

# **APPLYING THE REAL OPTIONS THEORY FOR IDENTIFYING FLEXIBILITY IN PROJECT DELIVERY OF HEALTH ORGANISATIONS**

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## **ABSTRACT**

Healthcare is influenced by many uncertainties. Uncertainties affecting health organisations also influence real estate since this facilitates the primary process. Within real estate management, decisions have to be made today while there is little knowledge about the future. Therefore, flexibility is needed in the process of designing, constructing and operating real estate. A case study has been done to gain insight about how health organisations deal with flexibility. The real options approach is used to show what types of flexibility have been used, and that uncertainty can also generate opportunities. Of the five types of flexibility, only in two types real options were identified in the case study. These were stage, abandon, defer and scale within process flexibility and the options growth and switch within product flexibility. This is partly a result of the fact that the project in the case study is not further advanced than the preliminary design phase. Nevertheless it can be concluded that project managers already act as using real options. Consciously using this concept might create even more real options to be used in project management.

## **KEYWORDS**

Case study, flexibility, health care, real estate management, real options

## **INTRODUCTION**

Already since WWII, an important means to control health care expenditures by the government has been the control on expenses on construction and maintenance of buildings. Since the 1980's, in the Netherlands, liberalisation was thought of one measure to limit costs. In 2008, liberalisation got a new impulse with new regulations which implied a more businesslike operation of health organisations, resulting in an increasing importance of efficient real estate management (Bellers, 2008; Raad voor de Volksgezondheid en Zorg, 2006). An approach for managing real estate strategically is known as Corporate Real Estate Management (CREM). CREM implies that future and current supply and demand have to be met, by setting out a real estate strategy. CREM considers both the design and construction of a building, as well as the management of the building during its lifetime. Many uncertainties influence healthcare organisations, which make it difficult to which strategy to choose. A way to deal with future uncertainties is flexibility, which enables adaptations to these changing circumstances.

However, since health organisations have little experience with efficient real estate management, insights are needed in how flexibility can be incorporated in their real estate strategy. A promising approach to provide these insights is the real options theory, as suggested by different

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authors (Gehner, 2008; N. O. E. Olsson, 2004; Vlek, 2005). Where in project management it is a new approach, in health it has never been considered. A real option is a right, not an obligation to exercise an option, where the option has been developed against a certain investment. The real option enables flexibility and attributes value to it. More uncertainty implies a higher value for flexibility. Using real options as a way of thinking helps real estate managers recognising that uncertainty is not something negative, but even can provide value.

The aims of the research are first to discover which uncertainties require what type of flexibility and secondly what the implications are for the type of real options that is being applied by real estate managers in health. Besides, we look at if and how the development of uncertainties influences the price and timing of exercising the real option.

Moreover, the application in real estate management and health has not been further developed by other researchers. Therefore we want to explore whether it is a useful approach. The research question we want to answer in this paper is:

- What kind of real options are applied in real estate management and what are consequences of uncertainties for the timing and exercising of the real options?

This paper will first introduce the framework consisting of two elements: flexibility and real options. The objective of the research is to find the relation between these two elements to provide more insight into flexibility by using the real options as a way to describe and communicate flexibility. We use the critical events technique, which we apply to a case study. We describe the critical events that incur a change in the process and influence flexibility. In the conclusion we reflect on the relations we found between flexibility and real options.

## **THEORETICAL FRAMEWORK**

The concept of flexibility will be explored in this section. Flexibility in project management and especially in construction (management) is a widely used term with different meanings. In this research we use the classification of Olsson (2006) because it provides an overview of useful elements of flexibility in project management. Flexibility in this research is defined as room for manoeuvre in decision making. Olsson (2006) uses three different categorisations of flexibility, of which we will only use types of flexibility.

### ***1.1. Types of flexibility***

The first type is flexibility in the decision process. According to Olsson (2006), process flexibility is based on an approach where decisions and commitments are made sequentially over time. It also has to do with ways to make irreversible decision more reversible or postponing irreversible decisions until more information is available. In our research we look how project delivery systems enable process flexibility. Olsson also mentions product flexibility, which is similar to design flexibility (Blanken, 2008), technical flexibility (Cbz, 2005, Carthey et. al. 2010) and spatial flexibility (Jonge, 2009).

Within design flexibility a further distinction can be made between different time-spans the flexibility is applicable. We use the level of time-span as a subdivision of types of flexibility and we mainly focus on the latter in our research. Blanken (2008) refers to Yun (2007) to point at

two types of design flexibility: tactical and strategic flexibility. For example, strategic design flexibility is long term flexibility and might imply changes of size of the building. Tactical flexibility is on the short term without changing the overall size and functionality of the building. Besides strategic and tactical level, Carthey et.al. (2010) add the operational level, which means that changes are easy to implement, with low impact on time and cost.

Another type used by Blanken (2008) is financial flexibility. VAG (2007) defines financial flexibility as the possibility to satisfy both current and future demand and meet financial obligations, as to respond to future demand and longer-term obligations. Means to enable this are increasing revenues and decreasing costs by short term lease contracts, value creation of real estate, better use of land, attuning investment decision in buildings, ICT and medical inventory, contract options and financial arrangements.

Service flexibility is also mentioned by Blanken (2008). This is applicable if services are transferred to the SPV (special purpose vehicle) in case of an integrated project delivery system. Service flexibility can be both on a strategic and tactical level. On a strategic level that would be adaptation of the price by benchmarking or market-testing the services. Tactical flexibility means flexibility on an ad-hoc basis.

Finally, organisational flexibility is mentioned by the former advising board of the Dutch government, the *College Bouw Zorgvoorzieningen* (2005), as well as by Jonge et.al. (2009). This is the optimisation of the use of the spaces in the building by clustering facilities, adjusting operating hours, implementing new ways of working and density control.

### ***1.2. Real options and flexibility in corporate real estate management***

The finance sector found a way to describe and value flexibility, by means of the real option theory, first introduced by Myers. The basic idea of the theory is that flexibility (the real option) is created by paying for the opportunity for a future investment, or to withdraw from investment, i.e. respectively a call and a put option. Good timing of exercising the option is important to make optimal use of the real option. The option has value, and can even be more valuable in case of more uncertainty (Winch, 2010) and (Alessandri, 2003). The price for the option is a fraction of the overall investment required, called the option premium. Merton and Scholes won their Nobel price with real options, which have a financial background. Some authors explain that real options also can be used as a way of thinking to obtain insight into how opportunities for future flexibility can be created by current actions (Miller and Lessard, 2001; Ford et.al., 2002; Miller and Waller, 2003; Alessandri et.al., 2004; Cornelius, 2005; Winch, 2010). Several authors propose to apply this theory to real estate management. Olsson (2006) notes that the real options theory is especially useful for users and project owners since the project flexibility represented by real options mainly deals with changes in the objectives of the stakeholders. We link the different types of flexibility to real options, which results in a model which forms the basis of further analysis in the research.

Winch (2010) determines seven types of real options that are useful in project management based on Fichman et.al (2005) and Sommer and Loch (2004). These are:

Stage, where after each stage the progress of the project is reconsidered based on more knowledge of uncertainties. Staging is an important real option in construction, often applied in for example the traditional project delivery system, by determining after each phase whether will be continued to the next phase. After each phase more information is available, also about the requirement of the client. The resulting project will then be more according to the needs of the client which adds value. The real option premium then is for example the investment in a conceptual design. Concluding from this, it will not always be beneficial to integrate different tasks which are executed by one contractor, since different options will be lost. This is especially the case in projects with a high uncertainty, since the value of different options then also increases.

An abandon option is an exit strategy in a project, if uncertainties turn out to have a too negative effect on the project. After each stage in a staged project, theoretically the project can be stopped. However, there are other issues that play a role when deciding to stop the project: there have been sunk costs: costs that cannot be recovered and will be lost, and image damage for the initiators of the project.

Defer options enables postponing decisions until more information is available. Waiting until more information is available is the option to defer. However, one should be aware of the risk that the real option will not expire. For example, a permit for construction might expire. However, just waiting until more information is available in itself is not a real option. Therefore, more alternatives should be considered when the uncertainty/ies develop in different directions. For example, certain adaptations in a building enable deferring the decision about the target groups of certain rooms, when there is still uncertainty about the demand from different target groups. This is also called *safeguarding* (Winch 2010). Technological flexibility can be a defer option. For example in a house for elderly care: by means of building in installations to enable future installation of bathrooms, the option is created to do this in the future when the demand for single rooms with private bathrooms increases. In the same time this is an example of a switch option since the function of the space can be changed. A switch means that the building can be used for other functions

A growth option is created when a baseline investment enables potential future expansion of the project. An example of a growth option is keeping a site in ownership: an investment is done to own the site, and options for the purpose of the site are still open. This is related to the scale options, in which the asset can be scaled up or down when there is more knowledge on uncertainties related to the use of the asset

A select option is created when several alternatives are developed in parallel, to have the option to choose when there is more knowledge about conditions. An example is the invitation of different architects in case of procurement. They all receive a remuneration for their preparations, which is the option fee, and the client has several options to select from. Different alternatives pass by which might generate ideas by the client who gains deeper knowledge about the project. Further, the client can choose from different options which he/she wouldn't have had by only inviting one architect.

### 1.3. Combining flexibility and real options in real estate management

When comparing the types of flexibility and levels and the real options and reasoning logically, it appears that certain real options can be identified as the enablers of certain types of flexibility. Therefore we propose the combination of real options and types of flexibility as presented in table 1, and which we will test in the case study.

Table 1: Real options enabling types of flexibility

Types of flexibility	Real options						
	Stage	Abandon	Defer	Growth	Scale	Switch	Select
Process	X	X	X				X
Product Technical/design, Spatial	X			X	X	X	X
Financial	X	X	X				
Service					X	X	
Organisational							

## METHODOLOGY: CRITICAL EVENT TECHNIQUE

The aim of the research is to find the relation between flexibility and real options in real estate management in health. We expect that flexibility is created and undone in decision making, which occurs on many levels and in very different forms. Therefore we conducted an exploratory, in-depth case study in order to catch all different aspects of the decision making process.

### 1.4. Case study research

The value of a single case study is that phenomena can be qualitatively described with more nuances on the development of phenomena than a quantitative methodology (van de Ven, 2007; Yin, 1989). Only few construction projects will be executed in the same way since all have their own stakeholders and interest and therefore their own dynamics. This makes every case unique and therefore also valuable (Siggelkow, 2007). We will shortly introduce the case study in our research.

Our case study is Utopia, the feigned name of a building which is being redeveloped and part of the real estate portfolio of a large welfare organisation in a middle large town in the Netherlands. The welfare organisation, called Ibis in this story, offers different welfare-, living- and care services over the total line of life. Ibis is the result of a merger in 2008, between the organisations Parrot and Crane. With the start of the project in 2005, Utopia was owned by Parrot.

During the development process, many changes occurred in healthcare as e.g. the liberalisation of the market. Therefore it is a good example of a project dealing with uncertainties with large consequences and therefore a substantial need for flexibility.

### ***1.5. Process research***

We want to answer the question *how* real options are applied and exercised. Therefore, the process theory approach is very suitable (van de Ven, 2007). The process theory approach is different from the variance theory approach, defined by Mohr (1982). In the variance theory, the causal effects between variables is explained statistically, while in the process theory the process is more fine-grained and narrative analysed by identifying all events, activities and choices, on different levels, that influence the process. Besides, the time aspect in the process theory is important since entities acting in the events change over time, as well as the variables used in the research: flexibility, uncertainties and real options. *Incidents* and *events* in a process theory are analogous to the distinction between *variables* and *constructs* in variance theory. Langley (1999) proposes to not artificially separate variables and events, but use both elements in research. We do this by referring to flexibility, uncertainties and real options as variables, while they are being reflected in incidents and events. Where incidents are direct observable activity, events are on a more abstract level and might be a longer during event. In the following section we will explain how we defined the critical incidents and events in our research.

In our research we define a critical event as a decision that influences the direction of the process. This can be a change within one of the elements of the project which are associated with types of flexibility, following van de Ven (2007): process, technical/ spatial/product, financial, service, and organisational. In the analysis we will see whether these decisions can be related to real options. When collecting process data, we attempted to document as completely as possible the sequence of events, pertinent to the processes studied (Langley, 1999).

From these events we further distilled which events had influence on flexibility and the creation, price, timing and types of real options. In a case study report we chronologically described each incident, the development that motivated for this incident, and the consequences for flexibility.

### ***1.6. Validation of the research***

Triangulation took place by using different information sources: different kinds of documents: meeting minutes, documents from the ministry and the *Bouwcollege*, contracts with contractors. Process data are analysed by using the Visual Mapping Strategy (Langley, 1999). Additional advantages besides narrative approaches are that they 'allow the presentation of large quantities of information in relatively little space, and they can be useful tools for the development and verification of theoretical ideas' (Langley, 1999; Miles and Huberman, 1994). We used the mapping of the incidents to verify our findings during a workshop, in which the participants could reflect on it. Some participants in the workshop were involved in the project and others experienced the process from the outset. We used Nvivo to code incidents within documents with one of the concepts described above.

Critical events were identified both retrospectively and actually. The part of the project that took place before this research started was recovered retrospectively by interviews and document

review. Information on the part of the project that was executed in the duration of the research was retrieved by both document review and participating in project group meetings.

## RESULTS

In this section we present the findings of the case study. First we shortly describe the reason for the redevelopment of Utopia. The development process including the critical events is depicted in a process flowchart. Then we outline on the different types of flexibility that we found and we link these types of flexibility to types of real options.

### 1.7. The development of Utopia

The construction site of Utopia exists of two buildings: the original nursing home, the “Old Structure”, and the Somatic House, which are mutually connected. The Old Structure dates for a small part from 1967 and the rest from 1977. No large adaptations have occurred. The Somatic House has been newly built after demolishing of the old building in 1994. A part of the staff areas dates from 1977. In 2003, the most recent Long Term Housing Plan was written, a strategy formulation about the type of buildings and their capacity and how to reach this. Also under the new regime this is obligatory in order to keep control on the capacity. Some points of departure are formulated in the LTHP where the organisational vision is expressed in a strategy. After a technical and functional analysis of the whole building portfolio of Parrot, it appeared that among others the building complex of Utopia needed redevelopment.

The initiation- design phase took a long time and is still continuing, as can be seen in Figure 2.

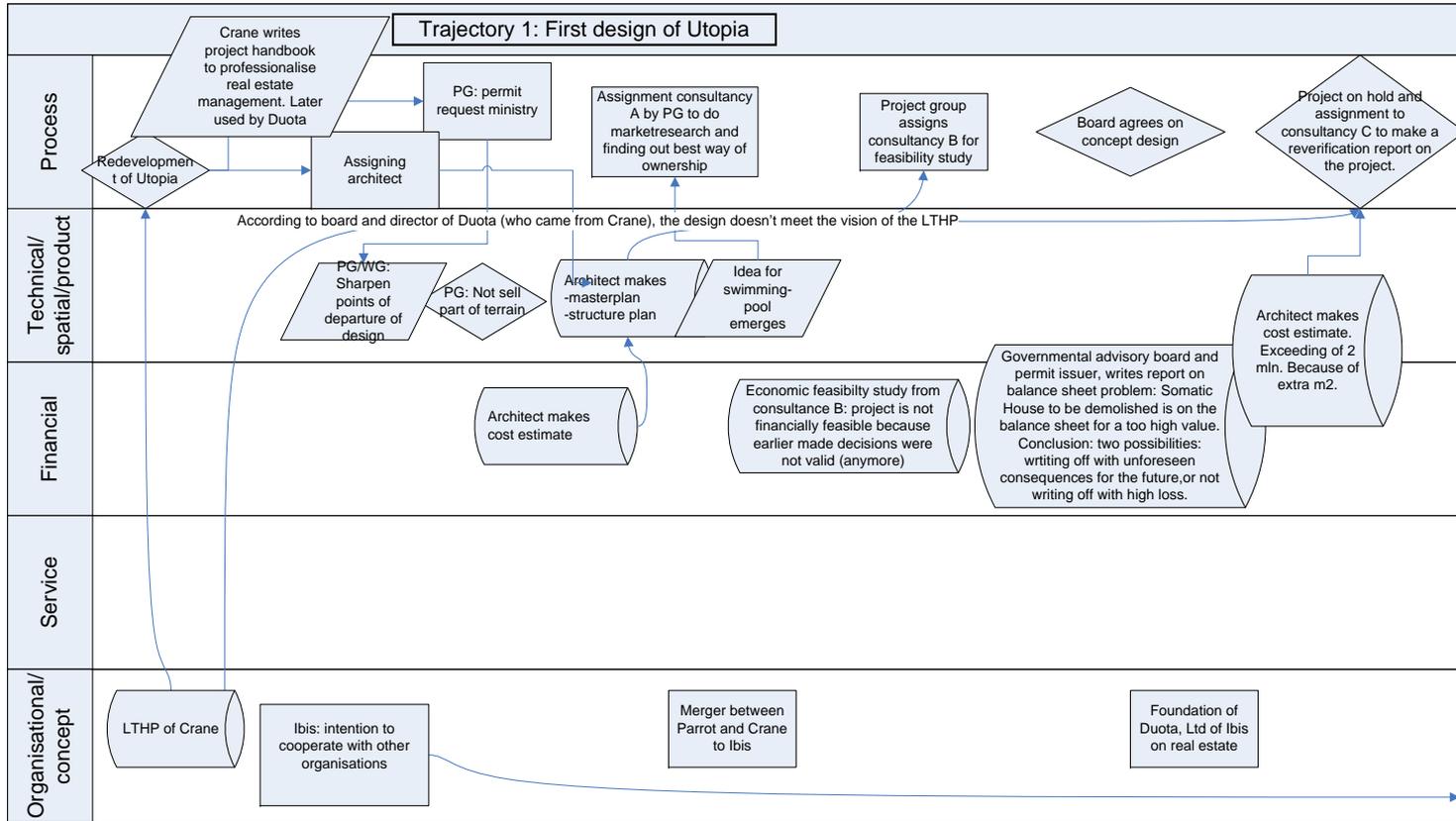
2005				2006				2007				2008				2009				2010				2011			
1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
i	i	d	d	cd	cd	cd	cd	cd	cd	fd	fd	i	i	i	i	i	i	d	d	cd	cd	cd	cd	cd	cd		

i =	initiative phase
d =	definition phase
cd =	concept design phase
fd =	final design phase

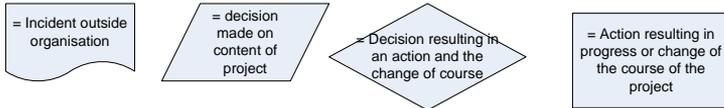
Figure 2. Development phases of Utopia

In the Process flowchart below, the main critical events are depicted. They are arranged in the different areas in which also the different types of flexibility have been recognised. In the next section we describe what types of flexibility we found, which we link with different types of real options.



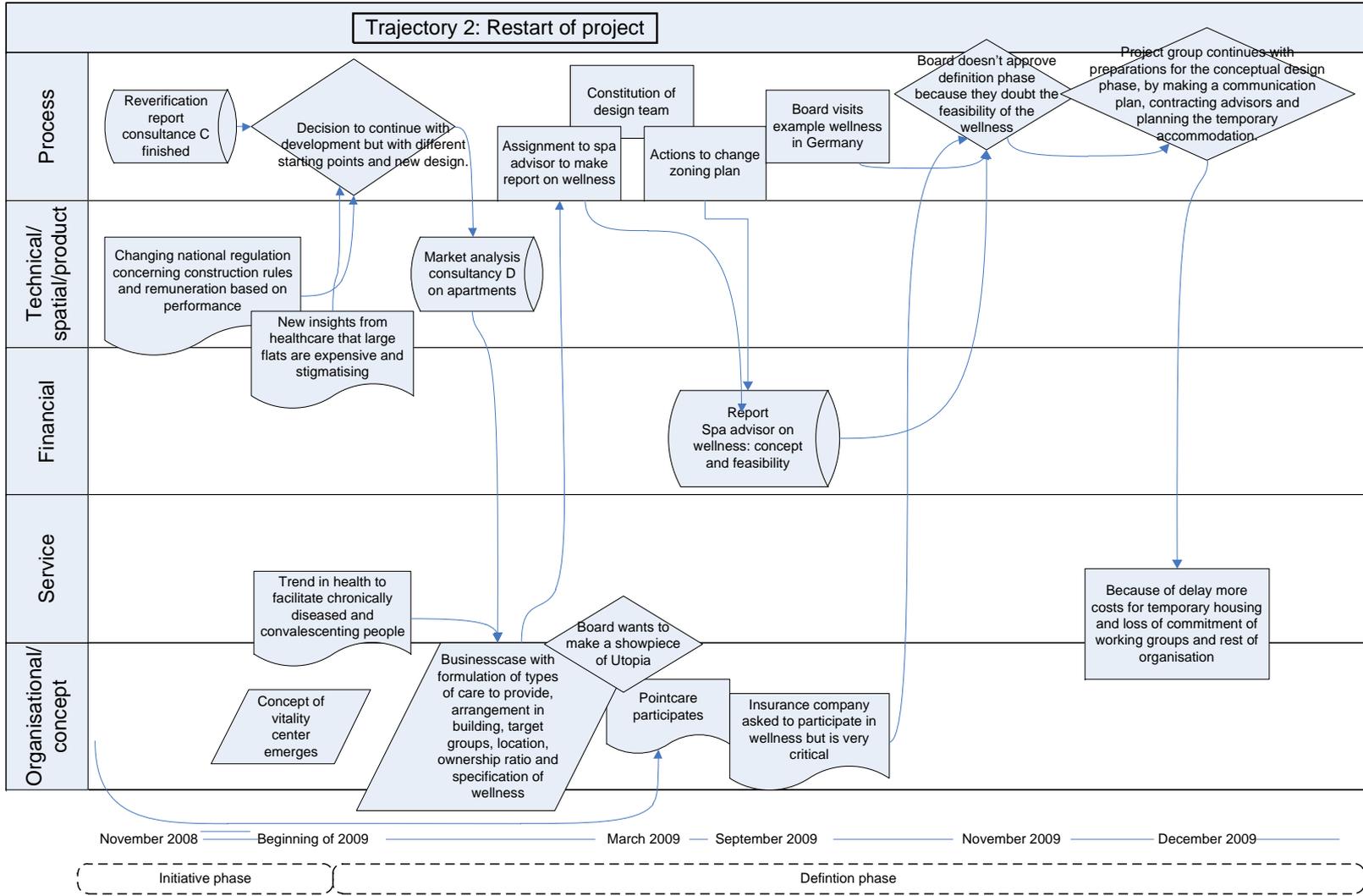
2003 ————— May 2005 ————— June 2006 ————— October 2006 ————— July 2007 ————— Februari 2008

Initiative phase      Definition phase      Concept design phase      Final design phase      Initiative phase

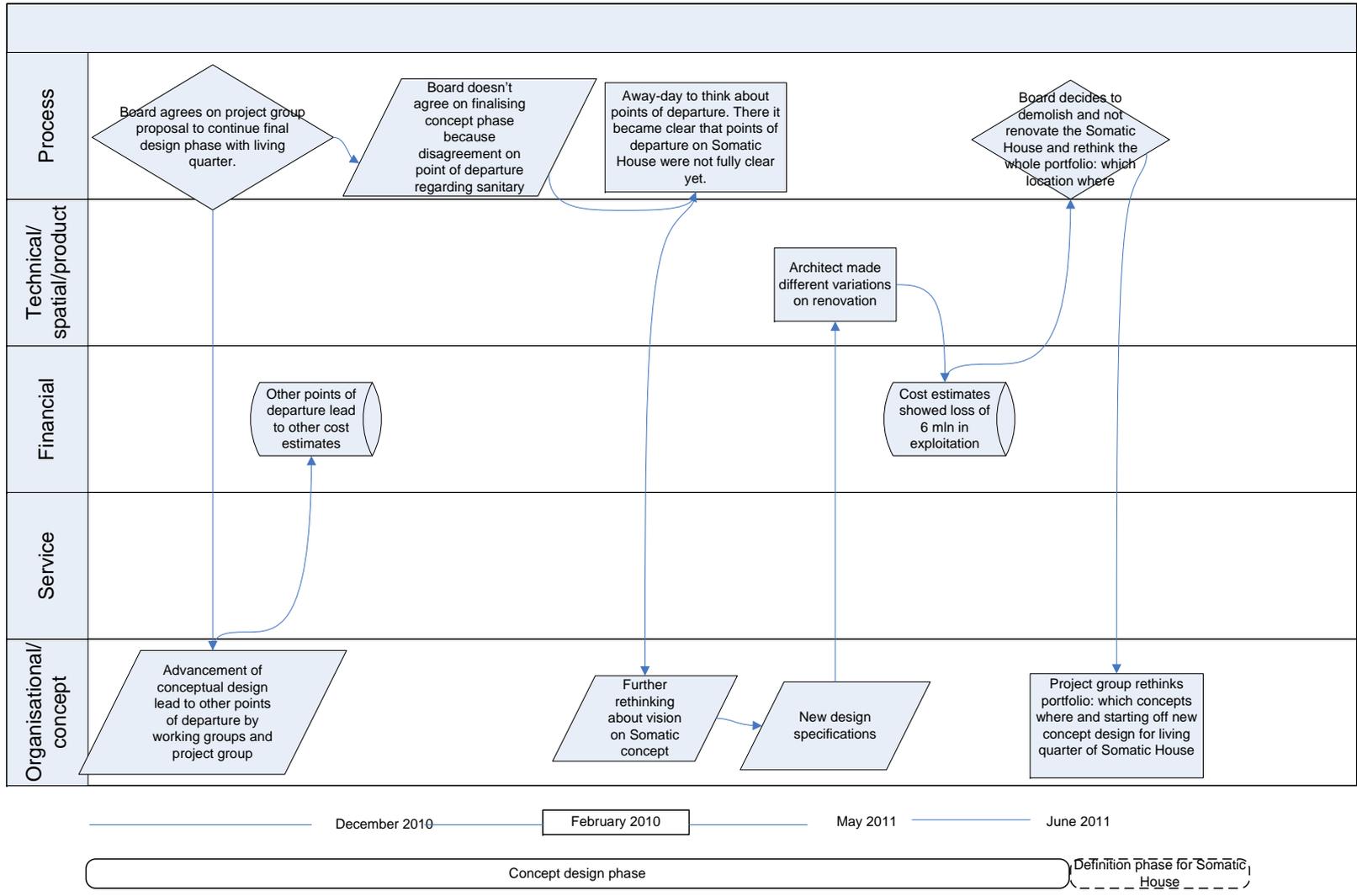


**Figure 2. Process Flowchart of development project of Utopia**

### Trajectory 2: Restart of project







### *1.3 Flexibility and real options*

Process flexibility We can identify different types of flexibility within the process, enabled by different real options. The main driver of flexibility is uncertainty. Most real options are realised because of uncertain development in the future, and exercised if there is more knowledge about that certain development. A major uncertainty comes from stakeholders outside the organisation, such as the government and the municipality. An important delaying factor in construction projects can be the change of the zoning plan for a certain area. Therefore, involvement of the municipality early in the process increases the probability that a permit request will be approved sooner. It is a process type of flexibility that creates flexibility in the planning of the project. The permit request to the ministry and the municipality where critical incidents in the process, since they created the flexibility to continue with the development project, or not. Since there are mere alternatives, one can speak of a real option. The premium is the investment in the permit. On the other hand, a permit limits flexibility, since when the zoning plan is changed, the purpose for the area is fixed. However, in the Utopia case, the timing of the option, i.e. the request for the permit, had not been appropriate since after receiving the permit, the plan was changed and a new request had to be handed in. This will have a negative on the relationship with the municipality. However, effects can be limited by creating understanding by the municipality by keeping them informed about the decision making process.

The project, as are all projects of Duota, is phased. This creates stage options since after each phase there is a flexibility to abandon or defer. Disadvantages are that procuring contractors after each phase costs time and contractors might take less advantage of each other's knowledge.

In the first trajectory which took place under the previous regime, a permit had to be asked at the ministry as well. While disapproval could lead to serious delays, when it was approved it meant that funding was guaranteed and extra costs during exploitation were remunerated. Therefore flexibility to be more efficient was not an issue. When the governmental policy changed, stakeholders of Utopia decided to look more carefully at the financial and qualitative consequences of the project, leading to the reverification report. This is one example of uncertainty reductions in this process, as well as the report from consultancy A on real estate management and the feasibility study on the wellness centre. These all can be viewed as sunk costs, but also as real option premiums, which would less probably have been made in a non-staged project since that was already a rolling train. The investment resulted in more knowledge and change of the direction of

the conceptual design phase, just before the project continued further and would be less flexible.

Investing in a concept design was also a real option, since during this process more knowledge was gained from the users about requirements of the design. Just as in investing time to let the users participate in the design process. This was done more elaborated in the second trajectory, also because of the involvement of another health organisation. This would have prevented changes later on in the process. Even though in the first trajectory the final design had nearly been finalised, the board still decided to abandon the project because more knowledge was gained about the feasibility and the costs of the project.

The project group proposed a select option, by developing two different conceptual designs of the wellness centre. They dropped this plan, but when considering the consequences they might have decided otherwise. The value of the select option would have been the prevented extra costs of adaptations in the design of the living quarter, and extra information on routing, logistics, the character of the concept that has to be present in the whole complex etc. Something similar was done by starting the concept design phase of the living quarter and wait for the design of the wellness. However, this cannot be recognised as real option since no alternatives were developed and no additional investment was being done.

The project group invited different interior- and landscape architects, which created a select option: they could choose from different alternatives and also created more knowledge on what they actually wanted for their project. However, since comparison was based on the plans of the participants and not the costs of the project, one consultant objected that the plans could not be compared in that sense and probably not the best price will come out, which was determined after the selection. The project group didn't do this for the architect and electric – and heating advisors, since they saw advantage in their knowledge of the project. Creating a select option on this area would have been useful as well. See figure 4 for a summary of the findings.

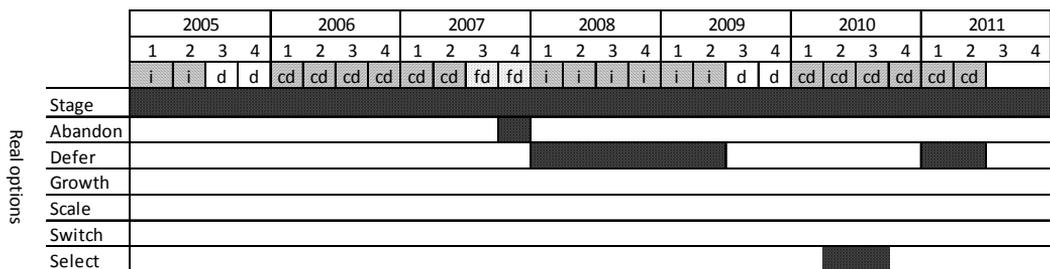


Figure 4. Flexibility in the process within different project phases.

Technical flexibility. The final decision in the process to not renovate but demolish and reconstruct the Somatic House created more space for application of different concepts. This is a growth and select option, related to external flexibility and scope (what) and internal flexibility (how). The writing off of the balance sheet value can be seen as the option premium, while the value of the option is the added value which will be repaid during the exploitation minus this premium. However, if the project group and the board had recognised this option, the long process of redesigning and calculating costs had been prevented, which was costly, time consuming and didn't create an option.

The project groups also added value to flexibility in the ability to convert the building to other functions, i.e. a switch option. Although they determined the level of applicability since a too flexible design which will never be used would be a waste of money and not worth the real option premium.

Related to the area, Ibis decided not to sell part of the terrain. This can be recognised as a spatial type of flexibility and a growth option. Although the zoning plan might have to change, it can also be a switch option since the area can be used for different purposes. This was made more concrete by consultancy A, who concluded that the design in trajectory was not marketable because of its monolithic appearance. A smaller design would be better, and the loss for places could be solved by other projects on the terrain, which would make the project financially feasible. Investing in changing the points of departure regarding urban planning, would also create added value because of the view and the connexion with the other buildings in the neighbourhood, which is also a switch option in order to eventually change the function in the future. A summary of findings regarding technical flexibility can be found in figure 5.

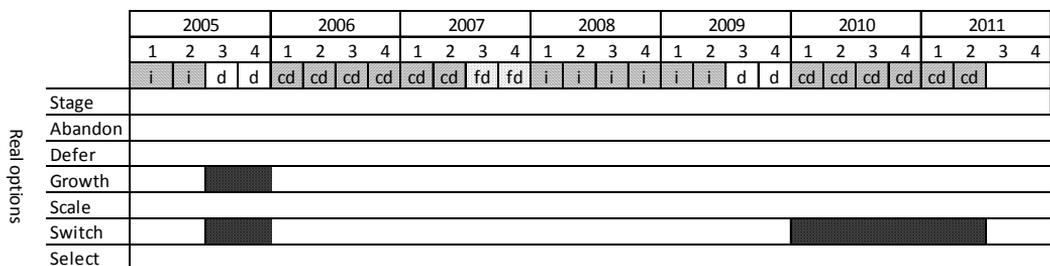


Figure 5. Technical flexibility within different project phases

Financial-, service- and organisational flexibility. Concerning finance, little flexibility is there. Finance was borrowed from the bank, for the duration of five year based on a business plan. Change of the project also needs a new request for the loan at the bank. Service flexibility is not yet applicable in this project since no organisations have been appointed for this aim. Regarding organisational

flexibility we didn't find real options, as expected, although perhaps in a later stadium of the project this type of flexibility exists.

## CONCLUSION AND DISCUSSION

This case study shows several real options within in the development of one development project of a construction site in health. In this section we will answer the research question.

The real option of stage is the most used real option in this case and enables flexibility in the process. The option to abandon and defer are in this case enabled by the stage option: after each phase it had been possible to abandon or defer the next phase. The option to select was considered but not applied because of the high costs. When considering this flexibility as a real option, the advantages of this flexibility had become more visible.

Other real options that have been applied relate to technical flexibility, on a strategic level. These were the option to grow and switch. We didn't recognise any real options related to financial and service flexibility, nor related to organisational flexibility, to which we neither could appoint real options based on literature. Table 2 shows what real options are found in the case study related to what types of flexibility.

Table 2. Real options found in the case study related to types of flexibility

Types of flexibility	Real options						
	Stage	Abandon	Defer	Growth	Scale	Switch	Select
Process	X	X	X				X
Product Technical/design, Spatial				X		X	
Financial							
Service							
Organisational							

We also asked the question what the consequences were of uncertainties on the timing and exercising of options. The main uncertainty in this case is the national policy change from remuneration based on re-calculation towards normative housing components, which requires real estate that is rentable over the life cycle. The stage option allowed deferment of the process to reduce the information gap

by allowing time for more research on the project. Although postponement of the project had negative consequences for other stakeholders in the process, in the end probably it will result in a building that much more reflects the needs of the users and clients and is more resilient to future changes.

A major uncertainty for the project group, being the main problem owners in this research, was the board, which approved continuation with the project. The stage option therefore was more an advantage for the board than for the project managers. Both real estate managers and directors of Ibis took place in the project group, which ensures that both the organisational as the real estate strategy are safeguarded and related, so in that sense no additional role had to be played by the board. It was already suggested during the process to more involve the board in the process, in order to prevent disapproval of the previous phase, because this leads to negative side effects as described above. Although this course of events might add to the effectiveness, more could be done within the decision making process to make this, besides the real estate itself, also more efficient.

This paper showed how flexibility can be enabled by real options. It adds to the body of knowledge on flexibility, which is still a broad concept. Using real options provides insight into the value of flexibility. Ford et.al. (2002) propose a simple method to value flexibility, which can also be applied in this case when real estate managers would like to have more insight into the monetary value of flexibility as ground for decision making.

Within the process, several times the consultancy made use of scenario's to depict the consequences of decisions. In combination with real options this would be a better method to gain insight into the need and value of flexibility, as proposed by Miller and Waller (2003). One can think of many uncertainties to happen. For convenience of comparison 3 different options should be worked out, as has been done in the example above. Miller and Waller (2003) propose to use the real option theory in combination with scenario planning. When using one or two extreme scenario's and one trend scenario with a qualitative description of uncertainties, decision makers will have a manageable overview of the uncertainties they have to deal with and which they have to consider in determining the real options.

This case shows that advantages of a traditional project delivery system where the project can be staged. However, literature shows advantages of integrated project delivery systems. Therefore it would be useful to analyse an integrated project process, to see what real options are available there. Our case study had not yet reached the construction and operation phase, therefore some real options such as related to technical flexibility, could not be evaluated. It would be useful to follow this project further or do case studies on projects which are in a more advanced stage.

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