAL ESTATE AND CONSTRUCTION

BY
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HONG KONG

CONTENTS

Abstract

This Study examines the factors that affect developers' decisions in choosing forms of redevelopment in Hong Kong. (i.e. "refurbishment" vs. "demolish and new build" decisions).

A total of 32 factors affecting developers' redevelopment decisions are identified from literature and these factors are categorized into five groups: economic considerations, corporate strategies, characteristics of existing building, government policy and other factors. Three case studies with three leading property developers (namely Developer A, Developer B and Developer C) in Hong Kong are carried out. Ranking of factors are established in order to analyze the relative importance of each factor. The results show that *profitability*, *compulsory statutory requirements*, *existing land use*, *increase in rental value* and *achievable lettable floorspace* are the most importance factors to be considered by the three developers.

Rank correlation analysis shows that the three developers show correlation at 5% significance level in ranking the individual factors while they show no correlation in ranking different categories of factors. From the findings in the rank correlation

analysis, it is found that all the three developers have the same perception in ranking the factors related to economic considerations. It is concluded that different categories of factors, except related to economic considerations, being considered are affected by the company size and investment strategies.

A decision process flowchart is constructed in accordance with the interviews with two senior managers in Developer A and Developer C. The decision-making process for the two developers is similar. However, the two developers show slight differences in considerations and procedures in two decision stages. The model aims at providing a clearer picture on how developers in Hong Kong make redevelopment decisions in order to improve the effectiveness of the decision process. From the constructed decision process model in the two case studies, it is observed that both developers' decision-making process in choosing forms of redevelopment follows the 'bounded' rationality model proposed by Simon (1957) as the developers are making 'good enough' decisions with limited knowledge whilst following a thorough and conscientious decision-making process.

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Last but not least, my sincere thanks to my friends, studio groupmates, floormates and family, for providing me with their continuous support and encouragement. Special thanks to Hue, a special one for me, for his care, encouragement and support.

Declaration

I declare that this dissertation represents my own work, except where due acknowledgment is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

Signed: _____

Name: _____

Date: _____

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Chapter 1

Introduction

1.1 Background

Decision-making is essential throughout the whole property development process.

In Hong Kong, a developer may provide new accommodation to the market by two ways: 1) acquiring a vacant site and developing a new property and 2) carrying out redevelopment on existing properties. However, due to the land policy in Hong Kong, land supply is artificially constrained by the Government and, thus, redevelopment of existing properties can play an important role in providing "new" accommodation in the market. In deciding which is a better way for the developer to provide new accommodation, a lot of important decisions are needed. First, the developer needs to choose among the two options for providing new accommodation. Second, if redevelopment is chosen, there are two options: 1) to refurbish the building and 2) to

demolish the existing building and build a new one. Once the demolition works start, it is difficult for the developer to recover the building to its original status and thus, it is important for the developer to take a thorough analysis before the redevelopment decision is made.

There are of course pros and cons for different redevelopment options. However, regarding the decisions made by the developers in choosing the forms of redevelopment of their existing buildings, there are not detailed developed models for reaching the decisions.

What factors are actually affecting the developers in making the "refurbishment" and "demolish and new build" decisions in Hong Kong? It is a prompting question that triggers this Study. This Study focuses on factors affecting private developers in the "refurbishment" and "demolish and new build" decisions for redevelopment projects of their existing properties.

1.2 Aim and Objectives of the Study

This dissertation aims at developing a preliminary decision model for private developers to determine "refurbishment" vs. "demolish and new build" decisions on their existing properties in Hong Kong.

The objectives of this Study are:

i. To identify the factors that affect developers' decisions in choosing forms of redevelopment in Hong Kong

ii. To determine the relative importance of the factors

iii. To develop a preliminary decision model

1.3 Methodology

The central problem of this research is to examine the factors affecting the redevelopment decisions on existing properties that developers hold, i.e. "refurbishment" vs. "demolish and new build" decisions. The methodology of the dissertation is basically carried out in two ways – literature review and case studies. Various literature are reviewed in the chapter of literature review to familiarize on the nature of property development, development control in Hong Kong as well as the factors that affect the redevelopment decisions. The choice of case studies approach is mainly because of the limited reply from respondents. In considering the small number of developers that agree to provide information for the Study, case studies can generate some in depth ideas and make results more valid. Three case studies are finally carried out, data and information are collected by formal questionnaires and follow-up telephone interviews.

Case studies are carried out to achieve the objectives. First, the identification of the factors affecting developers' choice on "refurbishment" or "demolish and new build" redevelopment decisions is adopted in various literature with modification in order to suit the property development industry in Hong Kong. 32 factors are finally identified

in the questionnaire. 9 invitation letters are sent to different developers in Hong Kong, only 3 developers (namely Developer A, Developer B and Developer C) reply and agree to provide information through questionnaires and telephone interviews. However, due to late reply from one of the developers, follow-up interviews cannot be arranged with that respondent. All the respondents of the questionnaires and telephone interviews are senior management in the companies and they are actively involved in the decision-making process in property development aspect. It is believed that they have a comprehensive knowledge in how the "refurbishment" vs. "demolish and new build" decisions are made within the companies and give more reliable and realistic results. The questionnaire is divided into 3 parts. The first part is a collection of background information of developers' involvement in redevelopment projects in Hong Kong. Developers are also asked to indicate factors, which the companies consider as the most important factors that influencing their choices on development options, whether to develop on a vacant site or to develop "new" accommodation by "refurbishment" or "demolish and new build" of their existing properties. The second part of the questionnaire consists of the factors that affect developers in Hong Kong in making the "refurbishment" or "demolish and new build" decisions. The third part concerns the decision-making processes in making the "refurbishment" vs. "demolish and new build" decisions in the company. The results of the questionnaires are used as

a support for the later chapters of dissertation.

After analyzing the questionnaire responses by developers, follow-up telephone interviews are carried out with senior managers in the developers. Two telephone interviews are conducted. The information obtained from the interviews is used to determine a preliminary decision process model for developers in Hong Kong.

1.4 Outline Approach

The dissertation is divided into 9 chapters. Chapter 1 serves as an introduction to the Study. It presents the background of the study, aim and objectives and methodology of the Study. It also describes the overall organization of the dissertation.

Chapter 2- Literature Review

Chapter 2 reviews literature relating to the definition of terms using in the Study, nature of the property development industry, decision-making theory and the factors identified from literature that affect developers' decisions in choosing forms of redevelopment.

Chapter 3 – Property Development and Development Controls in Hong Kong

Chapter 3 provides an overview of the structure and characteristics of the local property development industry to make the subsequent discussion more meaningful. It describes and details a number of areas: importance of property development and construction industry in the economy, land policy and supply and the development control systems in Hong Kong.

Chapter 4 – Research Design

Chapter 4 discusses the research design of the Study. The reasons for choosing particular methods of research are presented. This chapter forms the basis for the construction and layout of the questionnaire.

Chapter 5 – Questionnaire

The methodology used in the questionnaire is discussed. Objective 1 is achieved in the discussion of how to formulate the questionnaire contents. The layout of the questionnaire and rating of the factors are presented in this chapter.

Chapter 6 – Case Studies Findings Analysis

Quantitative studies of the data are carried out in this chapter. This chapter focuses on evaluating the relative importance of factors by ranking the indicated level of importance by the respondents, which is the objective 2.

Chapter 7 – Discussion of Case Studies Results

In this chapter, Spearman rank correlation is carried out in order to investigate correlations between the three developers in ranking the factors in the case studies. Qualitative studies of the most important factors affecting developers' decisions in forms of redevelopment in two of the case studies are also carried out. Reasons for marking the most and least important factors are presented.

Chapter 8 – Decision Model

A non-weighed preliminary decision process model of developers' choice between forms of redevelopment ("refurbishment" vs. "demolish and new build") is constructed based on the previous analysis of questionnaires and interviews with respondents in two of the case studies. The decision process model aims to illustrate the possible differences in considerations and procedures in the decision-making process in the case studies.

Chapter 9 – Conclusion

Chapter 9 summarises the analysis and findings in previous chapters, conclusions, implications, limitations and recommendations for further research are presented.

Chapter 2

Literature Review

2.1 Introduction

This chapter aims at reviewing literature relating to redevelopment decisions for private developers: either to provide "new" accommodation by "refurbishment" or "demolish and new build" of the existing properties that developer holds. It is divided into several parts. First, the nature of property development industry is studied in order to have an overview on the property development activities. Then, classical decision theories are discussed for later examination of the "refurbishment" vs. "demolish and new build" decisions. After the developer decides to take redevelopment as a means to provide "new" accommodation to the market, the means of redevelopment has to be considered. Factors affecting the "refurbishment" or "demolish and new build" decisions studied from previous researches are investigated.

2.2 Definition of Terms

The decision between the "refurbishment" and the "demolish and new build" of existing properties that developers hold is the area of property development examined, therefore, development of new properties on vacant land is beyond the scope of this study. "Refurbishment" and "demolish and new build" of existing properties play an important role in giving "new" accommodation to society in many countries, including Hong Kong, where the land supply is constrained due to the land policy in Hong Kong.

The terms, "refurbishment" and "demolish and new build", though they are terminologies commonly used in the construction industry, may mean different things to different people and, thus, the interpretation of these terms may vary. There is not a definite answer to such interpretations. For the sake of this study, it is necessary to delineate the terms and identify the differences between them.

According to Highfield (2000), generally, building refurbishment and upgrading is regarded as including maintenance, repair, restoration and extension. This approach gives a brief idea of what building refurbishment incorporates, however, it is not clear

enough.

Lee and Yuen (1993) state that maintenance is defined in BS 3811:1984 as "The combination of all technical and associated administrative actions intended to retain an item in, or restore it to, a state in which it can perform its required function". Further implications of the words "retain" and "restore" are stated as defects are prevented from developing by carrying out work in anticipation of failure and minor defects are allowed to occur before they are corrected respectively. This definition of the term "maintenance" is more specific and helps to distinguish "maintenance" from "refurbishment" in this study.

In a Guidance Note issued by British Cement Association by Gold and Martin (1999), six levels of refurbishment are defined. According to Gold and Martin (1999), the six levels of refurbishment are; minor refurbishment, services refurbishment, structural refurbishment, major refurbishment, complete refurbishment and new build. The six levels of refurbishment provide a detailed breakdown of works that can be done for an existing building structure, starting from daily maintenance to the "demolish and new build" option. Classification between levels and works is clear, however, this makes the term "refurbishment" more difficult to identify as its coverage is too broad.

Markus (1979) proposes that the overall purpose of "refurbishment" is to extend the beneficial use of an existing building by providing a cost-effective alternative to "demolish and new build". This definition of refurbishment implies that refurbishment only occurs when the building's present economic life is over, and the purpose of refurbishment is to extend the building's life.

Seeley (1987) believes that the word "refurbishment" may be used synonymously with "rehabilitation" in many texts. Quoting the RICS (1993), Seeley (1987) considers "rehabilitation" to be "aptly defined" as the:

> "*…carrying out of building work to any property, or series of properties, beyond routine maintenance, thus extending its life to provide a building or buildings which are socially desirable and economically viable.*"

The Refurbishment and Modernisation Supplement issued by Chartered Institute of Buildings (1987) defines that refurbishment is work carried out on an existing building in an attempt to improve and to update it to modern standards while retaining its current use. The British Standards Institute (1974) also provides a definition of

"rehabilitation", stating that extensive maintenance intended to bring property or building up to current acceptable conditions that usually involves improvements.

According to Mansfield (2001), the life of building can be regarded as a sequence of works – maintenance, repair, replacement, refurbishment and demolish and new build. Refurbishment is a part of this continuum, which can appear at any time when the owner is not satisfied with the performance and there is a change of needs of the occupants.

After studying some definitions of "refurbishment", problems of identification of this term rise since there is no clear demarcation between "demolish and new build", "refurbishment" and daily maintenance. Even in the statistics produced by the Census and Statistics Department, HKSAR Government, mixes up the refurbishment works, repairing works and daily maintenance works into the decoration, repair and maintenance category.

In summarising all the elements of refurbishment works, the meaning of "refurbishment" in this study can be defined as the building works carried out (e.g. upgrading and addition of building services, improvements of external façade) to any

property, or a series of properties, beyond normal maintenance and repairing but not involving major structural changes (e.g. knocking down all the structures but retaining the façade of the building), thus extending its life to provide a socially desirable and economically viable building environment to provide "new" accommodation and to satisfy the changes of needs of occupiers and increase rental incomes. It should be regarded as another way to extend the beneficial use of an existing building by providing a cost-effective alternative to "demolish and new build" redevelopment option.

"Demolish and new build", on the other hand, means the total destruction of existing building and structure, and after that, redevelopment works will be carried out to provide "new" accommodation according to the corporate business strategies or the owner's wish.

2.3 Nature of Property Development Industry

Property development is a loose term. There is a wide range of definitions of property development.

According to Berens *et al.* (2000), a development is an idea that comes to fruition when consumers, tenants, owners or occupants put in place by development team. Throughout the process, land, labour, capital and management are required to transform an idea into reality and, in consequence, value is created.

Byrne (1996) defines property development as:

> *The process by which development agencies, together or on their own, seek to secure their social and economic objectives by the improvement of land and construction or refurbishment of buildings for occupation by themselves or others.*

This gives a more specific definition of property development which includes examples of works carried out on land or to an existing building.

Property development is a complicated activity, it is a highly profitable business but risky. It requires important decisions to be made and involves many uncertainties and risks throughout the development process. It involves the consideration of a large number of variables and may present a range of alternative solutions which are not easily distinguished.

Byrne and Cadman (1996) point out that uncertainty lies at the root of the process of property development which is, essentially, concerned with the manufacture of a product in anticipation of unknown future demand. A decision of the developer about the choice of development option requires thorough considerations and, thus, a detailed decision-making process is required. A lot of information is required for the decision-maker to analyse in order to make the best decision. Byren and Cadman (1996) further suggest that it is necessary for developers to identify those uncertainties which are to some extent within their control and recognize those uncontrollable uncertainties when they are making their development decision to minimize the risks undertaken. Therefore, developers should have a rigorous decision-making process so that uncertainties and risks involved are assessed.

Property development is sometimes described as a “speculative” industry. Cadman

and Catalano (1983) state that the property market is speculative and dynamic in nature because developers are investing on the basis of an anticipated demand only, but not knowing the exact return of the development and this, results in a cyclical pattern of the property market, with cycles of over and under supply of accommodation.

Byrne and Cadman (1996) suggest that a developer cannot be sure of the market conditions at the time of the completion of a development and thus, making the development project speculative. The uncertainties involved lie within the disposal phase, for example, the rent and investment yield of a residential development.

It is commonly agreed that property development is a lengthy, time consuming, highly regulated and risky in production (Byren (1996), Cadman and Catalano (1983), Ratcliffe and Stubbs (1996), Wong (1998), Tang (1998)). It usually takes years for one new development on vacant land to be completed. It is difficult to estimate the actual flow of expenditure and income of the development. Moreover, due to the time lag between conception and completion, property development, is very vulnerable to other environment factors like changes in local economy, change in consumer's preference and interest rate which are not controllable by the developers.

2.4 Decision-making Theory

Decisions are necessary due to the dynamism of economy and society. (Fellows *et al*. 2002) Making decisions is an indivisible part of our life. It is a part of the larger process of a problem solving cycle which involves choosing among alternatives. Different decision making theories have been developed which may be categorized into different types according to their different concepts and approaches.

According to Cooke (1991), decision-making is a vital part of management. Decision-making is a part of the larger process of problem solving which includes the recognition that problems exist, the interpretation and diagnosis of the problems and the subsequent implementation of whatever solution is determined to be appropriate. Some decisions are clear, well-defined and unambiguous ('programmed decisions'). Other decisions are difficult to understand and so, may be made in an irrational manner ('unprogrammed decisions'). Cooke (1991) states that the judgment of what is a 'good' decision can be based on how the decision was made. A good decision would therefore be an outcome of a thorough and conscientious decision-making process, including different steps in a particular order of sequence. A decision may be affected by other decisions due to their inter-dependent characteristics and, at the same time,

influence other decisions.

Ungson and Braunstein (1982) propose two closely related concepts are involved in classic ideas of order in organizations. The first one is that events and activities can be ordered in chains of ends and means. Second, it is assumed that hierarchies happen in organizations, in which higher levels may command the lower levels and, through this kind of control, policies control is implemented.

In large part, the traditional theory of decision-making is dominated by the assumption of complete rationality. The classical model prescribes the ideal way in decision making and assumes the decision-maker strives for maximum yield. It assumes that people determine rationally the best course of action from among all those available to them in order to maximize their returns, and this could be referred to the "economic man" model. According to Rubinstein (1998), there are four underlying assumptions of this "economic man" model. They are as follows:

(1) Knowledge of problem - The decision maker (the economic man) has a clear picture of the choice problem he faces, that means he is fully aware of the set of alternatives from which he has to choose.

(2) Clear preferences - He has a complete ordering over the entire set of alternatives.

(3) Ability to optimize – He has the necessary skill to make whatever complicated calculations are needed to discover his optimal course of action. His ability to calculate is unlimited, and he does not make mistakes.

(4) Indifference to logically equivalent descriptions of alternatives and choice sets - Choices are invariant to logically equivalent changes of descriptions of alternatives. That is, replacing one "alternative" with another "alternative" that is "logically equivalent" does not affect the choice.

In addition, according to Leung (1992), the traditional theory on decision-making can be broken down in to a series of well-defined sequential steps. They are as follows:

(1) Perception of a Problem or an Opportunity – This involves the identification of the symptoms and then the uncovering of their causes of the problems

(2) Establishment of Objectives – The decision-maker decides what objectives or

goals he is trying to attain. This objective is very important as it guide the direction of the whole decision-making process

(3) Generation of Alternatives – Alternatives are generated which may satisfy the objectives set by the decision-maker in step 2

(4) Collection of Information about the Alternatives – All information regarding the decision should be gathers and all the unknowns involved should be clearly identified and quantified for objective comparison

(5) Evaluation and Selection of Alternatives –All the alternatives should be objectively reviewed so as to satisfy the objectives set in step 2

(6) Implementation of the Decision

However, the assumptions of an "economic man" are far from the situation in the real world and make the assumption of complete rationality not applicable in the real situation. Moreover, the feasibility to break the decision-making process down into a series of well-defined sequential steps can also be questioned.

Simon (1957) states that:

> "*the capacity of human mind for formulating and solving complex problems is very small compared with the size of the problems whose solutions required for objectively rational behavior in the real world – or even a reasonable approximation to such objective rationality.*"

Predicted rational models are rarely observable in practice due to different limitations. In actual practice, decision makers behave entirely differently than recommended by the rational model. This is due to the fact that the assumption of complete rationality is, to some extent, unrealistic and over-simplified. Complete rationality implies a complete knowledge of the exact outcome of the choice, which cannot be achieved in the real world where information is always insufficient and somewhat inaccurate. Complete rationality is also limited by the knowledge of the decision-maker. Uncertainty and risk also exist to make the choice more difficult and the result more difficult to predict. Mistakes will be made as a result of the assumption of complete rationality. Moreover, in traditional decision-making theory, focus is on examination of sets of rules that people should follow, instead of how decisions are actually made,

and this results in difficulties in fitting the model to the real world.

Because of the dissatisfaction with the traditional theory, alternative decision models have been developed. Simon (1957) proposes a new model which is the most representing work on how to model within bounded rationality. For Simon, "management" is equivalent to "decision-making" and his work focuses on how decisions are really made and how they might be made in a more effective way. Contrast to the "economic man model", Simon proposes an "administrative man" model. While "economic man" maximizes, that means selecting the best course from all alternatives available, "administrative man" 'satisfices', that means looking for a course of action that is satisfactory or 'good enough'.

Simon (1976) defines "satisficing" as:

> "*to denote problem solving and decision making that sets an aspiration level, searches until an alternative is found that is satisfactory by the aspiration level criterion, and selects that alternative.*"

He further proposes that most decision makers are concerned with the discovery and

the selection of satisfactory alternatives, only in exceptional cases are they concerned with the discovery and selection of optimal alternatives which are used to satisfy their own wishes, but not optimizing. He gives an example of the needle in haystack. Two research processes are possible, one who looks for the sharpest needle is the maximizing process, while the second one who only looks for a needle that is sharp enough to sew is "satisficing". The ideas of Simon provide a simple rule of thumb for decision makers to make decisions in a world which is full of uncertainties that "bound" (limit) the ability of decision makers to make decisions. This would make the world much simpler.

Simon also describes three stages involved in the overall process of decision-making: finding occasions calling for a decision; inventing, developing and analyzing possible courses of action; selecting a particular course of action from those available. Each stage of process can be a complex decision-making process itself. He makes a distinction between two polar types of decisions: programmed and non-programmed decisions. Decisions are programmed to the extent that they are repetitive and routine or a definite procedure has been worked out to deal with them. Decisions are unprogrammed to the extent they are new, unstructured or where there is no cut-and-dried method for handling the problem. The distinction between programmed

and unprogrammed decisions is important because different decisions require different handling techniques. The traditional techniques of programmed decision making are habit, including knowledge and skills, clerical routines and standard operating procedures, and also the organization's structure and culture. For the unprogrammed decisions, there is much reliance on the selection and training of executives to handle the new situation.

Since the Second World War, Simon (1976) proposes modern techniques of decision-making to dealing with the two kinds of decisions. The application of mathematical analysis, operational research, electronic data processing, information technology and computer simulation are used for programmed decisions whereas heuristic problem-solving techniques can be applied in training human decision makers and constructing heuristic computer programs. Simon's ideas on decision making under "bounded" rationality have formed a foundation for other researches in the same area and many researchers share his view and develop decision theory based on his ideas.

March *et al.* (1972) tries to further elaborate the "bounded" rationality model developed by Simon. March, together with Cohen and Olsen, proposes a 'garbage

can' model of organizational choice, which is famed for its name and also for what it postulates. The unclear and inconsistent goals and highly variable member participation in organizations makes the 'garbage can' model very useful in providing a range of solutions that suits different circumstances. The garbage can model describes how decisions can be made from a garbage can into which various kinds of problems and solutions are dumped by participants as they are generated. This model gives a decision that is an outcome of the interplay between problems, solutions, participants and choices, all of which arrive relatively independently one of another. And this suits the complexity of the real world.

The 'political model' proposed by Cyert and March (1963) regards decision-making as a political process in which negotiation takes a central role. The predominant assumption is that the players in the process have divergent and sometimes contrasting goals. There is an assumption that is power that determines whose interests, among those competing in the organization, prevails. Therefore, conflicts of interest among different parties to the group, bargaining, power struggle, and influencing attempts commonly happen in the group decision-making process. There is criticism that in the 'political model', optimal solution is not emphasised, but to further one's self-interest and expand one's power. As a result, the decision outcome

may not be acceptable to other parties in the group and may lead to disastrous result.

According to Poole and Baldwin (1996), group decision making is a theory of social interaction. Because of the difference in attitudes, beliefs, values, preferences, judgments, objectives, influence, membership, participation, input and confrontational tolerance, decision making by groups could be very complex and gives rise to many conflicts. Leung (1992) proposes that cultural differences exert a significant influence on the process of group decision making in organizations. The individualism and collectivism cultures between the west and the south-east Asia certainly affect the process of group decision making. Leung (1992) quotes that result of several studies showing that managers in south-east Asia are more directive, also, less information and objectives are being shared between managers and their subordinates and as a result, subordinates are only involved after decisions are made. Therefore, the group which participates in the decision-making process is small, excluding most of the employees in the organization.

Cultural differences, besides affecting the group decision-making process, also exert a significant influence on decision-making of individual in organizations. According to research quoted by Leung (1992), cultures in west is 'problem solving' cultures while

the culture in south-Asian can be classified as 'situation-accepting'. Difference in cultures results in different attitudes of decision-maker in decision-making process, in both rational and bounded rationality models. Research result by Tse *et al*. (1988) quoted found out that managers in the east are less attempt to control the environment, collecting information for decision-making process and generate alternatives.

According to French (2001), decision theory literature contrasts two types of decision models, namely descriptive and normative. The principal distinction is that normative models concentrates on 'how decisions should be made', whereas 'descriptive models' look at 'how decisions are actually made'. The distinction between the models is due to the differences in behavior of decision-makers when they make decisions in theory and in reality.

To sum up, there are three types of decision models (French, 2001):

1. Descriptive models - purport to describe how we do decide.
2. Normative models - suggest how we should decide.
3. Prescriptive models - use normative models to guide the decision-maker within other limiting cognitive parameters.

Prescriptive modeling is introduced in the last twenty years. Before the introduction of prescriptive modeling, Philips (1984) tries to argue that a requisite decision model, which is an amended model, can help to address the gap between the normative and the descriptive model. A requisite model, in simple terms, is a model that works whilst not necessarily being perfect. French (2001) suggests that the requisite model can be seen as the development upon the normative model. French (2001) states that a prescriptive model can be regarded as the application of normative ideas within the context of the findings of descriptive decision studies that lead the decision maker to "good" decision rule.

Unknowns are usually involved in making a decision which can be categorized as risks and uncertainties. Fellows and Langford (1980) define risk as an unknown which the probability of the occurrence can be assessed by statistical means. Uncertainty, on the other hand, is an unknown which cannot be assessed objectively. Subjective assessment of probability of uncertainty can be made upon knowledge accumulated of past events; however, there are possibilities to have different assessment towards the same item due to bias or different experience the assessor has. Areas of uncertainty may progressively transfer to areas of risk as the when of statistical data and

knowledge of data increases. Risk and uncertainty analysis can help decision-maker to optimize and to improve the quality of the decisions and to.

Clemen and Reily (2001) state that, a set of decision techniques, for example, decision trees, can help in identifying important sources of uncertainty and represent that uncertainty in a systematic and useful way. A framework and specific tools for dealing with multiple objectives are provided. A "better" decision would be made based on the framework and tools.

Five steps for decision-analysis process are identified as follows:

1. Identify the decision situation and to understand objectives in that situation
2. Discovery and creation of alternatives
3. Decompose and model the problems
4. Outcome evaluation
5. Sensitivity analysis

Different types of model can provide a structured, but no necessarily over-simplified, representation of a problem and of the process of decision-making required for its

solution. Cooke (1991) suggests that there are five better-known classes of decision models:

(1) Linear programming models – It treats the class of decision where resources have to be allocated to different activities. Rules ("constraints") are there to govern the feasibility of an allocation.

(2) Queuing model – It generally used to predict the behaviours of queuing systems, so that behaviour and costs can be combined to evaluate alternative arrangements.

(3) Competitive model – It concerns the nature of the uncontrollable input variables by the competitors. It is used to optimize the 'value' of the decision, while minimizing the expected losses or maximizing the expected gains.

(4) Heuristic model – It derives a good sub-optimal solutions, i.e., to adopt a satisficing approach.

(5) Simulation model – It relies on a statement of procedures which underlies the logical relationships between variables.

2.5 Factors Affecting Developer's Decisions in Choosing Forms of Redevelopment of Existing Properties

Gunnelin (2001) points out that the use of a property is not given once and for all. It means that any property can be redeveloped and converted to another type of property at a suitable time, either by changing the use of that particular existing property, or demolishing it and building a new one to suit the new anticipated demand.

When a developer needs to make such a decision, his decision may subject to many influences. Walker (2002) points out that in an early stage of the decision-making process, influences can be categorized into six parts including the political, legal, economic, institutional, sociological and technical influences. Such influences would determine the initial decision. Since the decision of whether to "refurbish" or "demolish and build a new building" of an existing building that developer holds is in an early stage of the overall redevelopment process, those factors that can affect the choice by the developer can vary the decision a lot and, thus, play an important role in determining the final decision of the developer.

Kwakye (1994) suggests that because of technological progress, political and

economic forces, changes in land values, changes in the needs of society and ravages of time are forces to make buildings generally become obsolete before the end of their economic and physical life. As a result, buildings are either demolished or refurbished. However, there is a trend that refurbishment becomes more popular for buildings erected within the last 30 to 50 years. Kwakye (1994) further suggests since there are rapid changes in land values and need to achieve the land's optimum use that curtail the economic life of sound buildings which are capable of serving a useful purpose, developers respond to these demands by two ways, either by refurbishment during buildings' useful life, or by demolition in preparation for a new development on the site.

Ratcliffe (1993) points out that a growing pressure to protect and manage existing building stocks rather than always demolish and construct a new over the past 15 years. He is almost certain that Hong Kong will follow this trend.

Gold and Martin (1999) state that 8 million metre square of office space requires refurbishment in United Kingdom instead of demolishing them and constructing new buildings. Those buildings have potential to provide up- to-standard accommodation if refurbished in the correct manner.

Highfield (2000) states that the "refurbishment" option has become more important in the property development industry in recent years in the United Kingdom. He points out that building owners and developers have, in recent years, come to realize the potential value of the vast stock of old, redundant and obsolete buildings as a means of providing, through the refurbishment and re-use of the existing buildings, high quality and modern accommodation in the United Kingdom. Retaining and refurbishing the existing properties is in preference to demolish and build a new one to suit the new demand. There are a lot of factors which underpin the decision of the developers.

Highfield (2000) gives four factors that contribute to the rise in "refurbishment" option for developers in recent years. First, through refurbishment, the time required to provide "new" accommodation is only half to three-quarters of the time needed for the "demolish and new build" option, and the cost of refurbishment is only 50-80% of the cost for having a new building, resulting in considerable financial benefits to the developers. Ratcliffe (1993) also points out that a comprehensive refurbishment can be undertaken at a cost around 20-25 percent lower than new development, and this gives a more economical way to developers to provide "new" accommodation using a

shorter period of construction time. The shorter development time of the "refurbishment" option gives further financial benefits, including reduction of the effect of inflation on building costs, reduction of cost of financing the whole development project and an earlier start of gaining revenue. The reason why the "refurbishment" option gives lower costs of development than "demolish and new build" is that many of the building elements are already constructed and no extra cost is required to demolish the existing buildings and site clearance works. Second, government policy also encourages the "refurbishment" option. The government environment policy on housing in the United Kingdom prescribes that over 50% of new development should be developed from the "refurbishment" option. Moreover, the UK Government also seeks to encourage developers to choose the "refurbishment" option by exempting building refurbishment from Value Added Tax (VAT) for schemes involving the conversion of commercial premises to housing to meet the new demand in city centres. Third, the change in attitudes on environmental issues is a factor that could affect a developer's choice. Recycling of materials and products is more environmentally friendly, that means that recycling buildings through refurbishment could be a good means to save raw materials, in contrast to the demolish and new build option. Fourth, the planning and zoning requirements affect the choices of developers. For changing the use of existing buildings, planning

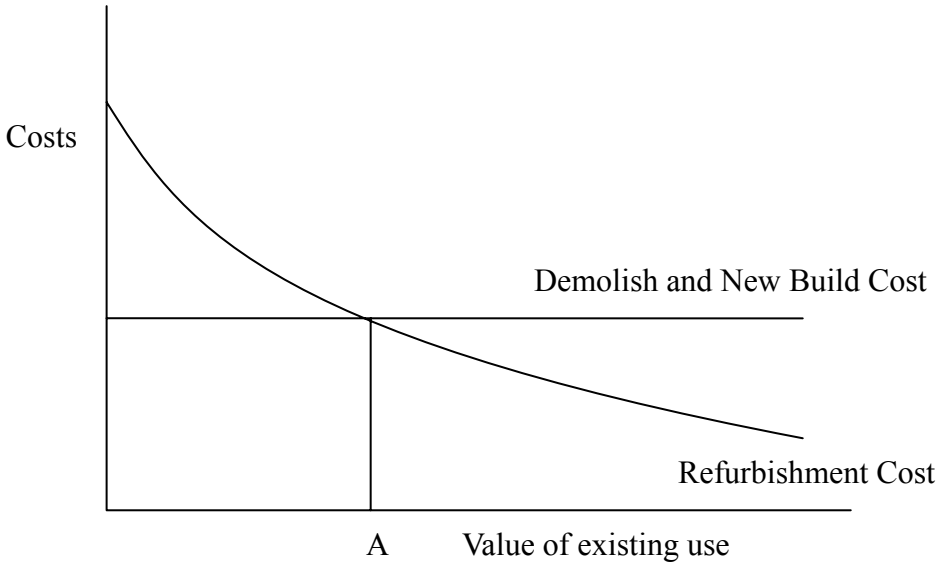
permission may not be required. Also, the plot ratio control on existing buildings would be less restraint due to tighter planning requirement nowadays, for example, the plot ratio in urban areas is reduced by the government so as to lower the population density in order to provide a better living environment. As a result, the developer can make more money in the "refurbishment" option than the "demolish and new build" option.

Summarizing the points made by Highfield (2002), the factors that affect why refurbishment is selected in preference to "demolish and new build" are mainly due to economic considerations; other factors include the government's policies encouragement and environmental considerations.

Pugh (1991) analyzes the decision of "refurbishment" and "demolish and new build" with reference to the mathematical models developed by Needleman (1965), Schaaf (1969) and Sigsworth and Walkinson (1967). In the model, the factors that affect the decision between "refurbishment" and "demolish and new build" include the cost of refurbishment, cost of demolish and new build, annual savings in maintenance after demolishing the existing structures and build a new one, the interest rate, the life expectancy of refurbishment buildings and capital value of the building before

refurbishment. Pugh (1991) identifies that rental values can be increase by over 60 percent for refurbished buildings and sometimes attaining levels at 80 percent of those in new buildings. Lower risk in volatile and fluctuating property markets in refurbishment option is also important in making the decision.

Based on the mathematical models proposed by Needleman (1965), Schaaf (1969) and Sigsworth and Walkinson (1967), Pugh (1991) illustrates when the decision of "refurbishment" and "demolish and new build" should be made in term of graph.



Source: Pugh, C. (1991). The Cost and Benefits or Rehabilitation and Refurbishment, Property Management, (9)2

According to Pugh (1991), the above figure indicates the economic considerations and identifies the range in which the "refurbishment" and "demolish and new build" option becoming competitive to decision makers. From the above figure, it is assumed

that the costs for "demolish and new build" is quite standard with reference to the existing property value, but the costs for "refurbishment" do related to the value of building in existing use. Therefore, there are shifts in favour of "refurbishment" and "demolish and new build" with buildings of different values of existing use. From economic perspective, the value of existing use of the building gives a significant impact on the redevelopment decision.

Kwakye (1994) expresses that it is essential to compare the cost of "refurbishment" and the cost of "demolish and new build" if economic constraints rather than other social factors are being considered. Kwakye (1994) also identifies two basic considerations which should be examined to give the "refurbishment" and "demolish and new build" decision, they are the existing land value and use, and the 'highest and best use concept' of land. There are also two groups of factors, named the social factors and the economic factors which favoring the "refurbishment" option instead of the "demolish and new build" option.

Gold and Martin (1999) quote results from a survey by RICS Refurbishment in the office sector 1997/1998, stating that one of the primary reasons for "refurbishment" option instead of "demolish and new build" is to attract new tenants or retain existing

tenants and to increase the yield from the property. The "refurbishment" mentioned mainly involves major and complete refurbishment to meet the changing demand for property in the country.

Ball (2002) points out there are three agents that affect the choice of redevelopment options of developers, including the overall situation of the local economy, the characteristics of the existing property and the attitudes, approaches and involvement in the property development industry. The situation of the local economy affects the vacancy rate of different properties and, thus, could affect the development options. The characteristics of the existing property, including the age, condition, size and location could underpin the choice of development options. The activities of actors and agents in the same arena would also affect the developer's decisions. Other than these three factors, he further suggests that physical planning controls and local policies might also be important. Because of the change in physical planning controls and local policies, the development potential of the site would be less than before. For example, the plot ratio reduction on a particular piece of land can not affect the buildings that already existed, but will subsequently affect the later development on the site.

Each type of decision is taken on the basis of certain criteria and in the light of the firms' objectives. Therefore, the decision of "refurbishment" or "demolish and new build" should follow the firm's objectives. First, it is well-recognized that the prime objective of private organizations is to maximize the shareholder's wealth and profit. There are different types of property developer in Hong Kong. For private property developers, their prime objective is clear. They are all here to make profits. Cadman (1995) suggests that the prime objective of private property companies is to direct profit from the process of development and bring raw materials together and process them into a product to be sold in market place. Therefore, property development by private property developers can be regarded as an investment activity, which represents certain sacrifices for uncertain benefits.

Growth of the firm is another important factor affecting the choice of investment options. Baumol (1967) points out that after the equilibrium of maximizing profit is achieved in the firm, there should be another consideration of company's executives, which is to expand the business. According to Baumol (1967), it is easy to find out that the preoccupation of top management in a company is the growth of the firm. Growth of the firms may include the expansion of size of market share in the industry that the company achieves. A business enterprise reports about the size of market

share it has attained is a good proof of the development potential of that company in the field. The same could be applied to property developers in Hong Kong; a choice of redevelopment option would be evaluated based on how that decision could affect the growth of market share in the industry.

Flexibility of decision on development options is also important. While the "refurbishment" option can reserve another path for the developer to change the development decision at any time he wants, the option of "demolish and new build" could not give the same degree of flexibility. The time available for the developer to change his mind is very short, only available until the demolition starts. Once the demolition works are underway, it is hard to return the building to the original conditions.

According to Kwakye (1991), "refurbishment" may be undertaken for a substantial modernization of buildings with the aim of improving the corporate image of the occupying organization. In other words, increasing or maintaining the reputation of the firm in the market may affect the investment decision for business enterprises in Hong Kong. It is no doubt that gaining reputation would help the firm to expand its market share in the industry and also help to maximize the profit. The attitude of

looking for brand name goods is also applicable to the property development industry. Therefore, when a developer needs to choose a redevelopment option, he may also consider how that decision would affect the overall image of the company or how that decision could probably help to increase the reputation of the company.

The development cycle of a property also affects the choice of redevelopment option according to the age and the quality of the property. Evans (1985) suggests an economic model determining the time that the "refurbishment" option should stop and when "demolish and new build" option should be carried out on the existing building. He suggests that when the new present values of the rental income generated from the property is less than the cost of redevelopment, the property should stop refurbishment and start to re-develop the site, i.e. "demolish and new build".

The previous discussion of factors that affecting developers' choice are mainly about economic considerations. Due to the fact that the "refurbishment" option can maximize the profit of the developers by various means, including reducing a lot of risks and giving extra development potential of the site than the "demolish and new build" option, the "refurbishment" option prevails.

However, the factors discussed above may not apply to the case in Hong Kong due to the differences in cultures, legislation and government policy, therefore, adjustments to these factors may be needed in the case of Hong Kong property development industry.

2.6 Conclusion

Property development decision is a complicated decision that involves many considerations. Before further investigate on factors affecting the "refurbishment" and "demolish and new build" redevelopment decisions in private developers in Hong Kong, different literature on various aspects about nature of property development, factors affecting developers' choice on forms of development of existing buildings etc. are reviewed to form a basis of later analysis.

From the previous literature and theories, it can be concluded that economic considerations, such as the profitability and the development potential of the project, underpin developers' decisions in choosing forms of redevelopment of their existing properties. As property development is an important investment activity of developers and redevelopment on existing buildings has become a trend, it is necessary to identify the factors influencing the choice between the "refurbishment" or "demolish and new build" options for developers in Hong Kong.

However, there seems no previous attempt to quantify the factors in terms of level of importance in the decision, which is an important aspect that underpins a decision

made by developer. Hence, three case studies are carried out with three leading developers in Hong Kong, which aim to get a better understanding on the decision-making process and quantify how those factors affect their decisions. Moreover, due to the lack of current decision model for property development, this dissertation targets this niche and attempts to develop a preliminary decision model on the property redevelopment of existing buildings for developers in Hong Kong.

Chapter 3

The Property Development Industry and Development Control in Hong Kong

3.1 Property Development Industry in Hong Kong

3.1.1 Introduction

The property development and construction industry is a vital part of any developed economy. Property development has played an important role in coping with the rapid economic growth and increasing social needs in Hong Kong. It provides and continually improves the built environment to accommodate for different types of activities.

The property development in Hong Kong is usually divided into two parts, namely, public development and private development. Public property development includes

the housing development by Government's authorities such as the Housing Authority and the Architectural Services Department. Private property development refers to projects undertaken by private property developers in Hong Kong.

3.1.2 Property Development and Construction's Place in the Economy

Property development, as a part of the construction industry, is a cornerstone of the overall Hong Kong economy. Walker (1990) states that the prosperity and stability of Hong Kong depends upon many factors but underpinning them all are satisfaction of social needs and maintenance of a profitable business community. The Hong Kong success could be attributed to property development in Hong Kong, since every person and every business in Hong Kong requires accommodation for a variety of purposes. Since 1990, the construction industry's contribution to GDP in percentage terms has been in the range of 4.9% to 5.5%, showing the importance of construction industry to Hong Kong's economy. Therefore, there is a close relationship between the overall Hong Kong economy and the construction industry.

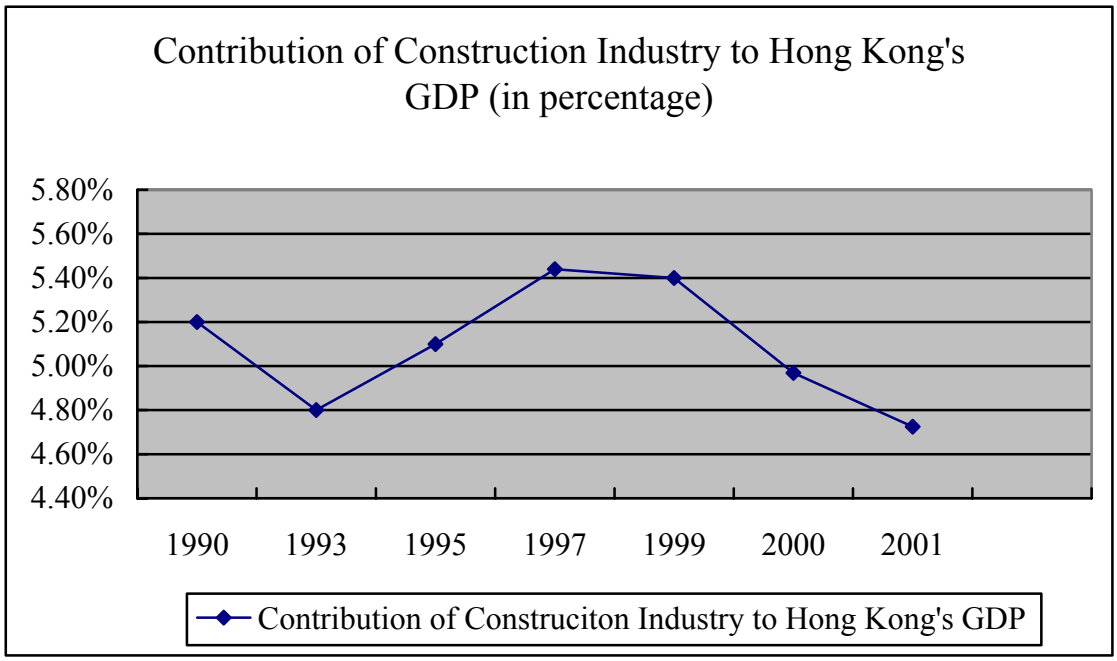


Figure 1 Contribution of Construction Industry to Hong Kong's GDP in Percentage

Source: Census and Statistics Department, HKSAR

Although property output is not as high compared to the time before Asian Financial Crisis, the property development industry remains an essential part of the Hong Kong economy. The reasons why property development industry is still a major part of concern by the HKSAR Government and the Hong Kong public can be categorized into three different aspects, namely social, political and economic.

The gross value of construction work[1] performed by main contractors at construction

[1] For statistical purpose, the construction works include new engineering and building projects, maintenance and renovation works as well as decoration works unless otherwise stated.

sites increased from HK$ 99.8 billion to $240 billion between 1990 and 1998. In year 1999, there was a 5.8 % drop to $226 billion, revealing the impact of economic downturn in the Asian Pacific region and the completion of major civil engineering projects. Although until 2002, the gross value of construction is still decreasing, construction industry still plays an important role in the Hong Kong Economy.

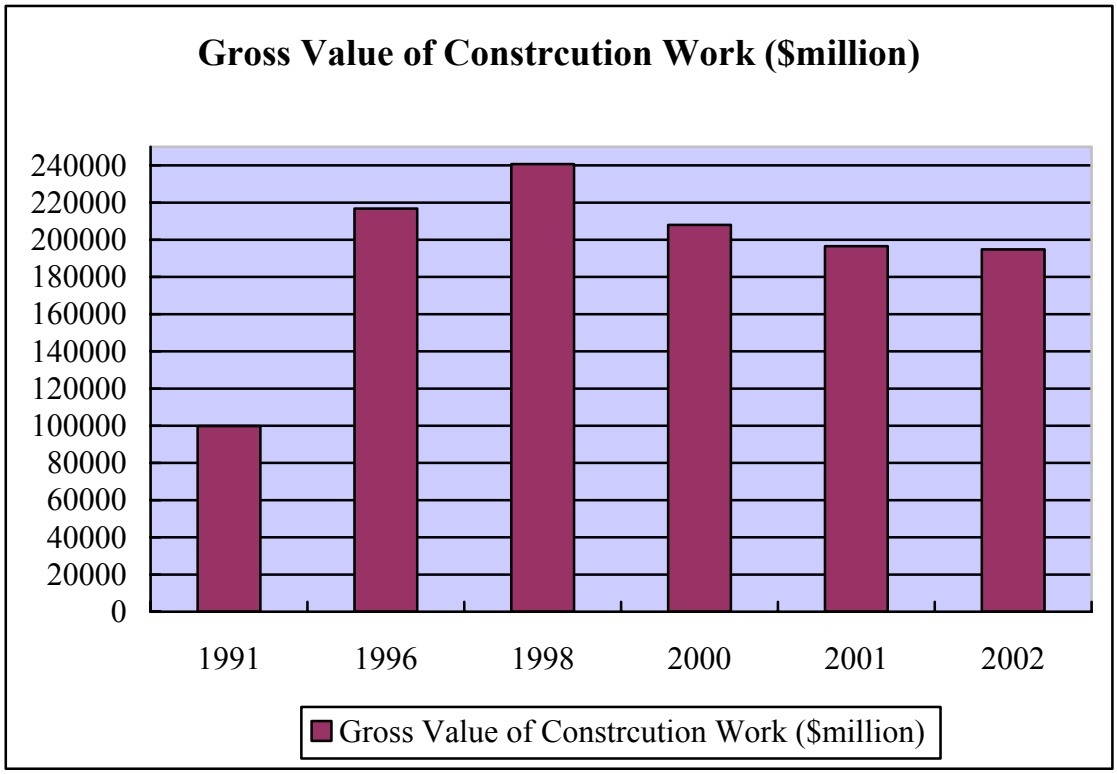


Figure 2 Gross Value of Construction Works in millions (1991-2002)

Sources: Annual Survey of Building, Construction and Real Estate Sectors (1990-2002), Census and Statistics Department, HKSAR

The value of refurbishment works can be regarded as an important contributor in the gross value of construction works. According to the results of the 2002 Annual Surveying of Building, Construction and Real Estate Sectors released by the Census and Statistics Department, the proportion of decoration, repair and maintenance works in the gross value of construction works performed increases from 11% in the year 1990 to 12.4% in the year 2002, showing that not only new construction works and property developments are important to the economy. Refurbishment works, according to the Industrial Classification issued by the Census and Statistics Department, are included in this category, implying that refurbishment works are actually very active in Hong Kong.

In Hong Kong, a high percentage of buildings is aged 30 years or above. According to the statistics issued by the Rating and Valuation Department, HKSAR, there are more than 30% of the existing building stocks which are built before the year 1975. Most of these buildings are situated in the urban areas, where the redevelopment potential is high. Given the high development value of these urban areas and difficulties in acquiring new sites for the developers, it is expected that redevelopment in urban areas will become a trend in the long-term.

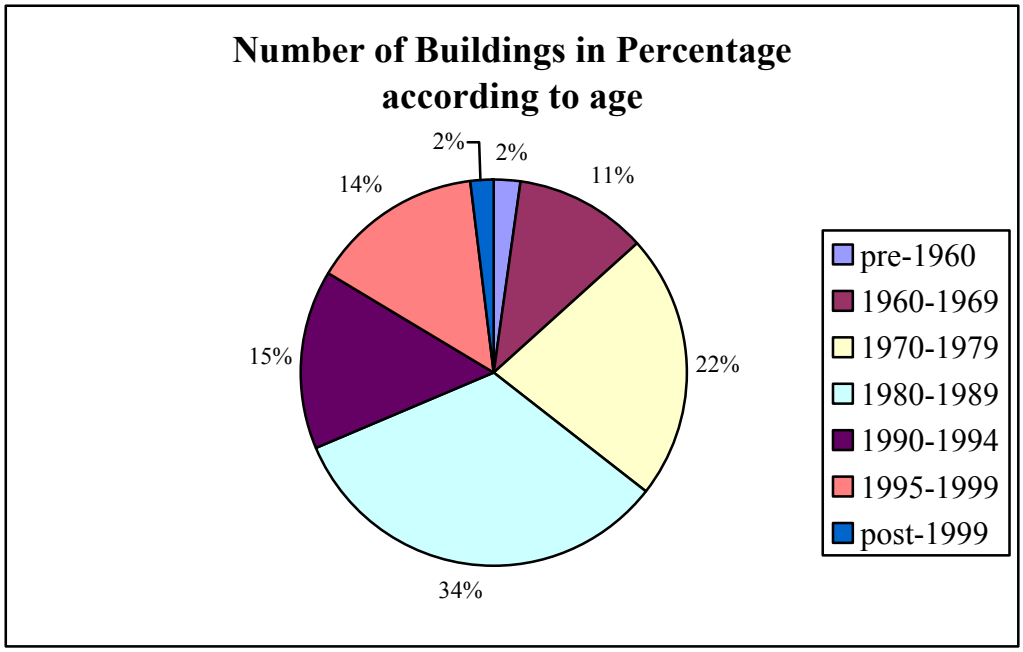


Figure 3 Number of Buildings in Percentage according to Age of Building

Sources: Rating and Valuation Department, HKSAR

Besides the direct contribution to the overall economy, property development provides a lot of job opportunities for the construction sector, including site workers, architects, surveyors, engineers etc. Without development, many workers and professionals would become unemployed. Continuous insufficient development would lead to serious social problems due to unemployment. In the year 2002, about 290,000 persons worked in construction industry, which constituted about 10% of the total workforce population. This proportion does not include the workforce in business and financial sectors that actually have a close working relation with the property market.

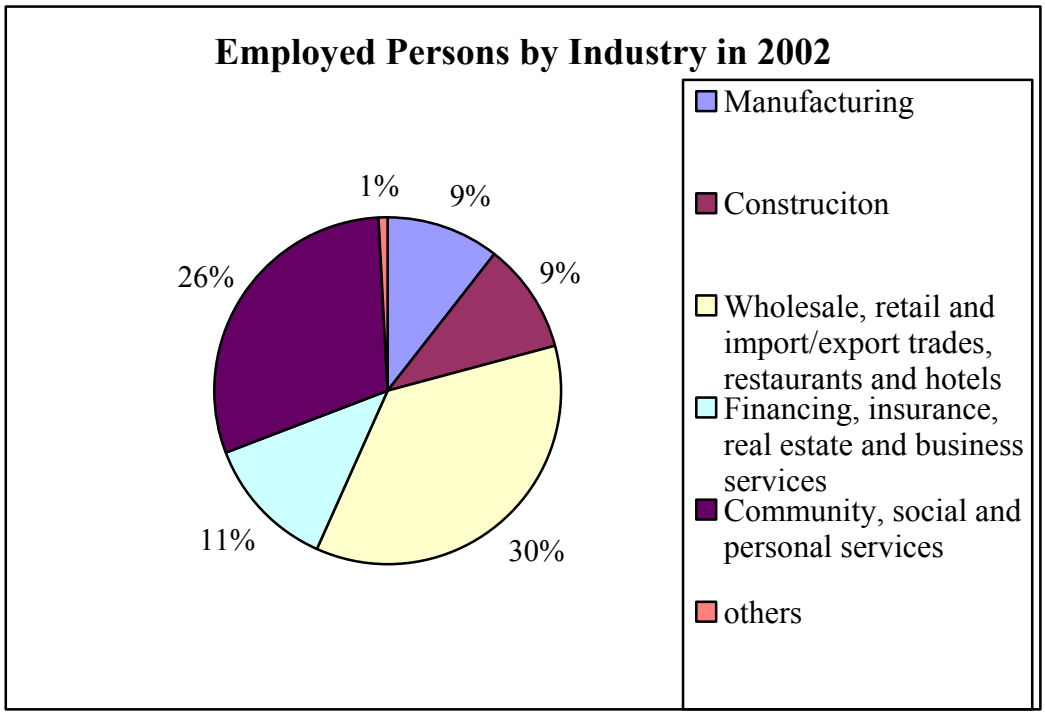


Figure 4 Employed Persons by Construction Industry in 2001

Source: Census and Statistics Department

Other than the economic sectors, the property market has a close relationship with the financial market in Hong Kong. This can be illustrated by examining the levels of loans and advances offered by the banking sector for property development.

3.1.3 Ways of Financing Property Development in Hong Kong

According to Tang (1998), basically, there are two types of financing for property development, they are debt financing and equity financing. Debt financing refers to developer's borrowing of money and credits from lenders in exchange for an obligation to repay at agreed dates later. In Hong Kong, the banking sector is the key source of debt finance to support property development for private developers. Property development contributes a lot to commercial bank loans, in local use bank loans, loans for property development and related uses constitute 21%. This figure also implies that property development is heavily financed by funding from banks; therefore, the rate of interest and the project duration significantly affect the cost of finance to the development project.

Moreover, banks in Hong Kong can normally provide finance up to 50% of the land costs and 100% construction costs for construction loans. Construction lending is actually a very risky lending business since the banks do not receive any cash inflows during the whole construction stage in normal circumstances. Hence, the banks will consider carefully the financial viability of projects and developer's capability to finish the project.

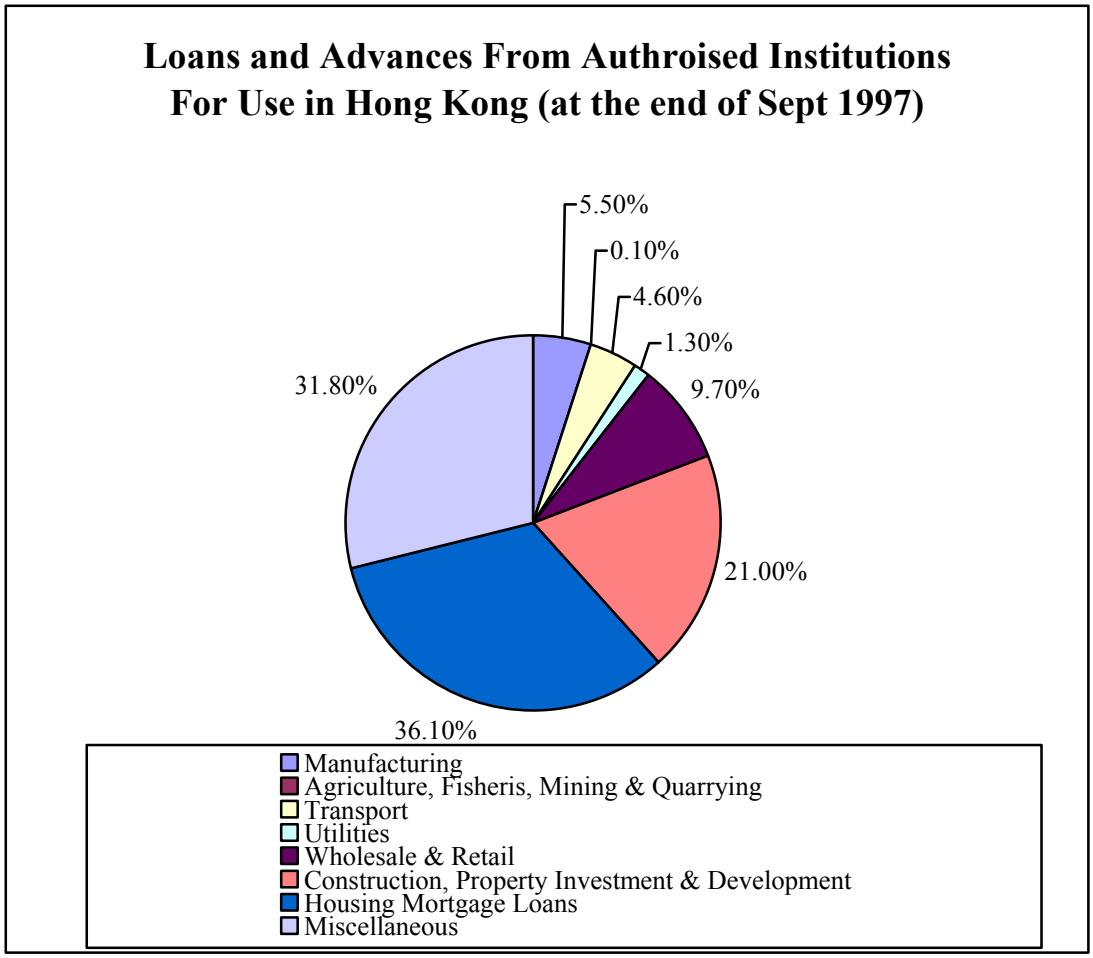


Figure 5 Loans and Advances from Authorised Institutions for Use in Hong Kong (at the end of Sept 1997)

Sources: Hong Kong Monetary Authority

Equity financing refers to capital injection into real estate projects. Public listing is one common method to raise equity capital. The market capitalization of property developers in the stock market has shown that private developers also depend a lot on equity funding from the public.

3.1.4 Land Policy and Supply in Hong Kong

Land is a key input in property development. Without land, there will be no property development. However, land supply is often regarded as a scarce resource in Hong Kong. According to Tang (1998), developed flat land consists only a small portion of the territory and it is usually located in densely populated area in urban districts.

All the land in Hong Kong belongs to the Hong Kong Special Administrative Region Government under the leasehold system practices in the HKSAR, except the land held by St. John's Cathedral, which was leased under a freehold system. The leasehold grant of land, starting from the time of colonial governance, can be regarded as a device of control. While the HKSAR Government retains the freehold title, the land is granted to the private sector by way of leasehold. Under the system of public auction and tender, normally the highest bidder would win the bid. In addition to the public auction programme, there is a "Reserve List" of sites which can be brought to the market if interested parties apply. The Lands Department of the HKSAR Government is the authority responsible for the matters concerning the sales of land. Moreover, the HKSAR Government has the power to determine whether or not to stop the supply of land through public auctions due to the market behavior. Therefore, one can say that

the land supply in the HKSAR is artificially limited by the government through the leasehold system. The artificial limited supply of land in Hong Kong is one of the reasons the land price of the HKSAR is higher than that of its counterparts. The leasehold system thus has an important effect on the property development industry due to the high land price as a result of a limited supply of land.

Due to the high land price, fast construction speed is of prime importance for developers in Hong Kong in the property development industry. Wong (1991) points out that the emphasis on the duration of design and construction is so high that it even outweighs the factor of quality. He gives an example about how high land price in Hong Kong affects significantly the emphasis on time. A particular site in Wanchai for an office building was acquired at government auction in 1989 at a price of HK$ 5 million per square metre site area. The interest on land price was so high that it was about HK$ 0.918 million per day in the year 1991.

Nissim (1998) states that due to the lack of natural flat land in Hong Kong, land reclamations have been a consequential feature of Hong Kong's development right from the outset. In total approximately 6,000 hectares of land have been added to the original land areas of Hong Kong, Kowloon and New Territories. The amount of land

obtained from reclamation has dramatically increased between the year 1976 and 1996. Most of the new towns were developed on reclaimed land, for example, Ma On Shan and Tung Chung. Generally, reclaimed land can have a better development because of the advancement of planning, design and infrastructure system. Therefore, through reclamations, the HKSAR Government could sell the land for higher price and thus providing the developers in the HKSAR with wider choices of sites for them to develop.

The change in land needs is inter-related to the change in property development in Hong Kong and thus, in order to suit the shift of demand of a particular type of land and properties, developers will follow the trend to provide accommodation accordingly. In the 1960s, manufacturing industry was the key economic sector in Hong Kong. Factories were built in order to meet the demand. Subsequently, the Hong Kong economy changed from an industrial based economy to a service economy, where business and commerce sectors become prevailing industries in Hong Kong nowadays, therefore, the demand for office buildings, shopping centres and hotels has increased and the demand for factories declined. Some buildings may become redundant and obsolete, but these buildings can still give a new lease of life if a proper redevelopment option is chosen. Therefore, developers can still generate

income from the obsolete properties if a proper redevelopment decision is made.

3.1.5 Conclusion

Property development plays a significant role in social, economical and financial environment in Hong Kong. It contributes a lot to the overall development in Hong Kong. However, though property development is very important to the economy of Hong Kong, there are a lot of constraints and controls in regulating the industry. The limited land supply for property development is one example. Other constraints and controls concerning property development are discussed as follows.

3.2 Development Control in Hong Kong

Development control is important because it seeks to ensure adequate safeguards of public interest and to promote common wealth. It can also cause substantial influence to the development potential of private development. In Hong Kong, the development control is generally exercised by the Government through three different means; namely the Conditions in land lease, the Buildings Ordinance and allied legislation and the Town Planning Ordinance.

3.2.1 Lease Control

The HKSAR Government exercises development control by stipulating restrictions and conditions in the lease documents. Generally, important things that determine the future development potential of that particular piece of land, like the site area, amount of premium, design, height and elevation, plot ratio and site coverage, are stated clearly. If any modification is required, lease modification to the Lands Department is essential. Breaches of the lease conditions would initiate lease enforcement actions including re-entry. A lease is a contract and, therefore, is enforceable under laws of contract. This is the major difference between the control through lease and the

control based on the Buildings Ordinance and the Town Planning Ordinance.

3.2.2 Buildings Ordinance

The Buildings Ordinance regulates development through control of building development. The Buildings Ordinance regulates all the private buildings in Hong Kong, both new and existing ones. The Buildings Ordinance provides a framework within which the following aspects are regulated, planning in terms of control on plot ratio, site coverage, open space; the design in terms of provision of lighting and ventilation; construction in terms of loading requirements, structural use of materials etc.; associated works; safety; and dangerous buildings.

3.2.3 Town Planning Ordinance

The Town Planning Ordinance provides guidance as to development control on planning aspects. The Town Planning Board is appointed under s. 2(1) of the Planning Ordinance to exercise the major responsibilities and duties conferred. Town planning in Hong Kong is exercised at three different levels in hierarchical structural; the three levels are the Territorial Level, the Sub-regional Level and the Local Level.

According to Lai (2000), the Town Planning Board can prepare statutory town plans, namely the Development Permission Area Plans and Outline Zoning Plans, for the whole territory. Under the Outline Zoning Plan (OZP), different areas are designated for different purposes of land use. For example, if the OZP designated an area X for industrial use only, a developer cannot change the land use to commercial without prior planning permission by the Town Planning Board. Planning controls or zoning regulations thus limit the way in which pieces of land can be used. The result of zoning is that developers need to apply for planning permission for a change of use in land if a particular development is not allowed at the beginning, i.e. rezoning. The Town Planning Board has the authority to examine and consider the application, and has the right to reject the planning application. Therefore, before a developer starts to develop the land according to the terms and conditions set in the contract (the lease) between the Government and satisfying the requirements stated by the Buildings Ordinance, he should also check the relevant statutory town plan to find out if his development would contravenes that set in the plan.

3.2.4 Conclusion

Property development always requires prior approvals from different public authorities. The key motive for private development is to derive profit and to follow the market force. It is difficult to remove the property once it has completed and it stays for a long time, therefore, development control is necessary to achieve certain social, political or economic objectives to strike a balance between public interest and private economic activities.

Chapter 4

Research Design

4.1 Introduction

In this chapter, the research design of the Study is discussed. The reasons for choosing the particular type of research methods are presented. This chapter forms the basis on the construction and layout of the questionnaire, the interview contents and the results, which are discussed later.

4.2 Types of Research Methods

There are various approaches for research study. According to Yin (1994), there are five major research approaches: 1) Experiments; 2) Surveys; 3) Archival analysis; 4) Histories; and 5) Case Studies.

These and other choices represent different strategies. Different approaches are different in ways of collecting and analyzing empirical data. Actually, even though each strategy has its distinctive characteristics, there are large areas of overlap among them. Each research approach can be used for different types of research studies. Research studies have three types; they are 1) descriptive, 2) explanatory and 3) exploratory. (Yin, 1994) The choice between different research methods mainly depends on the logic, objectives and practical limitations of resources in the study. Further, some approaches are more suitable for some types of data and information required.

4.3 Use of Research Strategies in the Study

To determine the suitable research method(s) for this Study, the first and most important condition is to consider the coverage of the research question(s) being asked and research objectives. In this Study, factors of the "refurbishment" vs. "demolish and new build" decisions for private developers in Hong Kong are identified from literature and a preliminary decision process model regarding the decision-making process of choosing forms of redevelopment of the existing properties that the developers hold, accompanied with the findings from questionnaire

study and telephone interviews, is constructed. Besides, practical limitations in carrying out the research can also limit the type of research methods used.

Case studies approach, instead of survey, is used in the Study. The choice of case studies approach is mainly because of the limited reply from respondents. In considering the small number of developers that agree to provide information for the Study, case studies can generate some in depth ideas and make results more valid.

Moreover, in this study, details of specific issues in decision-making process in practice are required. The case studies approach, which can generate more in depth information, is appropriate for this Study.

Case studies research can include both single and multiple case-studies. In this Study, multiple case-studies are used. Three case studies with three private developers in Hong Kong are finally carried out. Both quantitative and qualitative evidence are collected in the case studies.

4.4 Data Collection

Before deciding which research approach should be used in this study, invitation letters are sent to nine developers in Hong Kong, and finally, only three developers agree to participate in the Study. Data are collected from the developers by two ways. First, a formal questionnaire is sent to developers, by post and email, for them to complete. The second data collection method is by semi-structured telephone interviews, which are conducted after the developers returned the complete questionnaires. The information collected in the telephone interviews generates more detailed information for the decision model.

The questionnaire is sent by mail after the confirmation of senior managers in the developers who are willing to participate in the Study, accompanied by a letter of explanation and a questionnaire brief. The delivery method of questionnaires depends on the individual developer's choice. There are several advantages for using mailed questionnaire. First, using mailed questionnaire is considerably time savings, as in Hong Kong, the questionnaire can be reached the developers within two workings days. Second, all the questionnaires can be sent to individual respondents simultaneously. Third, the cost of posting a questionnaire is cheap, as compared to

expensive travel costs for interviews. Moreover, most of the seniors in developers in Hong Kong are fully occupied by their daily jobs, it is quite difficult for them to spare time for face-to-face interview. Obtaining data and information through formal questionnaires can save time.

Both close-ended and open-ended questions are asked in the questionnaire, while the first and second part of the questionnaire use close-ended questions, the third part of the questionnaire asking about the decision-making process within the organization uses open-ended questions. Questionnaire using close-ended questions also offers advantages. As in the questionnaire used in the Study, all the questions are set and same to all respondents, the later part on comparison between data and information is much easier.

However, mailed questionnaire also offers disadvantages. First, the actual identity, social class and ethnicity of the one who really fills in the form cannot be confirmed. For example, in this Study, questions about development decisions-making process are asked. It is believed that different people in the same company who are really involved in the decision-making process would have a clearer mind of what is actually happening throughout the process, although the questionnaire is titled to

senior managers in the developers, there are chances that it is not completed by the expected respondents and thus, the quality and accuracy of the data and information can be questioned. Second, mailed questionnaire is lack of flexibility. As interviewer is not present, there can be no variation in questions as adjusted according to different respondents with different backgrounds and specialists. This may make the results not comprehensive enough with each different case. Furthermore, highly complex and complicated questions cannot be asked in the questionnaire, be it mailed or in other forms, due to difficulties in explaining the whole situations to the respondents, without the presence of the interviewer. As a result, simple and straightforward questions can only be asked in mailed questionnaire. Therefore, follow-up works are needed to capture anything missed in the questionnaire replies.

For the second part of the study, semi-structured telephone interviews are conducted. After the respondents have returned the questionnaires, analysis on the data and information given is carried out. Follow-up telephone interviews are then be conducted with the respondents. Topic discussed is mainly based on the open-ended questions asked in the questionnaire. Questions about

1) the decision-making process of the developers in choosing forms of

redevelopment (i.e. “refurbishment” or “demolish and new build”) after they have decided to undertake redevelopment on their existing properties; and

2) factors that they consider in making the “refurbishment” and “demolish and new build” decisions and reasons for the level of importance of factors

are asked in telephone interviews.

The purpose of having follow-up telephone interviews is to produce more in-depth information on the decisions the developers made. It gives chances for the interviewer and respondent to communicate so that both parties have a better understanding of the questions asked and the answers written by the respondents. If any misunderstanding arises, the interviewer may have chance to clarify and ask the questions once again. Moreover, the information and contents that the respondents gave and discussed are not only restricted to the questions asked in the questionnaire. Interviewer can ensure all questions being asked are answered. Further, more complex questions can be asked during telephone interviews in order to supplement the questionnaires.

One may argue that interview studies are time-consuming and costly. The time

required to conduct an interview is usually longer than the time needed to complete a questionnaire. Bias may also arise due to misunderstanding between the interviewer and respondents. Most importantly, the quality of the information obtained from the interview depends on both parties' ability to express themselves and the willingness to cooperate.

4.5 Data Analysis

32 factors have been identified from previous literature and studies regarding the "refurbishment" and "new build" decisions on the existing properties the developers hold. The data collected from the questionnaire are easier to measure as all respondents are responded to the same set of questions. The information collected form part 3, together with the information collected through the follow-up telephone interviews, is used for the construction of a preliminary decision model. Ranking of the factors and correlation analysis are used to indicate the relative important levels of different factors for individual developers.

The factors relating to the "refurbishment" and "demolish and new build" decisions explored in the second part of the questionnaire are used in building the decision

model. Together with the previous findings and follow-up interviews, a decision model of developer's decisions towards the choice between "refurbishment" and "demolish and new build" options is constructed. Persons interviewed are senior managers in those developers who have completed the questionnaire beforehand. This is to ensure useful and practical information can be collected.

4.6 Conclusion

In conclusion, case studies strategy is used in the study due to the practical limitation in carrying out the research. Mailed questionnaires and semi-structured follow-up telephone interviews are used to collect the data and information required for determining the relative importance of factors that affect the "refurbishment" and "demolish and new build" decisions and a decision model in the Study.

Chapter 5

Questionnaire

5.1 Introduction

The data used for analysis for the Study are collected in form of questionnaire. The approach used in the construction of the questionnaire is discussed in this chapter. The data collected in the questionnaire are used to determine the relative importance of the factors that affect the developers' decisions in choosing forms of redevelopment.

5.2 Construction of the Questionnaire

5.2.1 Layout of the Questionnaire

A questionnaire brief (see Appendix A) is sent with the questionnaire to the respondent. The questionnaire brief is used to give background information of the research study. The use of a questionnaire brief can avoid any misunderstanding in the contents of the questionnaire.

The questionnaire (see Appendix B) is divided into three parts. The first part of the questionnaire contains questions asking some general information of the company. Whether the company is involved in redevelopment works on their existing properties is asked. Other questions like the amount of works carried out in "refurbishment" and "demolish and new build" works in terms of number of projects and total contract sums of in the past 12 months are asked in order to familiarize the involvement of the developers in the decision-making process that is examined in this Study. Moreover, indication on the important factors, e.g. profitability of the project, in determining the involvement in redevelopment decisions is requested in this part. There are five factors identified and respondents can add in other factors that they consider as other

important factors that influence the decision. This approach makes the questionnaire more flexible and avoids any bias in the preset list of factors. The results obtained from this question are considered to be useful for examining the primary variables that affect the subsequent decisions made for the "refurbishment" and "demolish and new build" redevelopment decisions in order to get a full picture for constructing the decision model.

In the second part, respondents are asked to indicate the relative level of importance (1 = low importance, 10 = high importance) on 32 factors that affect the developers' decisions in choosing "refurbishment" or "demolish and new build" as means to provide "new" accommodation in the market. The purpose of scoring the relative level of importance of factors is to assess how different factors affect developers' redevelopment decisions in real situations, after developers have chosen redevelopment of existing properties to provide "new" accommodation in the market. The consistent measurement of the relative level of importance of each factor allows analysis to be done easier.

The third part of the questionnaire contains questions that focus on the decision-making process of the "refurbishment" vs. "demolish and new build"

decisions. Open-ended questions are asked and respondents can denote any answers that he thinks it is suitable. The reason for using open-ended questions is to allow respondents to answer more complicated questions in a detailed manner, so as to capture any potential answers that can be made in other parts of questionnaire. Since the decision-making process is very complicated and unique for different developers and, thus, it cannot be simply summarized in a standard format for respondents to answer, therefore, a separate part using open-ended questions is used for constructing the decision model and to be used as a basis for follow-up telephone interviews with the respondents.

However, there may be some disadvantages of using open-ended questions. As more time and effort is required to answer the open-ended questions, this may discourage the respondents to give replies and, as a result, respondents may just leave the questions unanswered. This will increase the difficulty for getting useful information for further analysis which requires responses from respondents.

5.3 Factors Identified from Previous Literature

The second part of the questionnaire is about the factors that affect developers' decisions on forms of redevelopment of their existing properties. Due to the lack of previous comprehensive literature and studies on this specific topic, the set of factors identified in the questionnaire is derived from several references. Various literature about the decisions between "refurbishment" and "demolish and new build" redevelopment options are reviewed in order to identify any possible factors that affect the decision in the Study. Factors identified are mainly based on the United Kingdom practice, therefore, modifications are needed in order to suit the property development industry in Hong Kong. Moreover, a few factors are added in order to include all relevant factors in Hong Kong.

32 factors are finally identified from the previous literature and studies for this Study. The data collected is mainly used to:

- Identify factors that developers in Hong Kong consider in choosing forms of redevelopment of their existing properties (i.e. "refurbishment" vs. "demolish and new build")

- Determine the relative importance of the factors

The factors affecting the developers' decisions in forms of redevelopment in the proposed questionnaire can be classified into five categories, which are shown in Table 1. They are:

1) Economic Considerations;
2) Corporate Strategies;
3) Characteristics of the Existing Building;
4) Government Policy and
5) Other Factors.

Category	Factors
Economic Considerations	1. Profitability of the development 2. Availability of funding 3. Cost of finance 4. Increase in rental value after redevelopment 5. Time required to provide "new" accommodation 6. Cost difference between "refurbishment" and "demolish and new build" decisions 7. Forecast economic growth percentage in Hong Kong 8. Existing land use 9. Existing land value 10. Annual saving maintenance cost
Corporate Strategies	1. Growth of market share 2. Flexibility of the decision 3. Improving corporate image 4. Activities that other developers do 5. Attracting new tenants 6. Retaining existing tenants
Characteristics of the Existing Building	1. Age 2. Location 3. Accessibility of site 4. Remaining life expectancy before redevelopment 5. Conditions and quality before redevelopment 6. Architectural merit before redevelopment 7. Achievable lettable floorspace after redevelopment
Government Policy	1. Planning requirements 2. Zoning requirements 3. Encouragement of conservation and preservation 4. Compulsory statutory requirements 5. Possible procedural delays in gaining necessary approvals
Other Factors	1. Social considerations 2. Public reactions 3. Legal considerations 4. Environment issues

Table 1 Factors Influencing the Developers' Redevelopment Decisions in the Questionnaire

After marking the level of importance of factors identified, open-ended questions about the decision-making process in making the "refurbishment" vs. "demolish and new build" decisions are asked. Those questions mainly focus on the policy and procedures that the company undertakes in order to reach such a decision. The information collected in this part is mainly used to:

- Identify the crucial decision points and procedures in making the redevelopment decisions

- Give basic information for the follow-up telephone interviews with respective respondents

5.5 The Rating of Factors

The relative importance levels of the factors are indicated by the responding developers. The respondents provided numerical scoring for factors expressing their opinion on each individual factors that affect the "refurbishment" and "demolish and new build" decisions of their existing properties. In each case study, a ranking of all the factors that respondents consider is calculated.

5.6 Conclusion

Due to the lack of previous comprehensive literature and studies on this specific topic, the set of factors identified in the questionnaire is derived from several references. 32 factors are finally identified for the second part of the questionnaire and open-ended questions about the decision-making process are asked in the third part.

Chapter 6

Case Studies Findings Analysis

6.1 Introduction

In this chapter, the case studies design is introduced. Also, the data collected from the questionnaires in the case studies are analyzed. Each factor is ranked according to the level of importance marked by respondents.

6.2 Case Studies Design

6.2.1 Focus

The case studies concentrate on the assessment of factors affecting the developers' decision in choosing forms of redevelopment options ("refurbishment" vs. "demolish and new build") and the decision-making process for this decision within developers in Hong Kong.

6.2.2 Reasons for Choosing the Cases

A good research result could never be reached without sufficient information and data support. Although many developers in Hong Kong refuse to participate in academic research, full support was granted from three leading developers in Hong Kong, namely Developer A, Developer B and Developer C in the Study, therefore, three case studies are carried out with the respective developers.

6.2.3 Case Studies Data Collection Method

Concerning the case study research method, Developer A, Developer B and Developer C agree to provide information by marking the level of importance of each factor identified in a preset questionnaire (in English), and follow-up telephone interviews are conducted to get a better understanding of the decision-making process within the companies and the reasons for marking the level of importance of each factor. However, due to the late return of the questionnaire from Developer C, follow-up interview cannot be carried out with the respective respondent. The use of questionnaires and telephone-interviews can be regarded as indirect observation research methods.

Respondents participated in the Study are senior management in Developer A, Developer B and Developer C, involving in the property development aspects. It is believed that they have a comprehensive knowledge in how the decisions are made within the company and give more reliable and realistic results.

6.3 Questionnaire Results Analysis

The first and second part of questionnaire aim at getting basic information on the level of importance of the factors identified in literature and theories that affect developers' "refurbishment" vs. "demolish and new build" decisions.

6.3.1 General Information from the Responded Developers

Developer A is one of Hong Kong's leading property companies, with extensive experience in the development and management of major commercial and residential properties. Its completed investment portfolio in Hong Kong principally comprises office and retail premises, which it manages in prime locations, as well as serviced apartments and other luxury residential accommodation. The completed portfolio totals approximately 14 million square feet of gross floor area in Hong Kong.

Developer B is another leading property investment companies in Hong Kong. Its investment property portfolio totals approximately 4.7 million gross square feet and the company believes that it is the largest commercial landlord in the Causeway Bay district of Hong Kong.

Developer C is a big local property developer in Hong Kong with high property output and huge amount of land bank. The average square footage completed by the developer each year range from 2 to 3 million square feet. The developer's local development activities are concentrated in the mass residential sector in the new townships located in the New Territories and particularly, along the key mass transportation routes. The investment property portfolio of Developer C in Hong Kong currently amounted to approximately 6 million square feet in total gross floor area. This business segment of the company has been increasing in importance as a profit generator to the company that contributed to stabilizing the company's performance in the medium to long term.

Moreover, the total development land bank of Developer C and its associate companies in Hong Kong amounts to around 21 million square feet in total gross floor area which includes the company's interests in development sites, investment properties, hotel properties as well as the property interests in its three listed associates. Developer C also holds around 23 million square feet of agricultural land which are spread widely over various districts in the New Territories and based on an internally planned schedule, application for conversion of land usage of these

agricultural land lots into development sites will be made in stages.

Comparing the company sizes of the three developers, it is observed that Developer A and C are relatively larger in terms of their total property output, amount of land reserve and market share. However, they have different investment behaviour. While Developer A focuses on developing investment properties, Developer C diversifies. Also, Developer C has a large land bank compared with the other 2 developers, which enables it to have large-scale development in the future.

On the other hand, Developer B is relatively small when compared with Developer A and C. It is reasonable to believe that the differences in company size and investment strategies can lead to different considerations when they make decision as to the form of redevelopment.

6.3.1.1 Amount of Works Undertaking in Redevelopment Projects

In the first part of the questionnaire, some general questions about their involvement in both "refurbishment" and "demolish and new build" redevelopment options are asked. The results show that the all three developers take redevelopment of existing properties they hold as an option to provide "new" accommodation in the market. In the past 12 months[3], all 3 developers have been involved in redevelopment projects, however, the three developers had different investment behavior in redevelopment projects, in terms of number of projects and total value of works.

For Developer A, the total value of works in "demolish and new build" was over HK$50 millions, while the total value of works in "refurbishment" works was under HK$ 10 million. For Developer B, there was not any "demolish and new build" works, while there was one "refurbishment" project carried out to an existing commercial property it holds in Causewaybay. For Developer C, there are more than 10 "demolish and new build" works and "refurbishment" works carried out. (See Table 2 and 3)

[3] March 2003 to March 2004

Amount of Redevelopment Works Undertaking within Past 12 Months (in terms of no. of projects)			
	Developer A	Developer B	Developer C
Demolish and New Build	<5	Nil	>10
Refurbishment	<5	<5	>10

Table 2 Amount of Redevelopment Works Undertaking With Past 12 Months In Terms of Number of Projects

Amount of Redevelopment Works Undertaking Within Past 12 months (in terms of total value of works)			
	Developer A	Developer B	Developer C
Demolish and New Build	> $ 50 millions	Not Applicable	> $ 50 millions
Refurbishment	< $ 10 millions	> $ 50 millions	$10 - 50 millions

Table 3 Amount of Redevelopment Work Undertaking Within Past 12 Months In Terms of Total Value of Works

6.3.1.2 Ranking of Factors Favor Redevelopment instead of a New Development on Vacant Land

In part 1 of the questionnaire, the level of importance of factors favoring redevelopment option instead of a new development on vacant land as a means to provide "new" accommodation are ranked by respondents. There are 5 preset factors and respondents can add any other factors that they think are important but not listed.

For Developer A, the factors "*Profitability of the development"*, "*Market Outlook*" (added by corresponding respondent) and "*Long term prospects"* (added by the corresponding respondent), score 9, which are the most important influences to the consideration of choosing redevelopment options. The factors "*Level of Cost*", "*Duration of development period*" and "*Location of the existing building*", all scored 7 in level of importance, are the second important influences. While the level of importance of the factors "*Design factors*" score 6, which is the lowest among the seven factors identified. (See Table 4)

From the data obtained from Developer B, the factors "*Profitability of the development*" and "*Existing portfolio of the company*" (added by corresponding

respondent), both score 10, are the most important influences to redevelopment as means to provide "new" accommodation. The factors "*Location of existing building*" and "*Growth of the market share*", both score 9, are the second important factor. It is noted that the factor "*Design factors*" score 5, which is the lowest among the seven factors identified. This factor is also of the lowest important influence marked by Developer A. (See Table 5)

For Developer C, the factors "*Profitability*", "*Level of cost*" and "*Location of the existing building*", score 9, are the most important factors for taking redevelopment as a means to provide "new" accommodation. The factor "*Design factors*" scores 8, is the second important factor. The least important factor is "*Duration of development period*" in this case. (See Table 6)

Factors Identified	Rank	Indicated Level of Importance
Profitability of the development	1	9
Long term prospects #	1	9
Level of cost	2	7
Duration of development period	2	7
Location of the existing building	2	7
Market Outlook #	2	7
Design factors	3	6

Table 4 Factors Identified by Developer A, Ranked in order of the Indicated Level of Importance of Factors Favoring Redevelopment instead of New Development on Vacant Land

(#: factor added by corresponding respondent)

Factors Identified	Rank	Indicated Level of Importance
Profitability of the development	1	10
Existing Portfolio of the Company#	1	10
Location of the existing building	2	9
Growth of the market share #	2	9
Level of cost	3	8
Duration of development period	4	7
Design factors	5	5

Table 5 Factors Identified by Developer B, Ranked in order of the Indicated Level of Importance of Factors Favoring Redevelopment instead of New Development on Vacant Land (#: factors added by corresponding respondent)

Factors Identified	Rank	Indicated Level of Importance
Profitability of the development	1	9
Level of cost	1	9
Location of the existing building	1	9
Design factors	2	8
Duration of development period	3	5

Table 6 Factors Identified by Developer C, Ranked in order of the Indicated Level of Importance of Factors Favoring Redevelopment instead of New Development on Vacant Land

6.3.2 Identifying the Importance of Factors

In part 2 of the questionnaire, data collected are used to evaluate the level of importance of each factor considered by developers in Hong Kong in choosing among the "refurbishment" and "demolish and new build" redevelopment decisions. The ranking of each factor is based on the level of importance indicated by the respondents. A summary with the corresponding ranking of level of importance of factors in three cases is given in Table 7.

The factors are grouped into five categories, which are prescribed in Chapter 4. The relative importance index of each category is calculated by averaging the level of importance of each factor within the category. The results from the three cases show significant variations in the average level of importance index for different categories of factors.

From the data collected from Developer A, the overall score of relative importance index for "*Other Factors*" is the highest among other four categories. The average relative importance is 8.00. The category of "*Characteristics of the Existing Building*"

has the lowest relative importance index, showing the least importance category to be considered by Developer A. The relative importance index of "*Characteristics of the Existing Building*" is 4.43. (See Table 8)

For Developer B, the overall score of relative importance index for "*Economic Considerations*" is the highest among the other four categories. The relative importance index is 7.30. The category of "*Government Policy*" has the lowest relative importance index, 5.00, among the other four categories. (See Table 8)

For Developer C, the overall score of relative importance index for "*Government Policy*" is the highest among the other four categories. The relative importance index is 8.40. The category of "*Other Factor*s" has the lowest relative importance index, 6.75, among the other four categories. The result of relative importance index among different categories of factors has slight differences in three case studies. (See Table 8)

For the relative importance of individual factors, there are a lot of similarities between three cases, though there are some deviations in some factors, the deviations are not very significant. In all cases, the factors "*Compulsory statutory requirements*", "*Legal considerations*", "*Increase in rental value after redevelopment*", "*Profitability*" and

"*Existing land use*" are the top five important factors influencing the redevelopment decisions. While the ranking of these factors are similar in the cases, their scores in the level of importance slightly vary. For the lowest influencing factor to the decision, the factor "*Possible procedural delays in gaining necessary approvals*" scores the lowest level of importance for both Developer A and Developer B. The results for Developer C show that "*Availability of funding*" and "*Cost of finance*" are the lowest influencing factors, which is quite different from the other two developers.

The top five factors for Developer A are "*Compulsory statutory requirements*", "*Legal considerations*", "*Increase in rental value after redevelopment*", "*Profitability*" and "*Social considerations*" while the least important factors for the decision is "*Possible Procedural delays in gaining necessary approvals*" from the Government. (See Table 7)

For Developer B, the top five individual factors are "*Profitability of the development*", "*Increase in rental value after redevelopment*", "*Compulsory statutory requirements*", "*Legal Considerations*" and "*Cost of finance*", which show similarities to the results of Developer A. Similar to Developer A, the factor "*Possible Procedural delays in gaining necessary approvals*" is also of least importance in this case. However, the

factor "*Social considerations*" does not show high priority of consideration for Developer B. Apart from asking the respondents to mark the listed factors in the questionnaire, the respondents are also requested to add other factors they think are important but not listed in the questionnaire. The respondent from Developer B mentions an extra factor, "*Existing portfolio of the company*". Its level of importance scores 9 and its overall ranking is 2 among other 32 preset factors.

For Developer C, the top five individual factors are "*Profitability*", "*Achievable lettable floorspace after redevelopment*", "*Increase in rental value after redevelopment*", "*Compulsory statutory requirements*", " *Planning requirements*" and "*Zoning requirements*". (See Table 7)

Factors Identified	Ranks (Level of Importance)		
	Developer		
	A	***B***	***C***
Economic Considerations			
Profitability of the development	2 (9)	1 (10)	1 (10)
Availability of funding	5 (6)	6 (6)	6 (3)
Cost of finance	3 (8)	3 (8)	6 (3)
Increase in rental value after redevelopment	2 (9)	1 (10)	2 (9)
Time required to provide "new" accommodation	5 (6)	4 (7)	4 (7)
Cost difference between "refurbishment" and "demolish and new build" decisions	5 (6)	5 (6)	3 (8)
Forecast economic growth percentage in Hong Kong	5 (6)	6 (5)	4 (7)
Existing land use	3 (8)	2 (9)	2 (8)
Existing land value	5 (6)	2 (9)	2 (8)
Annual saving maintenance cost	6 (5)	8 (3)	4 (7)
Corporate Strategy			
Growth of market share	7 (4)	2 (9)	4 (7)
Flexibility of the decision	4 (7)	3 (8)	4 (7)
Improving corporate image	5 (6)	4 (7)	4 (7)
Activities that other developers do	3 (8)	6 (5)	4 (7)
Attracting new tenants	3 (8)	4 (7)	4 (7)
Retaining existing tenants	4 (7)	4 (7)	4 (7)
Characteristics of existing building			
Age	8 (3)	5 (6)	3 (8)
Location	6 (5)	2 (9)	3 (8)
Accessibility of site	6 (5)	3 (8)	3 (8)
Remaining life expectancy before redevelopment	7 (4)	6 (5)	3 (8)
Conditions and quality before redevelopment	7 (4)	7 (4)	3 (8)
Architectural merit before redevelopment	7 (4)	6 (5)	5 (6)
Achievable lettable floorspace after redevelopment	5 (6)	5 (6)	1 (10)

Government Policy			
Planning requirements	7 (4)	7 (4)	2 (9)
Zoning requirements	7 (4)	8 (3)	2 (9)
Encouragement of conservation and preservation	3 (8)	4 (7)	3 (8)
Compulsory statutory requirements	1 (10)	1 (10)	2 (9)
Possible procedural delays in gaining necessary approvals	9 (1)	9 (1)	4 (7)
Other Factors			
Social considerations	2 (9)	5 (6)	5 (6)
Public reactions	5 (6)	7 (4)	5 (6)
Legal considerations	1 (10)	1 (10)	3 (8)
Environment issues	4 (7)	6 (5)	4 (7)
Factor(s) added by the respondent			
Existing portfolio of the company	-	2 (9)	-

Table 7 Ranking of Factors Affecting Developers' Decision in "Refurbishment" vs. "Demolish and New Build" Options in the Three Case Studies

Category of Factors	**Average Relative Level of Importance**		
	Developer		
	A	***B***	***C***
Economic Considerations	6.90	7.30	7.00
Corporate Strategies	6.67	7.17	7.00
Characteristics of the Existing Properties	4.43	6.14	8.00
Government Policy	5.40	5.00	8.40
Other Factors	8.00	6.25	6.75

Table 8 Average Relative Level of Importance of Different Category of Factors in the Three Case Studies

6.4 Conclusion

After analyzing the results obtained from the replied questionnaires from Developer A, Developer B and Developer C, it can be observed that there are significant variations in the average level of importance for different categories of factors, while the deviations in the level of importance for individual factors only show little variation among the three developers. The results are used as a basis for the follow-up interviews and rank-correlation tests for discussing the possible correlations between the three developers in considering the factors that affect their redevelopment decisions and why there are different level of importance among factors influencing the "refurbishment" and "demolish and new build" decision for developers in Hong Kong.

Chapter 7

Discussion of Results

7.1 Introduction

After quantitatively analyzing the importance of factors influencing the developers' decisions in choosing forms of redevelopment in Hong Kong in the previous chapter, this chapter aims at investigating and discussing the following issues:

1. Investigating the correlation between Developer A and Developer B, Developer B and Developer C as well as Developer A and Developer C in considering factors that affect their redevelopment decisions

2. Explaining the reasons why the developers in the case studies rank the factors that affect their decisions in choosing forms of redevelopment differently

3. Explaining how the corporate size and investment strategies affect the developers' decisions in choosing forms of redevelopment

7.2 Spearman Rank Correlation Analysis

In order to test whether the three developers have similar behavior in ranking the factors that influence the "refurbishment" vs. "demolish and new build" decisions, Spearman rank correlation technique is used. A rank-correlation coefficient can be computed, which is a measure of the size of correlation that exists between two sets of ranks, a measure of the degree of association between the variables. In the Study, Spearman rank correlation test will be applied to the ranking of the 32 individual factors, the 5 categories of factors and the factors within each category for Developer A and Developer B, Developer B and Developer C as well as Developer A and Developer C are tested by Spearman rank correlation separately. (See Appendix C) The rank correlation coefficient can be calculated by the following formula:

$$r_s = 1 - \frac{6\sum d^2}{n(n^2 - 1)}$$

where

- r_s = coefficient of rank correlation
- n = number of paired observations
- $\sum$ = notation meaning "the sum of"
- d = difference between the ranks for each pair of observations

7.2.1 The Results

The values of the coefficient of rank correlation for the 32 individual factors between Developer A and Developer B (A-B), Developer B and Developer C (B-C), Developer A and Developer C (A-C) are 0.9797, 0.9608 and 0.9555 respectively. The values of the coefficient of rank correlation for the 5 categories of factors between A-B, B-C and A-C are 0.6000, -0.3000 and -0.4000 respectively. The coefficients of rank correlation for the factors within each category between A-B are 0.8242, 0.3429, 0.7857, 0.9000 and 1.0000 from category 1 to 5 respectively, and that between B-C are 0.8545, 0.3714, 0.6429, 0.1500 and 0.7000 from category 1 to 5 respectively, while the results between A-C are 0.8970, 0.5714, 0.8929, 0.5500 and 0.7000 from category 1 to 5 respectively. (See Table 9)

	Rank Correlation Coefficient		
	A-B	**B-C**	**A-C**
Individual factors	**0.9797 ***	**0.9608 ***	**0.9555 ***
Categories of factors	0.6000	-0.3000	-0.4000
Factors within Category 1 (Economic Considerations)	**0.8242 ***	**0.8545 ***	**0.8970 ***
Factors within Category 2 (Corporate Strategies)	0.3429	0.3714	0.5714
Factors within Category 3 (Characteristics of existing building)	**0.7857 ***	0.6429	**0.8929 ***
Factors within Category 4 (Economic Considerations)	**0.9000 ***	0.1500	0.5500
Factors within Category 5 (Other factors)	**1.0000 ***	0.7000	0.7000

Table 9 Rank Correlation Coefficients for the Rank Correlation Test

(*: significant at 5% confidence level)

When the rank correlation coefficients undergo hypothesis testing where the null hypothesis is that there is no correlation between two sets of data, it is found that at 5% significance level i.e. $\beta = 0.05$ which is a widely accepted significance level in statistics, the null hypothesis for individual factors and factors within category 1, 3, 4 and 5 between Developer A and B is rejected while that for categories of factors and factors within category 2 is accepted.

For the sets of data between Developer B and C, it is found that at 5% significance level i.e. β= 0.05, the null hypothesis for individual factors and factors within category 1 is rejected while that for categories of factors and factors within category 2,3,4 and 5 are accepted.

For Developer A and C, it is found that at 5% significance level i.e. β= 0.05, the null hypothesis for individual factors and factors within category 1 and 3 is rejected while that for categories of factors and factors within category 2, 4 and 5 are accepted. (See Appendix C)

Referring to the hypothesis testing at 5% significance level i.e. β= 0.05, the results report that correlations exist between Developer A, Developer B and Developer C in ranking the 32 individual factors and the factors within category 1 i.e. Economic considerations, while significant correlations do not exist between the three developers in ranking the 5 categories of factors and most of the factors within other categories. The results imply that for Developer A, B and C, generally, they have the same behavior in ranking the factors to be considered in the "refurbishment" vs. "demolish and new build" decisions. Moreover, there is no difference for the three developers in considering the factors in the category of economic considerations.

However, it is noted that the difference between Developer A and Developer B in considering different categories of factors in the "refurbishment" vs. "demolish and new build" decisions is mainly because of the deviation in considering the factors within the category of corporate strategies category. Note that the correlation coefficient of 1 shows that there is a perfect correlation between the two sets of data. This verifies the fact that the rankings of factors within category 5 i.e. other factors are identical between the Developer A and Developer B.

7.2.2 Discussion on the Results

From the results of rank correlation statistics for Developer A, B and C on the ranking of individual factors and factors within category 1 i.e. economic considerations that affect the developers' decisions in choosing forms of redevelopment, it is observed that the three developers behave similarly, which implies that their differences in corporate size do not lead to disagreement between the developers in ranking individual factors and factors within category 1.

It is also noted that Developer A and Developer C, though their corporate size is

similar, they behave quite differently from each other. They only show correlations between each other in ranking individual factors and factors within category 1 and 3. Also, it is noted that the differences between Developer A and Developer B, are not as great as the differences between Developer B and Developer C. For Developer B and C, they show correlations in ranking individual factors and factors within category 1 only, while for developer A and B, they show correlations in ranking individual factors and factors within category 1, 3, 4 and 5, and this implies that the disagreement between Developer A and B in ranking different categories of factors is mainly due to the significant variations in ranking of factors within category 2 i.e. corporate strategies.

The difference between rankings of factors within the corporate strategies category can be explained by the fact that Developer A and Developer B have significant difference in corporate size. Developer A, with its completed investment properties portfolio totals over 14 million square feet of gross floor area in Hong Kong, is relatively a large property developer in Hong Kong when comparing with Developer B. Because of the difference in the corporate size between the two developers, it can be expected that there are differences in adopting strategies in choosing investment activities between the two developers. In indicating the level of importance of factors

within the corporate strategies category, the factor Growth of market share, shows the greatest difference between the two developers. For Developer A, the indicated level of importance is 4 while that indicated by Developer B is 9. The factor Activities that other developers do in the same arena, show the second greatest difference. For Developer A, the indicated level of importance is 8 while that for Developer B is 5.

Because of the relatively small proportion of market share that Developer B has in the market, the company would try to seek every growth opportunity for capital accumulation. However, for Developer A, which is a relatively big property developer within the industry with relatively large market share in the industry, would normally focus on what other developers in the industry do in the market so as to maintain its leading position.

It is observed that there are significant variations between Developer A and Developer C in ranking factors in different categories and categories of factors. This can be explained by the differences in their investment strategies. Although the two developers have similar corporate size, their investment strategies vary significantly. While Developer A focuses on developing investment properties (e.g. office and shopping malls), Developer C has a diversified investment pattern in both residential

development and investment properties. Moreover, Developer C has a big development land bank which includes rural and urban areas. Their similarities in corporate size do not lead to similarities in considering the categories of factors due to the substantial differences in their investment strategies.

7.2.3 Conclusion

Generally, Developer A, Developer B and Developer C in the case studies behave similarly in considering the individual factors that affect the "refurbishment" vs. "demolish and new build" decisions, and especially, the factors within the category Economic considerations. The differences in corporate size and investment strategies between the three companies do not affect their considerations in these areas. However, due to the significant difference in company size between Developer A, Developer C and Developer B, there are significant variations in ranking different categories of factors for the three developers. Moreover, though Developer A and Developer C have similar corporate size, they do not show significant correlations in ranking different categories of factors. The variations are mainly due to the different investment strategies adopted by the two developers.

7.3 Qualitative Analysis of Case Studies Results

The factors that affect the developers' decision in the two case studies are examined according to the results from the replied questionnaires. 2 follow-up interviews with the respondents in Developer A and Developer B, who are the senior managers in the two developers, are carried out together with literature review in order to examine reasons for importance of the factors affecting the redevelopment decisions. Follow-up interviews cannot be arranged for Developer C due to the late return of the questionnaire from the respondents. The personnel to be interviewed in the two developers are senior managers who are actively participating in property development decision. As the interviewees are not willing to disclose their identities, their names will remain confidential.

In the first part of the follow-up interviews, both respondents give basic information on examples of redevelopment projects, both "refurbishment" and "demolish and new build", in order to give the interviewer a better understanding on how much their companies are involved in redevelopment projects.

In the second part of the interview, reasons for choosing individual factors that affect

the redevelopment decisions are discussed and especially, reasons for ranking the top 2 factors and the lowest factor(s).

7.3.1 Case Study Results Analysis

7.3.1.1 Example of Redevelopment Project by Developer A

According to the follow-up telephone interview with the respondent, who is a senior management in property development and valuation department of Developer A, a redevelopment project using "demolish and new build" approach was launched in June 2003. The demolition work commenced last year and the proposed development on the original industrial sites is a 69 storey office building with a height of approximately 280 metres. The approved gross floor area of 1.55 million square feet, which is ten times more than the original two industrial buildings, represents a plot ratio of approximately 14.0 on the total site area. The estimated construction cost is approximately HK$3 billion.

7.3.1.2 Example of Redevelopment Project by Developer B

Developer B, which is believed to be the largest commercial landlord in the prime office and retail CausewayBay District, undertook a refurbishment project for its existing retail shopping mall in the year 2003. The reason for carrying out this refurbishment projects is mainly because of the group's strategy to further grow of its retail property sector. The total investment is about HK$ 140 millions. The refurbishment project does not involve any change in use and gross floor area. It simply includes the upgrading of external and internal facades, installation of additional building services and improvement of shopper circulation to allow greater flexibility in creating larger store layouts at ground level to maximise brand exposure. The refurbishment works finished in late 2003 and all the shops are reopened.

7.3.1.3 Reasons for Scoring the Level of Importance of Factors

The following section is divided in two parts. The first part explains on the high ranking factors with little deviation in the two case studies while the factors to be considered vary significantly between the two case studies are explained in the second part.

Factors to be discussed in the following section include:

1) Compulsory statutory requirement
2) Legal Considerations
3) Profitability of the development
4) Increase in rental value after redevelopment
5) Possible procedural delays in gaining necessary approvals

(A) Compulsory statutory requirements and Legal Considerations

These two factors are considered as the most important influences to the redevelopment decisions by both developers, as they score the highest level of importance in both cases.

Under the Antiquities and Monuments Ordinance (Cap. 53), subject to section 4 of the ordinance, the Secretary for Home Affairs (the Authority) may, after consultation with the Board and with the approval of the Chief Executive, by notice in the Gazette, declare any place, building, site or structure, which the Authority considers to be of public interest by reason of its historical, archaeological or palaeontological significance, to be a monument, historical

building or archaeological or palaeontological site or structure. This declaration can limit the development of the property under section 6(1)(b) of the Ordinance, that is, no one can demolish, remove, obstruct, deface or interfere with a proposed monument or monument.

It is agreed by the respondents that this kind of compulsory statutory requirements issued by the Government can greatly affect the development decision of their existing properties. Although the developer, as the private owner of the property, has the right to object or refuse this declaration against the Authority and the Chief Executive, however, there must be some grounds and reasons for the Government for declaring the property as a monument. If the developer cannot object the Authority's decision, it is obliged to fulfill the declaration and follow what Government requires. Therefore, it is important for the developer to consider if there is any compulsory statutory requirements that need to be follow since as a responsible investor and developer in Hong Kong, it is important to follow the laws.

Moreover, legal considerations are another factor that scores the highest level of importance. The reason why legal considerations have the higher ranking among

other factors is similar to that of compulsory statutory orders. Since any property development in Hong Kong should be approved by the Government, it is important to follow all the laws and guidelines issued by the Government as any negligence in considering legal matters will totally affect the whole development plan, process and also the profit derived, therefore, it should be ranked as the most important issues.

(B) Profitability of the development

According to Cadman (1995), the prime objective of private property companies is to direct profit from the process of development and bring raw materials together and process them into a product to be sold in market place. Fellows *et al.* (2002) also suggest that a generally applicable spectrum of a firm's objectives would include profitability, turnover etc. Therefore, the profitability of the development is also a crucial influence to the development decision of a developer.

The respondents agree that profitability of the development is important as both Developer A and Developer B are private firms, they have its own financial planning and need to be responsible for its shareholders. It is not doubt that all the

developers in Hong Kong will develop a property without generating any profit.

Furthermore, it is noted by the respondent from Developer B that maximizing return from its existing investment property portfolio is one of the three main strategies of the company, therefore, profitability of the development project is one of the greatest concern for making decisions in redevelopment options.

(C) Increase in rental value after redevelopment

From the view of the developers, the differences between the rental value before and after the redevelopment are highly correlated to the profitability of the development. Before the redevelopment process starts, development appraisal should be carried out and one of the important influences and determinants in development appraisal is rental value. It is a vital element in deriving the developer's budget. Therefore, the respondents rank it as the same or similar importance level as the factor profitability.

(D) Possible procedural delays in gaining necessary approvals

In chapter 3, the development control system in Hong Kong is discussed. There are a lot of regulations, guidelines and constraints for property development in

Hong Kong, and there are many necessary approvals that the developers need to acquire before any development starts, during the whole construction stage, and after the completion of property for sale. Therefore, there must be chances for procedural delays in gaining necessary approvals that hinder the whole development process.

However, in view of the respondents, both developers do not take this factor as an important influence. As stated by the respondents, both companies have a lot of expertise and experiences in handling the necessary applications for development approvals, they are familiar with the procedures and applications and therefore, the chances for getting procedural delays are low. Moreover, the time required by the Government to approve and consider necessary applications is short; in case of no legal disputes arise. Even though disputes may arise in redevelopment project (e.g. the classification of site), however, this should be the main concern in the primary stage of deciding a redevelopment project and there are always uncertainties that cannot be controlled.

After discussing the reasons why the two developers have the same or similar ranking and indicated level of importance towards some factors, analysis of factors that vary quite a lot between the case studies is discussed below.

Factors to be discussed in the following section include:

1) Social considerations
2) Growth of market share
3) Existing portfolio of the company#

(#: factor added by respondent from Developer B)

(A) Social considerations[5]

It is interesting to find out the different perceptions of level of importance to the factor "*social considerations*" between the two developers. For Developer A, this factor is ranked as the same importance level as the factor "*profitability*".

Different firms have different corporate values and cultures and the differences

[5] This factor scores 9 in the level of importance and ranks 2nd in the overall ranking by Developer A

between their values and cultures will affect their investment behaviors in the market.

'Social responsibility' is one of Developer A's corporate values. The company strives to strike a balance between making profits and caring for the society. As all the decisions made by senior management will normally follow the corporate goals, values and strategies, therefore, when considering the redevelopment decisions, social considerations become an important influence throughout the whole decision-making process.

(B) Growth of market share[6]

This factor shows the largest variance between the two developers. For Developer A, its level of importance is 4 but for Developer B, its level importance is 9. The reason for this significant difference, as explained by the respondent from Developer B, is a result of the emphasis of growth of market share of the Company.

According to Baumol (1967), after the equilibrium of maximizing profit is

[6] This factor scores 9 in the level of importance and ranks 2nd in the overall ranking by Developer B

achieved in the firm, there should be another consideration of company's executives, which is to expand the business. As one of the three main strategies of Developer B is to continue to selectively pursue growth opportunities in its core property business, it always seeks good opportunities for the company to excel further in its businesses. Therefore, growth of market share is another important influence on the redevelopment decisions for the company, since through involving in the redevelopment business, there are always chances for the company to seek growth opportunities in the market.

(C) Existing portfolio of the company[7]

This is a factor added by the Developer B, its level of importance is 8, reflecting the company's emphasis on this factor. The respondent from Developer B, using the example of the refurbishment works carried out in the year 2003, to illustrate the importance of this factor to the Company.

After the refurbishment works of the shopping mall, together with the adjacent shopping mall and office tower, a more attractive shopping landmark can be created. This will attract more new tenants and be beneficial to the existing

[7] This factor scores 9 in the level of importance and ranks 2nd in the overall ranking by Developer B

tenants and this will surely increase the rental income and the profitability of the portfolio. The refurbishment works will not only benefit the refurbished properties, but also benefit other properties that the developer holds. Therefore, when Developer B considers a redevelopment decisions, it takes the impact on the existing portfolio that the company holds into account, as the redevelopment decisions would not only affect the refurbishment buildings, but also other investment portfolio held by the companies.

7.4 Conclusion

Based on the rank correlation analysis and the discussion with two different developers in Hong Kong, the results show that there are differences in considerations as to the redevelopment decisions among different developers. This is predominately due to the differences between the company size, corporate values and strategies. Some factors are strongly emphasized by all developers in the case studies i.e. legal considerations, compulsory statutory requirements, profitability and increase in rental value after redevelopment. However, for some factors, there are significant differences, for instance, social considerations, growth of market share and existing portfolio. Therefore, it is concluded that developers' attitudes and considerations in redevelopment decisions towards the importance of different categories of factors vary with the corporate size, objectives, strategies and values.

Chapter 8

Decision Model

8.1 Introduction

Property development is an essential investment activity for private developers in Hong Kong. It is a complicated activities and senior management is constantly required to make decisions throughout the whole process, starting from the planning to the disposal of the project. Risks and uncertainties for taking up specific projects in the market should be taken into account before they make the decisions. Redevelopment, as an alternative means to provide "new" accommodation in the market to new development on vacant sites, has become more popular in Hong Kong because of the short supply of land and deterioration of existing properties in many urban areas.

In considering redevelopment of the existing properties that developers hold, there are

two forms of redevelopment available, they are the "refurbishment" and "demolish and new build" options. In determining which form of redevelopment is undertaken for an existing building, there are various stages in reaching the decisions which include different crucial decision points and variables.

In this chapter, stages for choosing among the "refurbishment" and "demolish and new build" options are discussed in detail and a non-weighted preliminary developers' decision process model on choosing among the "refurbishment" and "demolish and new build" options is also developed, both of which are based on the follow-up interviews conducted with developers' senior management in two of the case studies. The model illustrates a generalized process and considerations taken into account to make the "refurbishment" and "demolish and new build" decisions for developers in Hong Kong using the case studies' results so as to improve the effectiveness of developers' decisions in choosing forms of redevelopment options. Since there is no previous attempt to investigate this decision, it is not possible to have comparison between similar previous research.

8.2 Decision-making Process in Choosing Forms of Redevelopment – Developers' View

In the two case studies, both developers take redevelopment as a means to provide "new" accommodation in the market. Based on the information collected through the preset questionnaire and the interviews with Developer A and Developer B, the decision-making process in choosing among the forms of redevelopment options, i.e. the "refurbishment" and "demolish and new build" decision is examined. The whole process can be divided into seven stages.

8.2.1 Crucial Decision-making Stages

Stage 1 – Inception of Senior Management

The decision process of choosing forms of redevelopment starts from the inception of senior management. Senior Management, subject to the sense of market they perceive, will primarily have some ideas about what project the company should take. There are two forms of information; they are primary and secondary information. Primary information can be the past project experience of the company and secondary

information can be news reported by media. In order to test whether the inception of senior management is practical or not, different experts in the companies will try to carry out preliminary feasibility study of the project, which forms a basis for future decisions made by senior management.

Stage 2 – Availability of Suitable Properties for Redevelopment

After the senior management has decided to take redevelopment as a means to provide "new" accommodation in the market, the next step is to search if there is any suitable existing property available for taking the redevelopment option. If it is found that there is suitable site for redevelopment project, the whole decision process will proceed to another stage; however, if there is not any suitable site available, the companies will review the decision for a fixed period of time. For Developer A, this decision will be reviewed every six months, and for Developer B, there is not any fixed period of time for reviewing this decision.

Stage 3 – Legal Considerations

If suitable property can be found to take up the redevelopment option, the next step is

to take legal and compulsory statutory requirements into account. As legal and compulsory statutory requirements issued by the Government are always complied to follow (except the grounds given are irrelevant and unreasonable), it is very important to examine if there is any requirements issued by Government imposed on the existing property which may restrict and limit any future development of that particular building in order to reduce risks of wasting the efforts and recourses in investing into the project. From the developers' point of view, these kinds of legal constraints can be positive or negative, depending on the extent of the constraints and how individual developers in Hong Kong handle this kind of situation and negotiate with the Government.

Stage 4 –Preliminary Feasibility Studies

In this stage, several steps will be carried out in order to examine whether "refurbishment" or "demolish and new build" is a better option to the company.

First, evaluation of the existing property's performance is carried out. The present rental income, occupancy status, tenants contract arrangement etc. are studied in order to get a better understanding on how the existing property performs. The results from

the evaluation can be used as a basis for comparison between the overall market trend and the existing building's performance.

Second, general market research is carried out in order to establish the nature of the property market at that time. Information like the trend of the current property market, the rates of interest of short term and long term finance, the demand and supply of the proposed development premises and the activities that other developers do in the same arena should be collected through market research. The results from market research can be used for comparison with the existing building performance in order to evaluate if it is worthwhile to take the redevelopment project.

Third, qualitative assessment of the potential of the existing property to undertake the redevelopment project is carried out. Considerations like the impact of the proposed redevelopment project on the existing portfolio of the company and growth of market share will be taken into considerations. From the developers' point of view, development on vacant land and redevelopment are not mutually exclusive, and they can be considered and carried out together in order to achieve the best return. However, careful considerations should be made for the impact of any new project to the existing portfolio and to test if the new project is in line with the company's

strategies and values in long term. These are all qualitative analysis which cannot be fully supported by precise calculation.

Fourth, financial analysis should be carried out. As profitability of the project, is one of the major concerns for private developers in Hong Kong, financial analysis of the project is one of the important determinants for the boss to consider whether or not the project shall be carried out. Comparison between total revenue and total cost invested in the project is made to produce rate of return for the two options.

It can be concluded that the preliminary feasibility study plays an important role in the whole decision-making process. The results are used as a basis for the senior management to consider whether or not the redevelopment project should proceed, before choosing the forms of redevelopment for the particular premises. Based on the findings and analysis to the results, preliminary recommendations and suggestions can be made of which form of redevelopment is favorable or redevelopment project, neither the "refurbishment" or "demolish and new build", will produce fruitful return. Therefore, though the feasibility study is a preliminary one, the resources and efforts put in is high and the results produced are influential to the redevelopment decisions in the company.

Stage 5 – Review of Findings from Preliminary Feasibility Study

In this stage, the results and recommendations produced in the preliminary feasibility study are reviewed by senior management. After discussion among senior management, a decision can be made whether or not to proceed to detailed analysis of the redevelopment project. If senior management thinks that the project is worth adopting, a detailed feasibility study will be carried out in order to refine the financial return and the practical considerations of the projects.

Stage 6 – Detailed Feasibility Study

In this stage, it is almost confirmed that redevelopment will be carried out on an existing property that the developer holds, however, the form of redevelopment has not yet been decided. Detailed feasibility study is then carried out, either by external consultants or the in-house team. For example, scheme design for each option is produced for comparison. Moreover, financial return will be refined for both options. In-depth valuations and qualitative assessment are done in order to find out which form of redevelopment is more suitable for that particular premise.

Stage 7 – Review by Board Investment Committee and Decision is made

After the detailed feasibility study, the results will be reviewed by Board Investment Committee to see if the redevelopment project is worthwhile. If the Board Investment Committee does not agree with the potential of the existing premises to take the redevelopment project, no redevelopment works will be carried out. In contrast, if the Board Investment Committee agrees that redevelopment project is worthwhile to take, the Committee will try to compare and evaluate the pros and cons between the "refurbishment" and "demolish and new build" options. After that, a decision of choosing which form of redevelopment options can be made, and the whole decision-making process is ended.

8.2.2 Time Required for the Decision-making Process

From the developers' view, there is not a fixed time for the whole decision-making process. The time required usually depends on the scale of the project. Respondent from Developer B gives an example that the refurbishment works carried out in one of its shopping mall in the year 2003, which is a comparatively a small scaled project, the whole decision-making process for reaching the refurbishment decisions lasted about 1 year. In other cases that he encountered before, the decision-making process is much longer as large scale projects require more serious and thorough considerations.

8.2.3 Monitory System of the Execution of the Decision

For both developers, there is a monitory system of the execution of the redevelopment decision. For Developer A, a reporting system within the organization among different departments is implemented. The respondent from Developer A emphasizes the importance of communication among different departments when implementing a new decision. For Developer B, there is not a systematic monitoring system. Since various departments are involved in implementing the decision, the monitoring works leave within the departments. If there is any important event to be discussed, ad-hoc

meeting is held for discussing the problems.

8.2.4 Difference in Considerations of Factors for Different Types of Premises

Both developers agree that there is no difference in considering the factors that affect developers' choice in forms of redevelopment for difference types of premises. The decision process remains the same and the considerations taken into account shows no difference.

8.3 Decision Model

After concluding the opinions and information about the decision-making process in choosing among the "refurbishment" and "demolish and new build" options collected from the interviewees, a preliminary decision model can be worked out. Generally, the decision-making process in the two case studies is similar. One of the differences in opinions between the two case studies is the considerations, which they take into account in one step of the decision-making process. Also, there is a minor difference between the two case studies at the detailed feasibility study stage. A flow chart is used to demonstrate the flow of decision-making process for the developers in the case studies in choosing forms of redevelopment for existing properties they hold. This decision process model, is constructed based on the information collected via the return questionnaires and interviews with senior management in Developer A and Developer B in the case studies, however, it cannot be concluded that this decision process model is applicable to all the developers in Hong Kong.

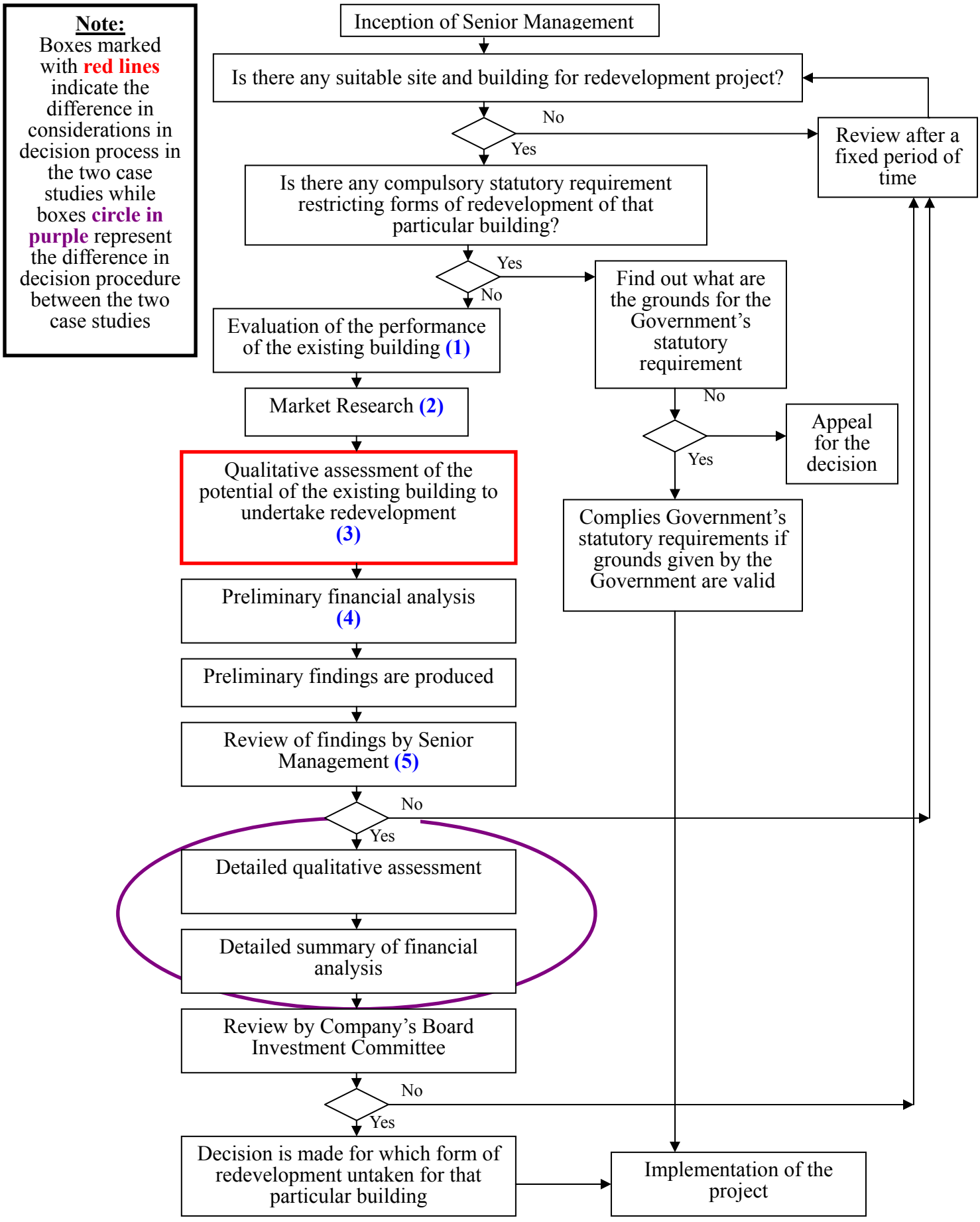


Figure 6 Decision Process Model for Developers in Choosing Forms of Redevelopment

8.3.1 Considerations and Implications at Different Decision-making Stages in the Two Case Studies

No.	Considerations	Implications
1	Rental income, occupancy rate, tenancy arrangement, legal considerations, existing land use	Is it worthwhile to make any change to the existing property? Will the redevelopment project improve the existing property's performance and increase the return from this property?
2	Current market trend and behavior (e.g. supply and demand, types of development are more favorable), activities that other developers do in the same arena, cost of finance, interest rates	Is it worthwhile to take redevelopment project as an alternative means to provide "new" accommodation under the current market situation?
4	Expected increase in rental income after the redevelopment project, the estimated cost of finance for the project, profitability of the project	Comparison between possible increase of revenue after taking the redevelopment project and the cost required to take the project

5	Profitability of the project	Does the project generate profitable returns?
	Corporate values and strategies	Is this redevelopment project in line with the corporate values and strategies? Will it affect the existing portfolios of the company?

Table 10 Considerations and Implications at Different Decision-making Process Stages for Developer A and Developer B

N.B. No. 3 shows differences in considerations for the two developers and will be presented below.

8.3.2 Differences in Considerations and Implications in Decision-making Stages in the Two Case Studies

Company	Considerations	Implications
No. 3		
Developer A	Social Impact	Will the redevelopment project bring adverse impact on the existing community? Is there any public reaction towards the project?
	Environmental Impact	Will the redevelopment project bring adverse impact on the neighboring environment or is there any better alternative that cause less harm to the environment?
	Existing Portfolios	Will the redevelopment project bring mutual benefits to the existing portfolios?
	Flexibility of the decision	

Developer B	Existing Portfolios	What is the impact of the new redevelopment project on the existing portfolios, be it negative or positive?
	Current Project Undertake	Is there sufficient resource to take the new redevelopment project?
	Availability of Vacant Sites	Is there any other vacant site that has a high potential for development?
	Flexibility of the decision	

Table 11 Differences in Considerations and Implications in a Decision-making Process Stage For Developer A and Developer B

The major differences in consideration in decision-making process for choosing forms of redevelopment in the two case studies appear in the stage, named "qualitative assessment of the potential of existing building to take up redevelopment". Basically, the differences between the considerations and implications are mainly because of the

differences in the corporate strategies and values between the two developers. As one of the corporate values of Developer A is social responsibility. Therefore, in assessing the feasibility of the proposed redevelopment options, social responsibility and environmental issues are considered. On the other hand, Developer B focuses on the impact of the proposed redevelopment projects on the existing portfolio.

8.3.3 Procedural Difference between the Two Case Studies

As indicated in the decision process model, there is a slight procedural difference between the two case studies in the detailed feasibility study stage and financial analysis. For Developer A, both the detailed feasibility study and financial analysis are carried out by in-house staff. The company seldom hires external consultants to execute this part of works as there are a lot of experts in the Company who are capable in executing the jobs. However, for Developer B, both the detailed feasibility study and financial analysis are carried by external consultants. From the developer's point of view, hiring external consultant can produce more professional results.

8.4 Conclusion

The decision process in choosing forms of redevelopment options of developers in the two case studies shows similarities, with only little variations in considerations and procedures throughout the whole decision-making process. Factors affecting the developers' decision in choosing forms of redevelopment are added into the decision model. The construction of the preliminary decision model in this Study aims at providing a clearer picture on developers' decision process in making an important property development decisions in order to improve the effectiveness in redevelopment decision process.

From the constructed decision process model in the two case studies, it is observed that the decision-making process of the two developers fit into the 'bound' rationality model proposed by Simon (1957) as both developers are making their redevelopment decisions concerning the discovery and the selection of satisfactory alternatives within a world that is full of uncertainties using their limited knowledge in making such a decision. This decision can also be regarded as a 'programmed' decision as it is well-defined, unambiguous and follows a set of procedures in reaching the decision.

Chapter 9

Conclusion

9.1 Research Background

Property development is an important economic activity for private developers in Hong Kong. When private developers want to provide new accommodation in the market, it can be achieved by developing new properties on vacant site or by redeveloping any existing properties or buildings that the developers hold. The choice between these two options mainly depends on the strategies and considerations adopted by different developers. During the property development process, there are two important sequential decisions for developers to make. The first one is whether or not to adopt redevelopment as an alternative means to provide "new" accommodation in the market. Developers may not take redevelopment as a way to develop new properties in the market. Considerations in various aspects such as market outlook and profitability of the project should be made before they make such a decision.

The second decision is the choice among forms of redevelopment, i.e. the "refurbishment" or "demolish and new build" options. The terms "refurbishment" and "demolish and new build" are defined in this Study. The choice among the "refurbishment" and "demolish and new build" options is a complicated decision which involves a lot of considerations over a considerable period of time. However, there is very little previous research studying the factors underpinning this decision. This dissertation focuses on the factors affecting developers' decisions in choosing forms of redevelopment in Hong Kong. A number of factors from previous literature and theories are identified. However, no previous study tries to investigate the relative importance of the factors that influence developers' decisions in choosing forms of redevelopment. Moreover, due to the lack of the decision models which represent how the "refurbishment" vs. "demolish and new build" decision is made, therefore, this dissertation targets this niche and investigates the factors that influence developers' decisions in choosing forms of redevelopment and determines their relative importance and develops a preliminary decision process model for developers through case studies of two developers in Hong Kong.

9.2 Research Results

Three objectives have been set out in this Study and conclusions relating to them are discussed below.

Objective 1: To identify the factors that affect developers' decisions in choosing forms of redevelopment in Hong Kong

Objective 1 has been achieved in Chapter 2, 5, 6, 7 in which literature review and three case studies has been carried out with three leading private developers in Hong Kong. Questionnaires are sent to senior management in the three developers who are actively involved is the decision-making process of property development in the companies. The results obtained from the questionnaire forms the basis of the research study on the factors influencing developers' decisions in choosing forms of redevelopment in Hong Kong.

It is found that there is diverse pattern in the average level of importance in different categories of factors between the three developers. The category *Other factors* ranks the highest among the five categories for Developer A, the category *Economic*

considerations ranks the highest for Developer B while the category *Government policy* ranks the highest for Developer C. This can be explained by the fact that the three developers have significant difference in investment strategies adopted and corporate size.

Objective 2: To determine the relative importance of the factors

Objective 2 is carried out in Chapter 6 in which the 32 factors identified are evaluated in both case studies by ranking the relative importance marked by the respective respondents. The factors *Compulsory statutory requirements*, *Increase in rental value after redevelopment* and *Profitability* rank the highest level of importance in the three case studies. This is due to the fact the statutory and legal requirements issued by the Government are compulsory to be complied. These requirements limit the choice of the developers and the future development potential of the existing properties. Therefore, both developers take this factor seriously in considering the forms of redevelopment used for their existing properties.

In order to test if the corporate size affects the three developers in indicating the level of importance of the factors, Spearman rank correlation test is carried out. The results

show at 5 % significance level, Developer A, Developer B and Developer C show correlation in considering all the individual factors, however, there is no correlation between them in considering different categories of factors. It is also noted that all the three developers have the same perception in ranking the factors within the category *Economic considerations*. This finding implies that all companies want to achieve the highest profit under constraints and developers in Hong Kong are no exception and this agrees with the theory of profit maximization.

For Developer A and Developer B, the difference in ranking different categories of factors is mainly due to the difference in ranking factors within the corporate strategy category between the two developers. For Developer A and Developer C, it is observed that there is not similar pattern in considering the categories of factors. These differences can be explained by the difference in the corporate size and investment strategies adopted.

Developer A has a relatively strong market position in the property development industry while Developer B is a relatively small property developer in Hong Kong, and therefore, when Developer A considers any investment activities, it does not emphasize on the growth of market share as Developer B does. In contrast, if

Developer B wants to excel its position in the industry, it needs to consider any growth opportunity available for the company so as to achieve a better position in the market and as a result, this leads to significant variations between the two developers in ranking the factor *Growth of market share*.

For Developer A and C, though their corporate size is similar, their differences in investment strategies lead to disagreement in ranking different categories of factors between them. This implies that even the developers have similar size and market share, they still consider different categories of factors affecting the redevelopment decisions differently due to the unique investment strategies that the company adopts.

It is concluded that developers' attitudes and considerations in redevelopment decisions towards the importance of different categories of factors vary with the corporate size, objectives, strategies and values.

Objective 3: To develop a preliminary decision model

Objective 3 is achieved in Chapter 8. A decision process flowchart illustrating the decision-making process of developers in choosing forms of redevelopment is

constructed in accordance to the results from the questionnaires and interviews. Respondents of the questionnaire from Developer A and B in the two case studies agree to provide information about the decision-making process in their companies. The two respondents are both senior management who are actively involved in property development decisions in the companies. Apart from the construction of the flowchart, different considerations and implications in various decision stages have been discussed in the two case studies.

Generally, there is not significant variation in the decision stages and processes between the two developers. However, due to the differences in the corporate values and strategies, and also the company resources and expertise, there is a little difference in the considerations in qualitative assessment decision stage and detailed feasibility study stage.

From the constructed decision process model in the two case studies, it is observed that both developers' decision-making process in choosing forms of redevelopment follows the 'bounded' rationality model proposed by Simon (1957) as the developers are making their 'good enough' decisions in a market which is full of uncertainties and risks with limited knowledge about the decisions they made. This decision can be

regarded as a 'programmed' decision as it is an outcome of a thorough and conscientious decision-making process, including different steps in a particular order of sequence.

9.3 Limitations of the Study

In this Study, factors affecting developers' decisions in choosing forms of redevelopment and their relative importance in Hong Kong are investigated. The most important limitation of the Study is the low response rate of developers that are willing to reveal their information and ideas in this aspect. The low response rate may affect the significance and the representation of the results among developers in Hong Kong. However, the response rate is difficult to control. If the number of developers who are willing to participate in the Study could be increased, more accurate and generalized results could be obtained. This can definitely reinforce the implication of the Study.

Moreover, the late reply of questionnaire from the respondents limits the collection of information from the respondents. It is not possible to reach the respondent after the collection and analysis of questionnaire. Follow-up interviews cannot be carried out

and, thus, it is not possible to discuss the reasons why the company ranks the factors in the questionnaire. If the follow-up interview could be done, this could reinforce the implication of the Study.

Besides the limited number of developers participated, another limitation for the Study is that the identification of the factors may not be comprehensive enough. Since there are no previous literature and studies which have identified comprehensive coverage of factors that affect the developers' "refurbishment" vs. "demolish and new build" decisions, factors used in the questionnaire are gathered from scattered literatures and theories. These factors may not be practical in Hong Kong, also, some of these previous researches have been undertaken for more than 10 years and may not be adoptable for the fluctuating property development business environment. There may be also some other factors, which are not including in these previous literature are omitted in this Study. Moreover, 32 factors are contained in the questionnaire, such large number of factors may have certain degree of correlations. This may affect the choice of level of importance of the factors to some respondents.

Using questionnaire and telephone interviews may also limit the scope of the Study. As in questionnaire, only simple and straight forward questions can be asked,

complex information cannot be collected for the purpose of the Study. Also, the use of telephone interviews may limit the information obtained. Direct observation and interaction are thus not possible.

Not only the research methods limit the Study, but also the scope and assumptions confine the Study. This Study focuses on factors affecting developers' decisions in choosing forms of redevelopment of properties they hold. This assumes that besides refurbishment and demolish and new build options, there are not any other alternatives available for developers. Alternatively, developers can choose to abandon the buildings or sell it to other companies instead of investing money into it. Therefore, the other possible measures in dealing with existing properties are excluded in the Study.

Further, the construction of the decision process model is based on the information acquired form the interviewees from the two developers in the case studies. The small number of developers willing to give information may affect the accuracy of the Study. It is assumed that their opinions represent the general practice and considerations for other private developers in Hong Kong. The shortcoming of this assumption is that their opinions may have bias and therefore, not applicable to all developers in Hong

Kong. Therefore, the process model constructed may not represent the entire situation in developers in Hong Kong.

9.4 Recommendations of Further Investigation

In this Study, a list of preset factors affecting developers' decisions in choosing forms of redevelopment is used for the rating of relative importance by the respondents. However, factors in the list may not be comprehensive enough and suitable for the situation in Hong Kong. These factors can be further examined in detailed so that the considerations and implications of these factors can be identified.

Moreover, in this Study, a preliminary decision process model is constructed based on the information given in the two case studies. The model is a preliminary one and is not tested with other developers in Hong Kong. Therefore, further testing on the model can be carried out in order to improve the accuracy of model.

Questionnaire Brief

The nature of buildings, building materials and forms of construction mean that most buildings will have long physical lives. However, during the life of the building, micro changes may render it redundant or obsolete long before physical decay and this implies that either refurbishment or demolition and redevelopment should be carried out in order to maintain or increase the rental income or profit.

In this Study, factors that affect developers' decisions in choosing forms of redevelopment and their relative importance would be identified so as to develop a preliminary decision model for developers to determine "refurbishment" vs. "demolish and new build" decisions in Hong Kong.

Terms used in the study

Refurbishment – the carrying out of building works (e.g. upgrading and addition of building services, improvements of external facade) to any property, or a series of properties, beyond normal maintenance and repairing but not involving major structural changes, thus extending its life to provide a socially desirable and economically viable building environment to provide "new" accommodation and to satisfy the changes of needs of occupiers and increase rental incomes. It is another way to extend the beneficial use of an existing building by providing a cost-effective alternative to demolish and new build.

Demolish and new build – total destruction of existing building and structure, and after that, redevelopment works would be carried out to provide "new" accommodation according to the corporate business strategies.

Decision Questionnaire

All responses will remain **FULLY CONFIDENTIAL**. Please respond by putting a check mark next of the appropriate number.

Part 1 Questions about your company

1. Amount of work undertaking within past 12 months

In terms of number of projects in:
Demolish and new-build works
____ 1) Under 5 ____ 2) 5- 10 ____3) Over 10

Refurbishment works
____ 1) Under 5 ____ 2) 5- 10 ____3) Over 10

In terms of total value of works (Millions of Hong Kong Dollars) in:
Demolish and new-build works
____ 1) Under 10 ____ 2) 10- 50 ____3) Over 50

Refurbishment works
____ 1) Under 10 ____ 2) 10- 50 ____3) Over 50

2. Does your company consider redevelopment of existing buildings (*either by refurbishment or demolish and new build*) as a means to provide new accommodation as an alternative to a new development on vacant land?

____ 1) Yes ____2) No

If No, why does your company not consider redevelopment as an option to provide new accommodation?

_____

_____

3. How frequently does your company review this decision?

____1) 0-6 months ____2) 6-12 months
____3) over 12 months ____4) never

4. Please indicate the factors that *favour redevelopment instead of a new development on vacant land* as a means to provide new accommodation and their level of importance

[High Importance = H; Low Importance: L]

Factors	**Level of Importance**									
	H									**L**
1) Profitability of the development	10	9	8	7	6	5	4	3	2	1
2) Level of Cost	10	9	8	7	6	5	4	3	2	1
3) Duration of development period	10	9	8	7	6	5	4	3	2	1
4) Location of the existing building	10	9	8	7	6	5	4	3	2	1
5) Design factors (e.g. plot ratio)	10	9	8	7	6	5	4	3	2	1
Please list other factors you think are important but not listed above.										
6)	10	9	8	7	6	5	4	3	2	1
7)	10	9	8	7	6	5	4	3	2	1
8)	10	9	8	7	6	5	4	3	2	1
9)	10	9	8	7	6	5	4	3	2	1
10)	10	9	8	7	6	5	4	3	2	1

Part 2 Questions about the factors that influence your redevelopment options involving refurbishment or demolish and new build decisions

Please INDICATE how important each of the following factors to the decisions that you make is.

[High Importance = H; Low Importance: L]

Factors	Level of Importance									
	H									**L**
Economic Considerations										
1. Profitability of the development	10	9	8	7	6	5	4	3	2	1
2. Availability of funding to the development (both long term and short term funding)	10	9	8	7	6	5	4	3	2	1
3. Cost of finance to the whole development project	10	9	8	7	6	5	4	3	2	1
4. Increase in rental value after refurbishment or new build	10	9	8	7	6	5	4	3	2	1
5. Time required to provide "new" accommodation to meet the market demand	10	9	8	7	6	5	4	3	2	1
6. Cost difference between refurbishment and demolish and new build decisions	10	9	8	7	6	5	4	3	2	1
7. Forecast economic growth percentage in Hong Kong by Government and major financial institutions (e.g. HSBC)	10	9	8	7	6	5	4	3	2	1
8. Existing land use	10	9	8	7	6	5	4	3	2	1
9. Existing land value	10	9	8	7	6	5	4	3	2	1
10. Annual saving maintenance cost	10	9	8	7	6	5	4	3	2	1

What kind of data you use for reference in making the decision? (e.g. bank interest)

_____

What are the sources of data?

_____

Corporate Strategies

11.	Growth of market share	10	9	8	7	6	5	4	3	2	1
12.	Flexibility of the decision	10	9	8	7	6	5	4	3	2	1
13.	Improving corporate image	10	9	8	7	6	5	4	3	2	1
14.	Activities that other developers do in the same arena	10	9	8	7	6	5	4	3	2	1
15.	Attracting new tenants	10	9	8	7	6	5	4	3	2	1
16.	Retaining existing tenants	10	9	8	7	6	5	4	3	2	1

Characteristics of the existing building

17.	Age of the building	10	9	8	7	6	5	4	3	2	1
18.	Location of the building	10	9	8	7	6	5	4	3	2	1
19.	Accessibility of the site	10	9	8	7	6	5	4	3	2	1
20.	Remaining life expectancy of the building before redevelopment	10	9	8	7	6	5	4	3	2	1
21.	Conditions and quality of the building before redevelopment	10	9	8	7	6	5	4	3	2	1
22.	Architectural merit of the building before redevelopment	10	9	8	7	6	5	4	3	2	1
23.	Achievable lettable floorspace after redevelopment	10	9	8	7	6	5	4	3	2	1

Government Policy

24.	Planning requirements (e.g. no. of storeys, overall height, plot ratio)	10	9	8	7	6	5	4	3	2	1
25.	Zoning requirements (e.g. nature of development permitted)	10	9	8	7	6	5	4	3	2	1
26.	Encouragement of conservation and preservation	10	9	8	7	6	5	4	3	2	1
27.	Compulsory statutory requirements	10	9	8	7	6	5	4	3	2	1
28.	Possible procedural delays in gaining necessary approvals (e.g. demolition consent, planning applications)	10	9	8	7	6	5	4	3	2	1

Other factors

29.	Social considerations (e.g. retaining the historical image of the community)	10	9	8	7	6	5	4	3	2	1
30.	Public reactions against the location and design of new development	10	9	8	7	6	5	4	3	2	1
31.	Legal considerations (e.g. ownership, easement)	10	9	8	7	6	5	4	3	2	1
32.	Environmental issues (e.g. energy and resources conservation)	10	9	8	7	6	5	4	3	2	1

Please list other factors you think are important but not listed above (in 1-32).

33.	_____	10	9	8	7	6	5	4	3	2	1
34.	_____	10	9	8	7	6	5	4	3	2	1
35.	_____	10	9	8	7	6	5	4	3	2	1

Part. 3 Please indicate the following:

1. Please briefly explain the process of making the refurbishment or demolish and new build decision in your company (use of diagrams to illustrate is welcome)

   _____
   _____
   _____
   _____

   Please list in time based sequence the crucial decision points in making a decision of refurbishment or demolish and new build to an existing properties

1.	_____	6.	_____
2.	_____	7.	_____
3.	_____	8.	_____
4.	_____		_____
5.	_____		_____

2. Would the decision process be different for different types of premises?
   ____ 1) Yes ____2) No

   If Yes, what is the major difference?

   _____

3. Would the considerations be different for different types of premises?
   ____ 1) Yes ____2) No

   If Yes, what is the major difference?

   _____

4. Who considers these factors when making the refurbishment or demolish and new build decision?

   _____

5. How long usually would the decision process take?

   _____

6. Who approves the decisions within the organization? When is it done? If the approval is in stages, please state the main stages.

   WHO _____
   WHEN _____
   MAIN STAGES _____

7. Is there any monitory system of the execution of the decision?

   _____

   Is Yes, how does the system work?

   _____

If you have any additional information that would help us to understand your firm's decision process, please state here.

_____
_____
_____

THANK YOU VERY MUCH FOR YOUR COOPERATION

Rank Correlation Statistics Result

(of individual factors)

Factors	Ranks		d	d^2
	Developer A	Developer B		
Profitability of the development	2	1	1	1
Availability of funding to the development	5	6	-1	1
Cost of finance to the whole development	3	3	0	0
Increase in rental value after redevelopment	2	1	1	1
Time required to provide "new" accommodation	5	4	1	1
Cost difference between the two decisions	5	5	0	0
Forecast economic growth percentage	5	6	-1	1
Existing land use	3	2	1	1
Existing land value	5	2	3	9
Annual saving maintenance cost	6	8	-2	4
Growth of market share	7	2	5	25
Flexibility of the decisions	4	3	1	1
Improving corporate image	5	4	1	1
Activities that other developers do in the same arena	3	6	-3	9
Attracting new tenants	3	4	-1	1
Retaining existing tenants	4	4	0	0
Age of the building	8	5	3	9
Location of the building	6	2	4	16
Accessibility of the site	6	3	3	9
Remaining life expectancy before redevelopment	7	6	1	1
Conditions and quality of building before redevelopment	7	7	0	0
Architectural merit of the building before redevelopment	7	6	1	1
Achievable lettable floorspace after redevelopment	5	5	0	0
Planning requirements	7	7	0	0
Zoning requirements	7	8	-1	1
Encouragement of conservation and preservation	3	4	-1	1

Compulsory statutory requirements	1	1	0	0
Possible procedural delays in gainaing necessary approvals	9	9	0	0
Social considerations	2	5	-3	9
Public reactions against the location and design of new development	5	7	-2	4
Legal considerations	1	1	0	0
Environment issues	4	6	-2	4
Spearman Rank Correlation = 0.9797		**$\sum d^2 = 111$**		

Factors	Ranks		d	D^2
	Developer B	Developer C		
Profitability of the development	1	1	0	0
Availability of funding to the development	6	6	0	0
Cost of finance to the whole development	3	6	-3	9
Increase in rental value after redevelopment	1	2	-1	1
Time required to provide "new" accommodation	4	4	0	0
Cost difference between the two decisions	5	3	2	4
Forecast economic growth percentage	6	4	2	4
Existing land use	2	2	0	0
Existing land value	2	2	0	0
Annual saving maintenance cost	8	4	4	16
Growth of market share	2	4	-2	4
Flexibility of the decisions	3	4	-1	1
Improving corporate image	4	4	0	0
Activities that other developers do in the same arena	6	4	2	4
Attracting new tenants	4	4	0	0
Retaining existing tenants	4	4	0	0
Age of the building	5	3	2	4
Location of the building	2	3	-1	1
Accessibility of the site	3	3	0	0
Remaining life expectancy before redevelopment	6	3	3	9
Conditions and quality of building before redevelopment	7	3	4	16
Architectural merit of the building before redevelopment	6	5	1	1
Achievable lettable floorspace after redevelopment	5	1	4	16
Planning requirements	7	2	5	25
Zoning requirements	8	2	6	36
Encouragement of conservation and preservation	4	3	1	1
Compulsory statutory requirements	1	2	-1	1
Possible procedural delays in gainaing necessary approvals	9	4	5	25
Social considerations	1	5	-4	16

Public reactions against the location and design of new development	5	5	0	0
Legal considerations	7	3	4	16
Environment issues	6	4	2	4
Spearman Rank Correlation = 0.9608		**$\sum d^2 = 214$**		

Factors	Ranks		d	D^2
	Developer A	Developer C		
Profitability of the development	2	1	1	1
Availability of funding to the development	5	6	-1	1
Cost of finance to the whole development	3	6	-3	9
Increase in rental value after redevelopment	2	2	0	0
Time required to provide "new" accommodation	5	4	1	1
Cost difference between the two decisions	5	3	2	4
Forecast economic growth percentage	5	4	1	1
Existing land use	3	2	1	1
Existing land value	5	2	3	9
Annual saving maintenance cost	6	4	2	4
Growth of market share	7	4	3	9
Flexibility of the decisions	4	4	0	0
Improving corporate image	5	4	1	1
Activities that other developers do in the same arena	3	4	-1	1
Attracting new tenants	3	4	-1	1
Retaining existing tenants	4	4	0	0
Age of the building	8	3	5	25
Location of the building	6	3	3	9
Accessibility of the site	6	3	3	9
Remaining life expectancy before redevelopment	7	3	4	16
Conditions and quality of building before redevelopment	7	3	4	16
Architectural merit of the building before redevelopment	7	5	2	4
Achievable lettable floorspace after redevelopment	5	1	4	16
Planning requirements	7	2	5	25
Zoning requirements	7	2	6	36
Encouragement of conservation and preservation	3	3	0	0
Compulsory statutory requirements	1	2	-1	1
Possible procedural delays in gainaing necessary approvals	9	4	5	25
Social considerations	2	5	-3	9

Public reactions against the location and design of new development	5	5	0	0
Legal considerations	1	3	2	4
Environment issues	4	4	0	0
Spearman Rank Correlation = 0.9555		**$\sum d^2 = 243$**		

Rank Correlation Statistics Result

(of category of factors)

Category	Ranks		d	d^2
	Developer A	Developer B		
Economic Considerations	2	1	1	1
Corporate Strategies	3	2	1	1
Characteristics of Existing Building	5	4	1	1
Government Policy	4	5	-1	1
Other Factors	1	3	-2	4
Spearman Rank Correlation = 0.6000			**$\sum d^2 = 8$**	

Category	Ranks		d	d^2
	Developer B	Developer C		
Economic Considerations	1	3	-2	4
Corporate Strategies	2	3	-1	1
Characteristics of Existing Building	4	2	2	4
Government Policy	5	1	4	16
Other Factors	3	4	-1	1
Spearman Rank Correlation = - 0.3000			**$\sum d^2 = 26$**	

Category	Ranks		d	d^2
	Developer A	Developer C		
Economic Considerations	2	3	-1	1
Corporate Strategies	3	3	0	0
Characteristics of Existing Building	5	2	3	9
Government Policy	4	1	3	9
Other Factors	1	4	-3	9
Spearman Rank Correlation = - 0.4000			**$\sum d^2 = 28$**	

Rank Correlation Statistics Result

(of factors within a category)

Category 1 – Economic Considerations

Category 1 – Economic Considerations	**Ranks**		**d**	**d^2**
	Developer A	**Developer B**		
Profitability of the development	1	1	0	0
Availability of funding to the development	3	5	-2	4
Cost of finance to the whole development	2	3	-1	1
Increase in rental value after redevelopment	1	1	0	0
Time required to provide "new" accommodation	3	4	-1	1
Cost difference between the two decisions	3	5	-2	4
Forecast economic growth percentage	3	6	-3	9
Existing land use	2	2	0	0
Existing land value	3	2	1	1
Annual saving maintenance cost	4	7	-3	9
Spearman Rank Correlation = 0.8242			**$\sum d^2$ =29**	

Category 1 – Economic Considerations	**Ranks**		**D**	**d^2**
	Developer B	**Developer C**		
Profitability of the development	1	1	0	0
Availability of funding to the development	5	5	0	0
Cost of finance to the whole development	3	5	- 2	4
Increase in rental value after redevelopment	1	2	-1	1
Time required to provide "new" accommodation	4	4	0	0
Cost difference between the two decisions	5	3	2	4
Forecast economic growth percentage	6	4	2	4
Existing land use	2	3	-1	1
Existing land value	2	3	-1	1
Annual saving maintenance cost	7	4	3	9
Spearman Rank Correlation = 0.8545			**$\sum d^2$ =24**	

Category 1 – Economic Considerations	**Ranks**		**d**	**d^2**
	Developer A	**Developer C**		
Profitability of the development	1	1	0	0
Availability of funding to the development	3	5	-2	4
Cost of finance to the whole development	2	5	-3	9
Increase in rental value after redevelopment	1	2	-1	1
Time required to provide "new" accommodation	3	4	-1	1
Cost difference between the two decisions	3	3	0	0
Forecast economic growth percentage	3	4	-1	1
Existing land use	2	3	-1	1
Existing land value	3	3	0	0
Annual saving maintenance cost	4	4	0	0
Spearman Rank Correlation = 0.8990			**$\sum d^2$ =17**	

Category 2 – Corporate Strategies

Category 2 – Corporate Strategies	**Ranks**		**d**	**d^2**
	Developer A	**Developer B**		
Growth of market share	4	1	3	9
Flexibility of the decision	2	2	0	0
Improving corporate image	3	3	0	0
Activities that other developers do in the same arena	1	4	-3	9
Attracting new tenants	1	3	-2	4
Retaining existing tenants	2	3	-1	1
Spearman Rank Correlation = 0.3429			**$\sum d^2 = 23$**	

Category 2 – Corporate Strategies	**Ranks**		**d**	**d^2**
	Developer B	**Developer C**		
Growth of market share	1	1	0	0
Flexibility of the decision	2	1	1	1
Improving corporate image	3	1	2	4
Activities that other developers do in the same arena	4	1	3	9
Attracting new tenants	3	1	2	4
Retaining existing tenants	3	1	2	4
Spearman Rank Correlation = 0.3714			**$\sum d^2 = 22$**	

Category 2 – Corporate Strategies	**Ranks**		**d**	**d^2**
	Developer A	**Developer C**		
Growth of market share	4	1	3	9
Flexibility of the decision	2	1	1	1
Improving corporate image	3	1	2	4
Activities that other developers do in the same arena	1	1	0	0
Attracting new tenants	1	1	0	0
Retaining existing tenants	2	1	1	1
Spearman Rank Correlation = 0.5714			**$\sum d^2 = 15$**	

Category 3 – Characteristics of the existing building

Category 3 – Characteristics of the existing building	**Ranks**		**d**	**d^2**
	Developer A	**Developer B**		
Age of the building	4	3	1	1
Location of the building	2	1	1	1
Accessibility of the site	2	2	0	0
Remaining life expectancy of the building before redevelopment	3	4	-1	1
Conditions and quality of the building before redevelopment	3	5	-2	4
Architectural merit of the building before redevelopment	3	4	-1	1
Achievable lettable floorspace after redevelopment	1	3	-2	4
Spearman Rank Correlation = 0.7857			**$\sum d^2 = 12$**	

Category 3 – Characteristics of the existing building	**Ranks**		**d**	**d^2**
	Developer B	**Developer C**		
Age of the building	3	2	1	1
Location of the building	1	2	-1	1
Accessibility of the site	2	2	0	0
Remaining life expectancy of the building before redevelopment	4	2	2	4
Conditions and quality of the building before redevelopment	5	2	3	9
Architectural merit of the building before redevelopment	4	3	1	1
Achievable lettable floorspace after redevelopment	3	1	2	4
Spearman Rank Correlation = 0.6429			**$\sum d^2 = 20$**	

Category 3 – Characteristics of the existing building	**Ranks**		**d**	**d^2**
	Developer A	**Developer C**		
Age of the building	4	2	2	4
Location of the building	2	2	0	0
Accessibility of the site	2	2	0	0
Remaining life expectancy of the building before redevelopment	3	2	1	1
Conditions and quality of the building before redevelopment	3	2	1	1
Architectural merit of the building before redevelopment	3	3	0	0
Achievable lettable floorspace after redevelopment	1	1	0	0
Spearman Rank Correlation = 0.8929			**$\sum d^2 = 6$**	

Category 4 – Government Policy

Category 4 – Government Policy	**Ranks**		**d**	**d^2**
	Developer A	**Developer B**		
Planning requirements	3	3	0	0
Zoning requirements	3	4	-1	1
Encouragement of conservation and preservation	2	2	0	0
Compulsory statutory requirements	1	1	0	0
Possible procedural delays in gaining necessary approvals	4	5	-1	1
Spearman Rank Correlation = 0.9000			**$\sum d^2 = 2$**	

Category 4 – Government Policy	**Ranks**		**d**	**d^2**
	Developer B	**Developer C**		
Planning requirements	3	1	2	4
Zoning requirements	4	1	3	9
Encouragement of conservation and preservation	2	2	0	0
Compulsory statutory requirements	1	1	0	0
Possible procedural delays in gaining necessary approvals	5	3	2	4
Spearman Rank Correlation = 0.1500			**$\sum d^2 = 17$**	

Category 4 – Government Policy	**Ranks**		**d**	**d^2**
	Developer A	**Developer C**		
Planning requirements	3	1	2	4
Zoning requirements	3	1	2	4
Encouragement of conservation and preservation	2	2	0	0
Compulsory statutory requirements	1	1	0	0
Possible procedural delays in gaining necessary approvals	4	3	1	1
Spearman Rank Correlation = 0.5500			**$\sum d^2 = 9$**	

Category 5 – Other factors

Category 5 – Other factors	**Ranks**		**d**	**d^2**
	Developer A	**Developer B**		
Social considerations	2	2	0	0
Public reactions against the location and design of new development	4	4	0	0
Legal considerations	1	1	0	0
Environmental issues	3	3	0	0
Spearman Rank Correlation = 1.0000			**$\sum d^2 = 0$**	

Category 5 – Other factors	**Ranks**		**d**	**d^2**
	Developer B	**Developer C**		
Social considerations	2	3	-1	1
Public reactions against the location and design of new development	4	3	1	1
Legal considerations	1	1	0	0
Environmental issues	3	2	1	1
Spearman Rank Correlation = 0.7000			**$\sum d^2 = 3$**	

Category 5 – Other factors	**Ranks**		**d**	**d^2**
	Developer A	**Developer C**		
Social considerations	2	3	-1	1
Public reactions against the location and design of new development	4	3	1	1
Legal considerations	1	1	0	0
Environmental issues	3	2	1	1
Spearman Rank Correlation = 0.7000			**$\sum d^2 = 3$**	

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer B)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.20

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9797
The value of the test statistics r_s for categories of factors = 0.6000
The value of the test statistics r_s for factors in category 1 = 0.8242
The value of the test statistics r_s for factors in category 2 = 0.3429
The value of the test statistics r_s for factors in category 3 = 0.7857
The value of the test statistics r_s for factors in category 4 = 0.9000
The value of the test statistics r_s for factors in category 5 = 1.0000

Since n= 32, β= 0.20, the critical value of r_s is 0.1512. Because the test statistics r_s is 0.9797 for individual factors which exceeds the critical value of 0.1512, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking individual factors.

Since n=5, β=0.20, the critical value of r_s is 0.7000. Because the test statistics r_s is 0.6000 for categories of factors which is below the critical value of 0.7000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in the average ranking in different categories of factors.

Since n=10, β=0.20, the critical value of r_s is 0.4424. Because the test statistics r_s is 0.8242 for factors within category 1 which exceeds the critical value of 0.4424, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 1 (economic considerations).

Since n=6, β=0.20, the critical value of r_s is 0.6000. Because the test statistics r_s is 0.3429 for factors within category 2 which is below the critical value of 0.6000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.20, the critical value of r_s is 0.5357. Because the test statistics r_s is 0.7857 for factors within category 3 which exceeds the critical value of 0.5357, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.20, the critical value of r_s is 0.7000. Because the test statistics r_s is 0.9000 for factors within category 4 which exceeds the critical value of 0.7000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 4 (government policy).

Since n=4, β=0.20, the critical value of r_s is 0.8000. Because the test statistics r_s is 1.0000 for factors within category 5 which exceeds the critical value of 0.8000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer B)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.10

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9797
The value of the test statistics r_s for categories of factors = 0.6000
The value of the test statistics r_s for factors in category 1 = 0.8242
The value of the test statistics r_s for factors in category 2 = 0.3429
The value of the test statistics r_s for factors in category 3 = 0.7857
The value of the test statistics r_s for factors in category 4 = 0.9000
The value of the test statistics r_s for factors in category 5 = 1.0000

Since n= 32, β= 0.10, the critical value of r_s is 0.2303. Because the test statistics r_s is 0.9797 for individual factors which exceeds the critical value of 0.2303, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking individual factors.

Since n=5, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.6000 for categories of factors which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in the average ranking in different categories of factors.

Since n=10, β=0.10, the critical value of r_s is 0.5515. Because the test statistics r_s is 0.8242 for factors within category 1 which exceeds the critical value of 0.5515, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 1 (economic considerations).

Since n=6, β=0.10, the critical value of r_s is 0.7714. Because the test statistics r_s is 0.3429 for factors within category 2 which is below the critical value of 0.7714, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.10, the critical value of r_s is 0.6786. Because the test statistics r_s is 0.7857 for factors within category 3 which exceeds the critical value of 0.6786, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.9000 for factors within category 4 which exceeds the critical value of 0.8000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 4 (government policy).

Since n=4, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 1.0000 for factors within category 5 which exceeds the critical value of 0.8000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer B)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.05

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9797
The value of the test statistics r_s for categories of factors = 0.6000
The value of the test statistics r_s for factors in category 1 = 0.8242
The value of the test statistics r_s for factors in category 2 = 0.3429
The value of the test statistics r_s for factors in category 3 = 0.7857
The value of the test statistics r_s for factors in category 4 = 0.9000
The value of the test statistics r_s for factors in category 5 = 1.0000

Since n= 32, β= 0.05, the critical value of r_s is 0.2955. Because the test statistics r_s is 0.9797 for individual factors which exceeds the critical value of 0.2955, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking individual factors.

Since n=5, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.6000 for categories of factors which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in the average ranking in different categories of factors.

Since n=10, β=0.05, the critical value of r_s is 0.6364. Because the test statistics r_s is 0.8242 for factors within category 1 which exceeds the critical value of 0.6364, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 1 (economic considerations).

Since n=6, β=0.05, the critical value of r_s is 0.8286. Because the test statistics r_s is 0.3429 for factors within category 2 which is below the critical value of 0.8286, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.05, the critical value of r_s is 0.7450. Because the test statistics r_s is 0.7857 for factors within category 3 which exceeds the critical value of 0.7450, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.9000 for factors within category 4 which equals the critical value of 0.9000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 4 (government policy).

Since n=4, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 1.0000 for factors within category 5 which exceeds the critical value of 0.9000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer B)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.02

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9797
The value of the test statistics r_s for categories of factors = 0.6000
The value of the test statistics r_s for factors in category 1 = 0.8242
The value of the test statistics r_s for factors in category 2 = 0.3429
The value of the test statistics r_s for factors in category 3 = 0.7857
The value of the test statistics r_s for factors in category 4 = 0.9000
The value of the test statistics r_s for factors in category 5 = 1.0000

Since n= 32, β= 0.02, the critical value of r_s is 0.3689. Because the test statistics r_s is 0.9797 for individual factors which exceeds the critical value of 0.3689, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking individual factors.

Since n=5, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.6000 for categories of factors which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in the average ranking in different categories of factors.

Since n=10, β=0.02, the critical value of r_s is 0.7333. Because the test statistics r_s is 0.8242 for factors within category 1 which exceeds the critical value of 0.7333, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 1 (economic considerations).

Since n=6, β=0.02, the critical value of r_s is 0.8857. Because the test statistics r_s is 0.3429 for factors within category 2 which is below the critical value of 0.8857, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.02, the critical value of r_s is 0.8571. Because the test statistics r_s is 0.7857 for factors within category 3 which is below the critical value of 0.8571, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.9000 for factors within category 4 which equals the critical value of 0.9000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 4 (government policy).

Since n=4, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 1.0000 for factors within category 5 which exceeds the critical value of 0.9000, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and B in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer B and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.20

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9608
The value of the test statistics r_s for categories of factors = - 0.3000
The value of the test statistics r_s for factors in category 1 = 0.8545
The value of the test statistics r_s for factors in category 2 = 0.3714
The value of the test statistics r_s for factors in category 3 = 0.6429
The value of the test statistics r_s for factors in category 4 = 0.1500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.20, the critical value of r_s is 0.1512. Because the test statistics r_s is 0.9608 for individual factors which exceeds the critical value of 0.1512, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking individual factors.

Since n=5, β=0.20, the critical value of r_s is 0.7000. Because the test statistics r_s is -0.3000 for categories of factors which is below the critical value of 0.7000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in the average ranking in different categories of factors.

Since n=10, β=0.20, the critical value of r_s is 0.4424. Because the test statistics r_s is 0.8545 for factors within category 1 which exceeds the critical value of 0.4424, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.20, the critical value of r_s is 0.6000. Because the test statistics r_s is 0.3714 for factors within category 2 which is below the critical value of 0.6000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.20, the critical value of r_s is 0.5357. Because the test statistics r_s is 0.6428 for factors within category 3 which exceeds the critical value of 0.5357, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.20, the critical value of r_s is 0.7000. Because the test statistics r_s is 0.1500 for factors within category 4 which is below the critical value of 0.7000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 4 (government policy).

Since n=4, β=0.20, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer B and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.10

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9608
The value of the test statistics r_s for categories of factors = - 0.3000
The value of the test statistics r_s for factors in category 1 = 0.8545
The value of the test statistics r_s for factors in category 2 = 0.3714
The value of the test statistics r_s for factors in category 3 = 0.6429
The value of the test statistics r_s for factors in category 4 = 0.1500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.10, the critical value of r_s is 0.2303. Because the test statistics r_s is 0.9608 for individual factors which exceeds the critical value of 0.2303, we reject the null hypothesis of no correlation. It appears a correlation exists between Developer B and C in ranking individual factors.

Since n=5, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is -0.3000 for categories of factors which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in the average ranking in different categories of factors.

Since n=10, β=0.10, the critical value of r_s is 0.5515. Because the test statistics r_s is 0.8545 for factors within category 1 which exceeds the critical value of 0.5515, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.10, the critical value of r_s is 0.7714. Because the test statistics r_s is 0.3714 for factors within category 2 which is below the critical value of 0.7714, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.10, the critical value of r_s is 0.6786. Because the test statistics r_s is 0.6429 for factors within category 3 which is below the critical value of 0.6786, we accept the null hypothesis of no correlation. It appears no correlation exists between Developer B and C in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.1500 for factors within category 4 which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears no correlation exists between Developer B and C in ranking factors within category 4 (government policy).

Since n=4, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears a correlation exists between Developer B and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer B and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.05

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9608
The value of the test statistics r_s for categories of factors = - 0.3000
The value of the test statistics r_s for factors in category 1 = 0.8545
The value of the test statistics r_s for factors in category 2 = 0.3714
The value of the test statistics r_s for factors in category 3 = 0.6429
The value of the test statistics r_s for factors in category 4 = 0.1500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.05, the critical value of r_s is 0.2955. Because the test statistics r_s is 0.9608 for individual factors which exceeds the critical value of 0.2955, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking individual factors.

Since n=5, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is -0.3000 for categories of factors which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in the average ranking in different categories of factors.

Since n=10, β=0.05, the critical value of r_s is 0.6364. Because the test statistics r_s is 0.8545 for factors within category 1 which exceeds the critical value of 0.6364, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.05, the critical value of r_s is 0.8286. Because the test statistics r_s is 0.3714 for factors within category 2 which is below the critical value of 0.8286, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.05, the critical value of r_s is 0.7450. Because the test statistics r_s is 0.6429 for factors within category 3 which is below the critical value of 0.7450, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.1500 for factors within category 4 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 4 (government policy).

Since n=4, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer B and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.02

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9608
The value of the test statistics r_s for categories of factors = - 0.3000
The value of the test statistics r_s for factors in category 1 = 0.8545
The value of the test statistics r_s for factors in category 2 = 0.3714
The value of the test statistics r_s for factors in category 3 = 0.6429
The value of the test statistics r_s for factors in category 4 = 0.1500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.02, the critical value of r_s is 0.3689. Because the test statistics r_s is 0.9608 for individual factors which exceeds the critical value of 0.3689, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking individual factors.

Since n=5, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is -0.3000 for categories of factors which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in the average ranking in different categories of factors.

Since n=10, β=0.02, the critical value of r_s is 0.7333. Because the test statistics r_s is 0.8545 for factors within category 1 which exceeds the critical value of 0.7333, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer B and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.02, the critical value of r_s is 0.8857. Because the test statistics r_s is 0.3714 for factors within category 2 which is below the critical value of 0.8857, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.02, the critical value of r_s is 0.8571. Because the test statistics r_s is 0.6429 for factors within category 3 which is below the critical value of 0.8571, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 3 (characteristics of the existing building).

Since n=5, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.1599 for factors within category 4 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 4 (government policy).

Since n=4, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer B and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.20

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9555
The value of the test statistics r_s for categories of factors = -0.4000
The value of the test statistics r_s for factors in category 1 = 0.8970
The value of the test statistics r_s for factors in category 2 = 0.5714
The value of the test statistics r_s for factors in category 3 = 0.8929
The value of the test statistics r_s for factors in category 4 = 0.5500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.20, the critical value of r_s is 0.1512. Because the test statistics r_s is 0.9555 for individual factors which exceeds the critical value of 0.1512, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking individual factors.

Since n=5, β=0.20, the critical value of r_s is 0.7000. Because the test statistics r_s is -0.4000 for categories of factors which is below the critical value of 0.7000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in the average ranking in different categories of factors.

Since n=10, β=0.20, the critical value of r_s is 0.4424. Because the test statistics r_s is 0.8970 for factors within category 1 which exceeds the critical value of 0.4424, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.20, the critical value of r_s is 0.6000. Because the test statistics r_s is 0.5714 for factors within category 2 which is below the critical value of 0.6000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.20, the critical value of r_s is 0.5357. Because the test statistics r_s is 0.8929 for factors within category 3 which exceeds the critical value of 0.5357, we reject the null hypothesis of no correlation. It appears a correlation exists between Developer A and C in ranking factors within category 3 (characteristics of existing the building).

Since n=5, β=0.20, the critical value of r_s is 0.7000. Because the test statistics r_s is 0.5500 for factors within category 4 which is below the critical value of 0.7000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 4 (government policy).

Since n=4, β=0.20, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.10

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9555
The value of the test statistics r_s for categories of factors = -0.4000
The value of the test statistics r_s for factors in category 1 = 0.8970
The value of the test statistics r_s for factors in category 2 = 0.5714
The value of the test statistics r_s for factors in category 3 = 0.8929
The value of the test statistics r_s for factors in category 4 = 0.5500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.10, the critical value of r_s is 0.2303. Because the test statistics r_s is 0.9555 for individual factors which exceeds the critical value of 0.2303, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking individual factors.

Since n=5, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is -0.4000 for categories of factors which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in the average ranking in different categories of factors.

Since n=10, β=0.10, the critical value of r_s is 0.5515. Because the test statistics r_s is 0.8970 for factors within category 1 which exceeds the critical value of 0.5515, we reject the null hypothesis of no correlation. It appears a correlation exists between developer A and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.10, the critical value of r_s is 0.7714. Because the test statistics r_s is 0.5714 for factors within category 2 which is below the critical value of 0.7714, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.10, the critical value of r_s is 0.6786. Because the test statistics r_s is 0.8929 for factors within category 3 which exceeds the critical value of 0.6786, we reject the null hypothesis of no correlation. It appears a correlation exists between Developer A and C in ranking factors within category 3 (characteristics of existing building).

Since n=5, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.5500 for factors within category 4 which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 4 (government policy).

Since n=4, β=0.10, the critical value of r_s is 0.8000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.8000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.05

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9555
The value of the test statistics r_s for categories of factors = -0.4000
The value of the test statistics r_s for factors in category 1 = 0.8970
The value of the test statistics r_s for factors in category 2 = 0.5714
The value of the test statistics r_s for factors in category 3 = 0.8929
The value of the test statistics r_s for factors in category 4 = 0.5500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.05, the critical value of r_s is 0.2955. Because the test statistics r_s is 0.9555 for individual factors which exceeds the critical value of 0.2955, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking individual factors.

Since n=5, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is -0.4000 for categories of factors which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and B in the average ranking in different categories of factors.

Since n=10, β=0.05, the critical value of r_s is 0.6364. Because the test statistics r_s is 0.8970 for factors within category 1 which exceeds the critical value of 0.6364, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.05, the critical value of r_s is 0.8286. Because the test statistics r_s is 0.5714 for factors within category 2 which is below the critical value of 0.8286, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.05, the critical value of r_s is 0.7450. Because the test statistics r_s is 0.8929 for factors within category 3 which exceeds the critical value of 0.7450, we reject the null hypothesis of no correlation. It appears a correlation exists between Developer A and C in ranking factors within category 3 (characteristics of existing the building).

Since n=5, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.5500 for factors within category 4 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 4 (government policy).

Since n=4, β=0.05, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.7000 for factors within category 5 which exceeds the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears a correlation exists between Developer A and C in ranking factors within category 5 (other factors).

Test Statistic for the Rank Correlation Coefficient

(Between Developer A and Developer C)

No correlation is express symbolically as $\rho_s = 0$

H_0: $\rho_s = 0$
H_1: $\rho_s \neq 0$

The significance level is β = 0.02

$$r_s = 1 - 6 \sum d^2 / n(n^2 - 1)$$

The value of the test statistics r_s for individual factors = 0.9555
The value of the test statistics r_s for categories of factors = -0.4000
The value of the test statistics r_s for factors in category 1 = 0.8970
The value of the test statistics r_s for factors in category 2 = 0.5714
The value of the test statistics r_s for factors in category 3 = 0.8929
The value of the test statistics r_s for factors in category 4 = 0.5500
The value of the test statistics r_s for factors in category 5 = 0.7000

Since n= 32, β= 0.02, the critical value of r_s is 0.3689. Because the test statistics r_s is 0.9555 for individual factors which exceeds the critical value of 0.3689, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking individual factors.

Since n=5, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is -0.4000 for categories of factors which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in the average ranking in different categories of factors.

Since n=10, β=0.02, the critical value of r_s is 0.7333. Because the test statistics r_s is 0.8970 for factors within category 1 which exceeds the critical value of 0.7333, we reject the null hypothesis of no correlation. It appears a correlation exists between Developer A and C in ranking factors within category 1 (economic considerations).

Since n=6, β=0.02, the critical value of r_s is 0.8857. Because the test statistics r_s is 0.5714 for factors within category 2 which is below the critical value of 0.8857, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 2 (corporate strategies).

Since n=7, β=0.02, the critical value of r_s is 0.8571. Because the test statistics r_s is 0.8928 for factors within category 3 which exceeds the critical value of 0.8571, we reject the null hypothesis of no correlation. It appears that a correlation exists between Developer A and C in ranking factors within category 3 (characteristics of the existing building).

Since n=5, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.5500 for factors within category 4 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 4 (government policy).

Since n=4, β=0.02, the critical value of r_s is 0.9000. Because the test statistics r_s is 0.7000 for factors within category 5 which is below the critical value of 0.9000, we accept the null hypothesis of no correlation. It appears that no correlation exists between Developer A and C in ranking factors within category 5 (other factors).

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