

# Integrating Real Options Analysis into Practical Property Development Decision-Making; Practitioners' Receptiveness and Acceptance

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## Abstract

Studies have demonstrated the potential of RO/ROV in the property development decision making. However, practitioners are yet to accept, adopt and integrate real options analysis in Australian property development decision making process. The paper examines the receptiveness and acceptance of RO/ROV in the Australian residential property development market with the aim of determining the preparedness of practitioners to use RO in practical property development decision making.

Through face to face semi-structured interviews with twelve participants selected from the Australian property development sector, data is collected and analysed using thematic analysis to determine the requirements necessary before adoption of real option analysis/flexibility in property development decision making.

Acceptance and receptiveness of RO/ROV was unclear as participants were not unanimous in their response. Some stakeholders were quite positive about the potential of flexibility, but others were dismissive. Beyond developing quantitative models for real options analysis and valuation, the findings from the face to face semi-structured interviews suggest that practitioners are receptive to the RO/ROV models but clarity is needed regarding input variables in ROV models, justification of flexibility investments and highlighting benefits of ROV over current valuation models. Besides, simpler models and views of other stakeholders could be important in engendering acceptance of RO/ROV in practice.

There should be clarity from the valuation community on values associated with flexibility before developers and investors can decide to embed flexibility in development projects.

This is an initial evidence focusing on investigating the receptiveness and acceptance of real options/valuation theory in practice.

**Keywords:** Real options analysis; flexibility; property development; receptiveness and acceptance

## 1. Background

Property development actors agree that property development process is infinitely flexible and cannot be static or prescribed; circumstances alter cases due to uncertainties (Fisher and Collins, 1999). Managing uncertainties in Australian residential property developments require active decision making in the form of inherent strategic

alternative decisions (flexibility) that can serve as both a hedge against future unfavourable outcomes for developments and at the same time enable property developers to capitalise on emerging opportunities when market conditions are favourable. The value of such strategic flexibilities embedded in property developments are generally tied to uncertainty and the ability of developers to flexibly respond to changes in economic conditions during property projects execution. These strategic flexibilities have become generally known as building flexibility or real options.

Despite the potential of building flexibility to enhance uncertainty and risks assessment, Australian high rise residential property developers are still grappling with risks and uncertainties because of the use of traditional valuation methods for financial feasibility analysis that is incapable of incorporating flexibility. Financial feasibility evaluation is vital in any residential property development activity, because without an appropriate numerical measure of the potential future payoff from a proposed residential development, rational developers and investors are assumed not to commit to property development projects. Shapiro *et al.* (2013) indicated that in practice, the most widely accepted method of financial feasibility evaluation is the discounted cash flow technique (DCF) technique. DCF uses two main measures of profitability; net present value (NPV) and internal rate of return (IRR). However, DCF has been criticised on several grounds including the inability to analyse and incorporate values attached to strategic flexibilities (real options (RO)) (Hayes and Abernathy, 1980; Hodder and Riggs, 1985) and failure to account for time-series linked investments (e.g. strategic investments) which are often growth opportunities (real options/flexibilities) (Myers, 1984).

Due to these uncertainties and the inability of DCF to incorporate the value of flexibilities into financial feasibility evaluation of residential property development projects, Luehrman (1998) suggested that a better valuation approach would incorporate both uncertainty and decision-making required for a property project to succeed. Flexibility in buildings (both in design process delivery and structure) that serves as strategic rights for risk mitigation and for capitalising on emerging opportunities can be termed as real options. The term “real options” was coined by Stewart Myers in 1977 because of the application of options pricing techniques (OPT) to real assets (real estate, infrastructure etc). Therefore, real options theory has its roots from financial options and gained popularity after the seminal work of Black-Scholes (Black and Scholes, 1973) which was extended by Merton (1976). Myers (1977) referred RO to the adaption and application of OPT in finance to the valuation of investments in non-financial or “real” physical assets where much of the value of an asset is attributable to flexibility (managerial flexibility in decision making). Copeland and Antikarov (2001) suggested that when a property developer has the right but not the obligation to exercise such a right to defer, expand, switch, abandon, temporary shutdown until its expiration date, there is an embedded option/flexibility. As a result, an entire property development project can be considered as a series of flexibilities at different stages of the property development process.

Myers (1984) argued that RO theory could be used to complement DCF valuation as an attempt to link together financial and strategic managerial decision analysis. Thus, RO has been developed and devoted to complement DCF analysis, particularly in the valuation of projects that are irreversible under conditions of uncertainty. Kester (1984) after examining growth opportunities using RO framework summarised that options “integrates capital budgeting with long-range planning”. McDonald and Siegel (1986); McDonald and Siegel (1985) suggest that if the future is uncertain and an investment is durable and illiquid such as property, the ability to pursue a different investment or not to invest at all in the future has an economic value.

Subsequently, leading researchers have extended the theory through the development of new models capable of evaluating values attached to flexibility/RO in specific contexts. For example, in land development, Titman (1985) studied flexibility application to land use decisions and used real options valuation (ROV) model to value land development as an option. Williams (1991) derived a partial differential equation for determining the optimal density

and time at which a developer may develop a vacant land. Quigg (1993) extended the model of Williams (1991) by adding fixed cost to the total cost of construction and empirically tested ROV in practice. Capozza and Li (1994) applied ROV to determine the intensity and timing of land development. Sing and Patel (2001) developed a one factor contingent claim valuation model of land development. Grenadier (1995) developed a framework for valuing flexibility in lease contracts. Another generalized ROV model was developed by Grenadier (1995) for valuing a wide variety of leasing contracts, including the option to cancel, forward leases and lease insurance contracts. Buetow and Albert (1998) analysed the appropriate partial differential equation (PDE) which models flexibility to renew or purchase a property at the end of a lease. The development of RO theory is still at the early stages and attention has generally been dedicated to quantitative models and applications. As a result, the qualitative part where views of practitioners or potential users of ROV models in practical applications in the property and construction sector in Australia is missing. Consequently, after the development of ROV models and some applications, receptiveness and acceptance of flexibility and ROV models from the perspective of practitioners has not been explored. This paper is aimed at investigating the receptiveness and acceptance of RO/ROV models for practical decision making in the Australian residential property development market. This is part of a broader enquiry into empirical application of ROV models to Australian property developments with the aim of enhancing potential practical adoption of ROA and ROV models for decision making of which peer-reviewed papers have been published (Mintah, 2016; Mintah *et al.*, 2018b; Mintah *et al.*, 2017; Mintah *et al.*, 2018a).

## 2.0 Literature Review

The application of flexibility and the use of ROV models for valuation in property development and investment can be grouped into different areas. Vimpari (2014) suggested the groupings into vacant land valuation, general application to property markets, building flexibility, lease contracts and technology investments in the property sector. On vacant land valuation, Chiang *et al.* (2006) studied embedded options in Hong Kong auctioned land prices by applying both hedonic pricing model and ROV. Leung and Hui (2002) examined embedded options in property projects in Hong Kong Disneyland. Yu *et al.* (2002) developed a ROV model and used it to empirically evaluate option premiums associated with five selected “white sites” in Singapore. Rocha *et al.* (2007) developed a model that determined the optimal strategy whether sequential or simultaneous to the development of a residential housing project in Rio de Janeiro. Grissom *et al.* (2010) integrated option pricing approaches with land use decision in a case study of single and mixed use developments on same land. Geltner and de Neufville (2012) demonstrated the value of horizontal phasing of a large scale urban property development project using the certainty equivalence approach of the binomial option pricing method (BOPM) combined with Monte Carlo simulation analysis. Baldi (2013) adopted the BOPM to evaluate flexibility embedded in a greenfield development in Italy, and quite recently, Shen and Pretorius (2013) constructed ROV model for property development by considering and incorporating institutional arrangements, direct interactions and financial constraints. Yao and Pretorius (2014) developed and tested a long dated American call option pricing model for valuing development land under leasehold. Mintah *et al.* (2017) evaluated a deferral option embedded in Australian high rise residential project. Similarly, Mintah *et al.* (2018a) evaluated staging flexibility embedded in large scale residential urban development in Australia and found positive results associated with embedded flexibility.

On flexibility embedded in real estate lease contracts, ‘an upward only review’ in UK leases has been evaluated through RO framework by first considering case study in UK and analysing from international perspective (Ward and French, 1997; Ward *et al.*, 1998). Ashuri (2010) developed ROV model for valuation of flexible leases with option to expand, contract and cancel using possible changes in rents and firms required space as sources of uncertainty. Whereas Sing and Tang (2004) used a multi-period BOPM to examine the default risk options in office leases, Sing (2012) evaluated embedded flexibility in percentage lease agreements in the retail sector. Another area of

application of RO theory is design of flexible spaces in property development. On the flexibility to switch use, Trigeorgis (1993b) applied ROV to a construction project and concluded that the value of flexibility to switch was almost 7% of the project's gross value. Gann and Barlow (1996) argued that there is the need to incorporate greater flexibility in buildings to meet unforeseen changes in use in future. Patel and Paxson (1998) evaluated switching flexibility for a leisure centre development in a restricted sequential time context and found positive results. Leung and Hui (2002) evaluated several option types including the value of option to switch a part of hotel of Hong Kong Disney land project. Paxson (2005) also found similar results in an application of switching flexibility in property investments. Greden and Glicksman (2005) developed a model capable of justifying expenses in flexible design of a property that could be renovated into an office block at a specified cost in future.

de Neufville *et al.* (2006) evaluated flexibility of expanding a parking garage to meet future demand. Guma *et al.* (2009) using four case studies in the US, demonstrated the value of flexibility of vertically phasing a corporate real estate building. Fawcett (2011) indicated that a more systematic understanding of flexibility is offered by lifecycle options. Dortland *et al.* (2012) studied different kinds of flexibility and used qualitative analysis to argue that options and scenario analysis can aid in the management of uncertainties. Throupe *et al.* (2012) adopted a switching flexibility valuation analysis to compare the return on investment (ROI) for building as planned or switching to a different property mix conforming to allowable zoning codes. Throupe *et al.* (2012) suggested the use ROV to determine the exact time for a proposed development. Cardin *et al.* (2013) demonstrated that design flexibility has practical implications on the property industry with emphasis on development projects. Cardin *et al.* (2013b) suggested ways of achieving design flexibility and argued that such simple, intuitive and efficient procedures through flexibility can enhance life cycle performance of buildings. Vimpari *et al.* (2014) explored how real options analysis can be used for valuing flexibility in a real retrofit investment case. Recently, Vimpari and Junnila (2016) argued that physical adaptability of buildings are important but current investment analysis using DCF do not incorporate enough information on physical asset characteristics which leads to long term loss of competitiveness and imprudent use of built environment resources. Mintah *et al.* (2018b) also evaluated a switching output flexibility in a high rise residential project in Australia and concluded that flexibility is valuable because of the long-term nature of investments in the built environment sector.

Greden *et al.* (2005) evaluated the flexibility of converting a naturally ventilated building into a mechanically ventilated building. Fleten *et al.* (2007) presented a methodology for evaluating investments in decentralized renewable power generation under conditions of price uncertainty. van der Maaten (2010) evaluated whether policy incentives to invest now, rather than tomorrow can be designed to compensate for any option value to defer. Ashuri and Kashani (2011) used ROA/ROV to evaluate "Solar Ready Buildings" that can easily adopt PV panels later in future at the optimal time by incurring initial investments and waiting until the right time. Hillebrand *et al.* (2014) applied ROA/ROV to a university building retrofit and found that the energy, ecological and economic efficiency evaluation shows that a generally preferred retrofit option cannot always be identified. Vimpari and Junnila (2014) also applied ROA to evaluate green building certificates as real options and argued that ROV methods are appropriate to assess the monetary attached to green certificates.

General applications to real estate market dynamics exist in the literature. Lai *et al.* (2004) used ROV to examine the risk-return relationship of the presale system of residential property developments. Wang and Zhou (2006) also derived a closed-form solution for equilibrium real options exercise model with stochastic revenues and costs for several property markets. Lai *et al.* (2007) showed that developers' exercise strategies can be affected by the size and the type of property markets using ROV model. Bulan *et al.* (2009) examined the extent to which uncertainty delays property investment and the effect of competition on this relationship. Ott *et al.* (2012) presented ROV model that estimates the optimal phasing and inventory decisions for large-scale residential development projects. Clapp *et al.* (2012) examined the value of flexibility to redevelop and found positive association between option values and

drift in house prices. Clapp *et al.* (2013) analysed the relationship between house price dynamics and option to rebuild or enlarge established dwellings. Clapp *et al.* (2014) similarly analysed the determinants of expansions and contractions of shopping centres and showed that expansions and contractions of gross leasable area are less likely for large shopping centres. Vimpari and Junnila (2014) also evaluated flexibility to wait embedded in the active management of a residential real estate fund divestment. In a more recent study, Geltner *et al.* (2017) empirically estimated development asset value index (DAVI) for commercial property and compared it with a corresponding traditional transaction based hedonic property asset price index (PAPI) which has been corrected for depreciation. Geltner *et al.* (2017) argued that the difference between DAVI and PAPI reflects the realized value of timing flexibility embedded in land development.

It is evident from the extant literature that the focus of ROA theory development has largely been on the quantitative models for evaluating the value of flexibility. To the best knowledge of the author, Vimpari and Seppo (2015)'s study is the only paper that have until recently sought to determine the perspectives of practitioners on ROV using qualitative approach. Vimpari and Seppo (2015) suggested that ROA received a positive response and that based on certain conditions, ROV could be adopted for decision making. The current study extends literature on the qualitative aspect of RO theory by investigating the receptiveness and acceptance of RO/ROV in the Australian residential property development sector. This is an initial work focused on eliciting information from practitioners regarding acceptance of RO theory and potential adoption for decision making in practice in Australian residential property developments.

### **3.0 Methodology**

This paper adopted face to face semi-structured interview to elicit information from key participants. In face to face semi-structured interviews, there is generally an already prepared interview guide, but the researcher is not bound to follow the questions in an orderly manner. The fluidity of the interviewing process is important to ensure that respondents feel as informants and freely give information. In view of this, Yin (2003) posits that it is important for a researcher to maintain the main line of enquiry during a research interviewing process and at the same time asking actual conversational questions in an unbiased manner to obtain required information. In order to stay focused on the topic under discussion, an interview guide was used in the process of interviewing participants as supported (Easton, 1995).

In face to face semi-structured interviews, the researcher has the opportunity to ask further probing questions that emanates from answers provided by respondents. Runeson and Höst (2009) suggested that development of the conversation dictates the order of questions that are asked. This method allowed for extensive and in-depth exploration of receptiveness and acceptance of flexibility in the Australian residential property development market. In view of the use of face to face semi-structured interviews, the researcher had the opportunity to ask further probing questions and obtained rich in-depth information for analysis. The paper used purposive sampling technique of the non-random sampling strategy for the selection of participants for the face to face semi-structured interviews. The purposive sampling was used to choose experts who understand flexibility and its integration in practical decision making in the Australian residential development market. Selected participants were well experienced and conversant with the use of property valuation models and decision making in property development.

To ensure a balanced representation of views, participants were drawn from groups of valuers, long term property investors, property advisors (financial and property) and property developers (investor-developers and trader-developers). There were three (3) participants each from developers and valuers, and two (2) participants each from the large investors, property advisors and financial advisors. This resulted in twelve (12) key participants whose views were sourced and used for the study. As opposed to quantitative research, qualitative research tend to use very

limited number of participants because of the in-depth nature of the data (O'Leary, 2014). Responses from two participants from the same group were very similar suggesting repeatability of information. Thus, at the saturation point, the interviews were completed (Small, 2009). In collecting the qualitative data, the researcher used an audio recorder and transcribed into text format for analysis. To de-identify the participants and protect their anonymity, the researcher assigned identifiers to the various participants who participated in the interviews. Transcripts obtained from the audio transcription were analysed based on themes using the qualitative software, NVivo version 11. In analysing the data and answering the research questions, quotes from the interviews supported the arguments of the author in a thematic analysis as used by (Higgins and Moore, 2015).

## **4.0 Data Presentation and Discussion**

### **4.1 Receptiveness of Flexibility by Key Practitioners**

To integrate RO and ROV models in practice, practitioners would have to accept it. As a result, practitioners answered questions on the potential of adopting RO/ROV models in property development decision making. This was to elicit their views on ROV models and RO analysis as a strategic way of developing property assets. In general, the key participants interviewed indicated that they could envisage the benefits associated with the use of RO and ROV models in practice. Particularly the thinking around the decision-making process and the weighting given towards the result of potential future values of property assets over their entire life cycle.

This is not devoid of reservations and scepticisms about RO/ROV models because one of the participants indicated that it is possible to end up with a value for an asset outside the range of distribution despite incorporating probability analysis. Secondly, the suggestion by one of the valuers that ROV model could certainly be of use suggests some level of uncertainty surrounding the response yet positive. This is potentially attributable to the newness of RO/ROV models in the Australian residential property development sector. As evident in the suggestion of the global property valuer who indicated that it is important to develop a solid understanding of the RO/ROA models for decision-making. The global property advisor was also concerned about how to generate probability estimates for property valuation using ROV and reiterated “garbage-in-garbage-out” to support the argument.

However, the global property advisor indicated that ROV sounds accurate in the manner through which future values of property assets are derived but was worried about input into the modelling. Therefore, even though there are benefits in the use of ROV, participants are generally sceptical about its use. This is an indication that in the future, the method may be adopted in the Australian residential property development sector for decision making on the condition that practitioners develop better understanding of ROA theory and sources of input into the model. Supporting the discussion above are quotes below;

*“I think this is very interesting in some form of study and I can see the benefits in this, but I would need some solid underlying basis for making decision around the probability of the outcome” (Global Property Valuer).*

*“It sounds like it could be certainly worthwhile, and, yeah it gives you more options to look at different risk factors throughout the period that you're analysing” (Local Valuer).*

*“So really, the benefit that I can see is that you give some weighting towards an outcome” (Independent Property Valuer).*

*“I like it because it actually gives you your boundaries. What is my worst, what is my best, it is sort of defining it all for you. That is a good thing. Then it's probably coming up with the ability to say, well, what's my probability of being...” (Large Development Company).*

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*"I think in theory it really sounds very good and very accurate; I do wonder a little bit about I mean your output is only ever as good as your input in anything right, so working out the probability for some of these factors, how credible some of those probabilities are and what they are based on. Because your end result is going to be as good as what's going on into it. But I think in theory the model sounds very good" (Global Property advisor).*

#### 4.2 Acceptance and Adoption of Real Options Theory in Practice

The adoption of RO in decision-making in Australian residential property development is dependent on the acceptance of the method by practitioners. This is in the form of a tacit acceptance of the method as compared to DCF, which was determined through analysing the responses provided by participants. The potential of RO, which allows a decision maker to prepare against the impact of uncertainty at a certain time in future by strategizing to deal with such risks and uncertainties at inception of a development project was impressive to financiers. Possibly, this is because of the magnitude of capital committed to projects by financiers and the potential ramifications of failed development projects on their businesses. As a result, their major concern was to mitigate risks as much as possible. Under that circumstance, it is important to highlight the risk enhancement potential of RO and ROV in feasibility analysis vis-a-vis the cost of achieving such an objective of mitigating risks. Since RO allows a decision maker to re-evaluate project feasibility mid-way through execution via active management, it allows potentially unviable projects to be discarded thereby enhancing risk management of residential property developments. Moreover, it also enables project developers to capitalise on emerging upside opportunities through already embedded flexibility in property development project.

Despite the scepticism about ROV models and the possibility of not obtaining funding for flexibility investments, the financial advisors indicated that it is generally better to have an in-built strategy to deal with risks at some point in time in the life of a development project compared to being helpless in the face of unfavourable market condition. Thus, financial advisors favour the use of flexibility approach to dealing with risks and uncertainties in residential property development because of the opportunity to deal with risks better, albeit funding could be problematic. The investors and developers favoured RO/ROV models for two main reasons; range of values and probability/possibility analysis. One of the large fund developers argued that ROV models improve decision making relating to risk analysis in project execution as compared to DCF. This is attributable to the range of figures adopted by ROV models in the computation of profitability of property development projects which captures all possibilities as far as profitability is concerned. Thus, the use of probability/possibility analysis to represent uncertainties from which potential numeric outcomes (profits) of developments were calculated using ROV was better than the single point estimate using DCF because ROV weighs the probability of achieving a specific target return or profitability level.

*"Oh certainly! No doubt about it; you are much better off assessing them than just looking at one DCF model"*  
*(Large Fund/Developer).*

On the contrary, one of the large developers argued that the DCF is better because it is simple to use as opposed to ROV models, which uses probability analysis. Therefore, it can be argued that property developers would be inclined towards the use of simpler ROV models. Similar to this finding is the work of Vimpari (2014) who argued that property valuation models generally begin from simple models and are later improved. For example, direct capitalisation being improved and developed into DCF technique. This is supported by a developer who suggested that,

*"I think the DCF is better as a straight line from a point of view of simplicity. It comes down to who we are communicating this message to and how close I understand this philosophy. I think it is worth seeing. I think it's worth looking at closely and seeing how it might work and discussing with others within my business, what they think of this?" (Large Development Company).*

Thus, among the developers, there is general acceptance of ROV model and they see the worth of adopting it in decision-making. However, they would only do so based on a deeper understanding of ROV models and knowing the assumptions behind, and input parameters into ROV model. In addition, the simplicity or complexity of ROV models would also determine the acceptance for decision making.

An evaluation of responses from the valuers who responded to the adoption of ROV models in practice is also not unanimous. A local property valuer suggested that it is good to have such a model that can dynamically evaluate the value of flexibility because frequent changes in the property market necessitate flexibility. The participant indicated that having such a flexibility from the inception of a project affords a developer the opportunity to alter decisions based on future circumstances. On the contrary, a local independent valuer indicated that the DCF is better under current valuation practice because of client requirements. The indication is that the valuation of investment in flexibility must be executed in a manner consistent with how clients are evaluating similar opportunities in the property market. Since there is no demand from clients to adopt or change the current method (DCF), then DCF is considered as a better option to ROV models.

*“But it certainly sounds like a good option. I mean the property market is always changing so it is good to have a model that allows for flexibility” (Local Valuer).*

*“I actually think that, in the current environment, the DCF will probably be better, because I think that is the way our clients are looking at things” (Independent Property Valuer).*

Both valuers did not clearly state that they are willing to accept RO and ROV but it was obvious that one was willing and the other was concerned about client’s acceptance of the use of the models.

*“I think people are so used to doing what they're doing, it would be difficult to implement and bring it rolled out, and I guess industry wide” (Local Valuer).*

*“I think that first of all, you've got sales comparison method and income approach which is so important” (Global Property Valuer).*

The suggestion that the sales comparison and income methods are very important in valuation is an indication that practitioners would want to see these methods reflected in ROV models. Because they are familiar with the sales comparison and income approaches, highlighting similarities between ROV and existing valuation models (sales comparison and income approach) could aid acceptance.

#### 4.3 Practical Cases of Flexibility

On RO theory, it is vital to note that participants were mostly in favour of flexibility as an important concept in Australian residential property developments. Particularly, having the managerial flexibility to respond to changes occurring in the property market in future is considered essential. Some of the participants suggested that they were familiar with several property development projects that have embedded flexibility in practice. This is an important finding because although flexibility has enormous cost implications for developers and investors as disclosed through the interviews, it was surprising to know of an embedded flexibility in some projects they have executed in the past.

*“Yeah we can so an example of this, say I was valuing a big development in another state in South Australia and it was a three stage development, it wasn't one tower like this, it was three individual towers but a hell of a lot of infrastructure that was to be used for all three towers was to be built in the first stage, and so the cost to build the first stage was significantly higher than building the other two stages” (Global Property advisor).*

*“Lots of properties that are traditionally retail strips are doing residential above them as well. So, having that flexibility to diversify use is certainly valuable” (Local valuer).*



*“However, we have just finished this development right here, that project was developed over a car park because the car park has been built such that you could use the existing structure to some extent to build on top of it” (Large Fund/Developer).*

It is interesting and surprising to know that through flexibility, an office space was redeveloped on top of an existing car park. It would be important to know how the decision to invest in flexibility was justified before the commencement of the project. Apart from this, local authorities that approve planning permits for property development projects are also advocating for flexibility in the commercial property market space according to one of the participants. This is a significant breakthrough since one of the most important issues raised as a barrier to the execution of flexibility is planning approval. This indicates that the legal barriers to the adoption of flexibility could be overcome if the councils are becoming advocates of flexibility. A large investor-developer who deals with several councils for planning permit suggested that,

*“For example, Melbourne City Council at the moment encourage developers to build car park that in the future can be converted into an office space. As Melbourne City Council achieve its goal of keeping cars out of the city, they are suggesting to developers if you have floor to floor heights that are appropriate in your car park, then you can convert one day back into an office space” (Large Investor Fund).*

Significant among the findings is also the revelation by the global property advisor that another valuation team in their company uses ROV model for the valuation of mines and mining rights and had held a discussion on the possibility of adopting it for property valuation. This is an important step towards acceptance of ROV models in practice in Australian property development sector. Since international practices generally trickle down to affect local practitioners, it can be argued that in the long term, ROV models may be introduced to the Australian property industry by some of these international valuation firms and affect the practice of valuation in Australia.

*“Yeah, so I know our bigger business valuation team for example uses these techniques and I know it is used in the valuation of mines and mining rights and that sort of things, so we have discussed kind of this methodology, but I do not apply for property valuations. I know others in the firm who do” (Global Property Valuer).*

The findings of this paper are similar to (Vimpari and Seppo, 2015) in respect of the receptiveness of ROV which received positive response. However, results on acceptance of ROV models differ because in the context of Australian residential property developments, practitioners still favored DCF for decision making as opposed to ROV though observed the explicit benefits of ROV over DCF.

Practical empirical cases suggest an unconscious use of RO theory for decision making but practitioners are yet to adopt ROV for flexibility valuation in practice. It is accepted that there is more work to do to achieve acceptance of RO/ROV for decision making in the Australian property industry. The acceptance of RO and ROV was not unanimous because some of the practitioners had reservations about how some inputs in ROV models are derived for computation. Moreover, the computation of probabilities was also deemed to add a level of complexity to financial feasibility evaluation of property development projects. As a result, practitioners who had reservations indicated that the DCF technique is good for its simplicity in the current decision-making environment. Therefore, it can be inferred that simpler ROV models may be preferred to those deemed complex.

Since some of the practitioners thought that DCF was better due to its simplicity, ROV models that are simple in application must be used in demonstrating practical applications of flexibility valuation to achieve adoption of RO in practice. This is similar to the suggestion given (Vimpari, 2014) who argued that simplified ROV methods could encourage adoption. In this sense, the simple, yet novel Fuzzy Payoff Method (FPOM) must be emphasised because of its use of triangular distribution and embedded income approach, which practitioners and stakeholders are already using in practice in scenario and sensitivity analysis in property valuations. It is possible that their familiarity

with the triangular distribution and income approach would generate interest in and acceptance of ROA and ROV in practice. Besides, the FPOM does not require knowledge of probability theory to calibrate and construct the value evolution of property asset during development for ROV computation. As a result, FPOM may be simple for practitioners to use for decision making.

## **5.0 Conclusion**

This study aimed to investigate the receptiveness and acceptance of RO/ROV in the Australian residential property development sector. Using a face to face semi-structured interview approach, the study received positive response from practitioners on receptiveness of RO/ROV for practical decision making in residential property developments. This is largely due the positive attributes about RO/ROV revealed by participants in their responses during the face to face semi-structured interviews. For example, a participant observed the benefits associated with RO/ROV models compared to DCF, which suggests that highlighting these benefits over currently existing valuation models of financial feasibility evaluation could propel the acceptance of RO/ROV in practical decision making.

The acceptance of RO/ROV received mixed response from participants because there was no indication of a unanimous acceptance. Even though most of the participants observed the benefits of ROA/ROV, they were sceptical about accepting ROV method. This is partly due to the fear of unknown which characterises the introduction of new feasibility methods to a very conservative industry. Besides, there was an indication that clients have vital role to play in the acceptance of RO/ROV for decision making because valuers are required to adhere to the instructions of these clients who may not have knowledge of ROA/ROV models. It also seems participants require a better understanding of RO/ROV models to accept and use for decision making.

The determination that participants or practitioners have dealt with similar cases in the past is positive because it demonstrates that with plausible reasons, the industry could be convinced to adopt ROA and ROV for the valuation of flexibility in practice. The reason is that the use of current valuation models for the valuation of flexibility could lead to serious errors as posited (Trigeorgis, 1993a). As a result, it is important to push for the adoption of RO/ROV for the valuation of flexibility to derive the right results for decision making.

This study has focused on the qualitative aspect of ROV which is rarely examined because researchers of RO theory have mainly focused on the quantitative techniques. It has revealed the receptiveness and potential for acceptance of ROV for flexibility valuation in practice. Further research is recommended in examining the valuation of flexibility from the perspective of practitioners. During the interviews, one of the participants suggested a practical case where an office was developed on top of an existing car park. It will be interesting to find out how the valuation of the flexibility was executed. Another qualitative approach could focus on examining the requirements for integrating ROA/ROV in practical property development decision making.

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