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Real options in project coalitions in Dutch health care: two case studies of construction projects

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Uncertainties affecting health organizations inevitably influence real estate decisions since real estate is required to facilitate the primary process in cure and care. Decisions have to be taken when there is little knowledge about the future. Therefore, flexibility is needed in the process of designing, constructing and operating real estate. Real options provide an approach to gain greater insight into flexibility. The aim is to analyse whether real options can be recognized in the real estate strategies of health organizations and what real options are provided by various forms of project coalition. Two case studies reveal that real options thinking can indeed be recognized in specific real estate strategies. The choice of certain real options is partly a result of the type of project coalition applied. Further development of real options thinking in real estate management in cure and care creates opportunities to deal with future uncertainties.

Keywords: Case study, health care, project coalitions, real estate management, real options thinking.

Introduction

Since the 1980s, marketization has been an important approach to manage healthcare expenditures by national governments. This marketization implies a more business-like operation by health organizations, resulting in an increasing importance for efficient real estate management (Raad voor de Volksgezondheid en Zorg, 2006; Bellers, 2008). The main institutional change is the introduction of competitive diagnosis related groups (DRGs). A DRG includes a budget for both capital investments and for the workload of medical specialists, while the magnitude of this budget is still partly unknown. It is one of many uncertainties that affect healthcare organizations, which makes it difficult to choose the appropriate real estate strategy and adaptability for these changing circumstances. Developing real estate strategies, which we refer to as corporate real estate management (CREM), involves balancing the flexibility needed to meet an organization's and its users' needs, with controlling time, costs and quality by not allowing excessive flexibility. There is, however, little insight in how flexibility can be incorporated in the real estate strategy of health organizations. A promising suggested approach for providing these insights is real options theory (Olsson, 2004; Vlek and Kuijpers, 2005; Gehner, 2008). Real options, as a way of thinking, helps real estate managers recognize that uncertainty is not inherently negative, and can even provide value. A real option is defined as a right, not an obligation, to exercise an option, and derives from financial options (Black and Scholes, 1973). Myers (1977) applied options to *real* investments: so-called real options (Bowman and Hurry, 1993; Dixit *et al.*, 1994; Trigeorgis, 1996; Amram and Kulatilaka, 1999; McGrath and McMillan, 2000). Real options provide value, through the ability to be flexible, which increases as uncertainty increases.

Despite the increasing attention given to real options thinking in project management literature, it has not yet been studied in healthcare real estate management. Besides, as authors such as Ford and Lander (2011) point out, real options models have been applied in practice to a limited extent. It is therefore useful to find out how practitioners deal

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with flexibility. Therefore, this study is aimed at analysing whether real options thinking can be recognized in two construction projects of health organizations within different contexts. By means of cross-case analysis, the various conditions for exercising real options can be retrieved. While most real option studies on construction projects mostly consider real options applied by the contractor, in this research we mainly look at how real estate managers, i.e. the clients, implement real options in their real estate strategies. If real options are recognized as such, they can be used to gain greater insight into flexibility and also generate more flexibility, in order to mitigate future uncertainty regarding investments in health assets. Since various project coalitions are assumed to provide different degrees of flexibility, we show how two different forms of project coalition affect the use of real options. The two research questions we answer in this paper are:

(1) What categories and types of real options can be recognized in healthcare real estate management and in different project coalitions?
(2) What conditions determine whether real options can be exercised?

This paper will first elaborate on the various types of project coalitions and the concept of real options thinking. To analyse what real options are applied in construction projects in both care and cure, we carried out two case studies. We describe those critical events that result in a change in the process of initiating, designing and constructing real estate, and that influence flexibility. In the conclusions, we reflect on the relationships uncovered between the project coalitions selected when investing in health assets and their flexibility in terms of real options.

Theoretical framework

This section elaborates on the major concepts used in this study. First, different forms of project coalitions are discussed. Following this, the focus is on real options as applied in construction projects.

A typology of project coalitions

The project coalition plays an important role in project management. Therefore, the type of project coalition is an important mechanism in creating flexibility in the process. According to several authors, flexibility is one of the selection criteria for a certain project coalition or procurement system (Skitmore and Marsden, 1988; Alhazmi and McCaffer, 2000; Chan *et al.*, 2001). In this section, a short overview is provided of the main characteristics of three types of project coalitions described by Winch (2010), Bult-Spiering and Dewulf (2006) and Pries *et al.* (2006): separated, integrated and mediated project coalitions[1] (see Table 1).

In a *separated project coalition* an architect, a general contractor or a project team representing the client leads the design team. The architect or general contractor will then select contractors. In terms of flexibility, the client has much control and a lot of responsibility over the process since it procures each contractor separately. The client bears all the risks and the process takes considerable time.

In an *integrated project coalition*, multiple tasks such as design (D), build (B), finance (F), maintenance (M) and operation (O) are integrated into a single contract. Assignments are executed based on functional rather than technical specifications. Risks are transferred by the client to the contractor for a given price. In general, the influence of the client on the process is less than when using a separated project coalition.

In a *mediated project coalition* the client and the contractor together seek solutions and divide risks among those best able to bear them. Pries *et al.* (2006) speak of a strategic cooperation when all the DBFMO tasks reside within one coalition. The prime contractor takes on some of the risks associated with budgeting and scheduling through structured incentive contracts. In a mediated project coalition, both design and construction managers are appointed and these will be responsible for managing the trade contractors mobilized for onsite execution. Various terminologies are used, such as management contracting, construction management and design and manage. In a mediated project coalition, the client has more influence in the process than in an integrated project coalition.

The various types of project coalition all have different consequences for flexibility (as shown in Table 1). By applying the real options theory we attempt to give greater insight into the types of flexibility that are available in different project coalition forms. Based on the way project coalitions work, one can derive assumptions on their ability to create real options.

Real options and flexibility in corporate real estate management

Real options add value to the ability to be flexible, and this value increases when uncertainty increases. Real options have the following characteristics (Bowman and Hurry, 1993; Amram and Kulatilaka, 1999; Adner and Levinthal, 2004; McGrath *et al.*, 2004; Ford and Sobek, 2005; Hovmand and Ford, 2009):

Table 1 Characteristics of different types of project coalitions (derived from Bult-Spiering and Dewulf, 2006, Pries *et al.*, 2006; Winch, 2010)

	Project coalitions				
	Separated			Integrated	Mediated DBFM/O
	Traditional (DBB)	General contractor	Building team	DB, DBM, turnkey	Strategic cooperation
Characteristics	Takes a long time because of separate stages in project	General contractor appoints contractors on behalf of client	Exchange of useful information between contractors	Assignment based on functional I/O technical specifications. Tuning activities between parties. Increased certainty about duration and costs. Incentive for better price/quality ratio	Considers life cycle costs
Flexibility	Client flexibility but at high cost			Less flexibility unless negotiated, with specific costs	Considerable flexibility for client
Division of risks	Risks and responsibilities with client			Risks transferred to contractors	Risks transferred to parties best capable of bearing them
Type of contracts	Often fee-based			Fixed price	Incentive-based

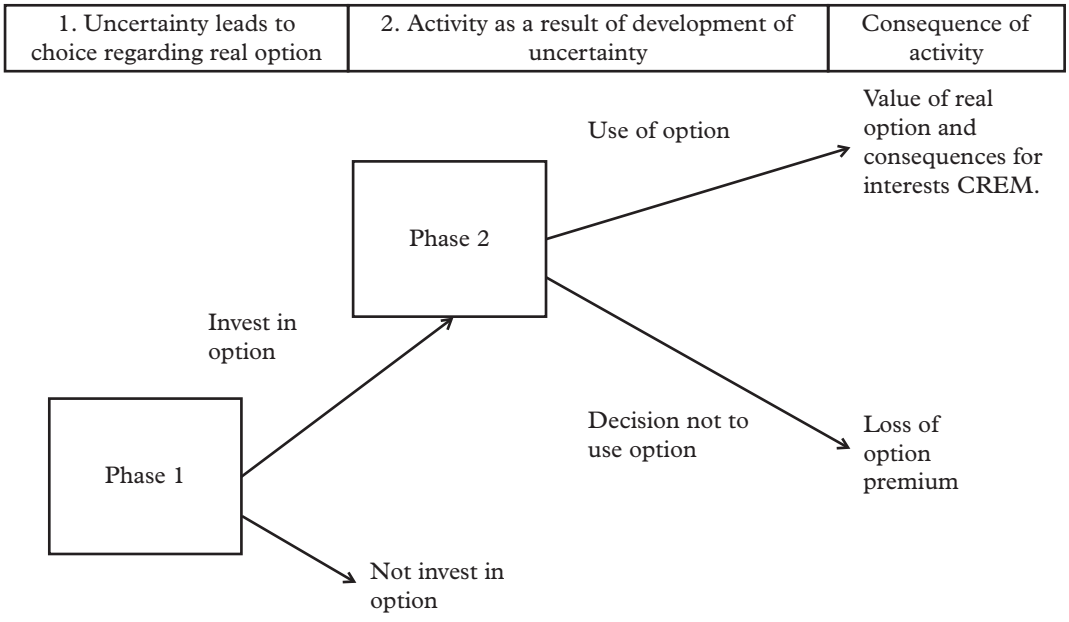

Figure 1 Phases in the working of a real option (based on Adner and Levinthal (2004))

(1) When a real option is created it requires a certain investment.
(2) The circumstances have to enable flexibility, otherwise there is no option.
(3) Different phases can be recognized in the application of real options (see Figure 1).
(4) Since uncertainty increases the value of a project through having real options, uncertainty should be seen as an opportunity rather than a risk.
(5) The difference of the outcomes of a reference strategy without options and the strategy with

real options is the value of the real option. These outcomes can be different from those that are assessed in monetary terms. Performance measures have to be determined on which the decision to invest in a real option is based. The real option should be exercised at a certain point otherwise the possibility exists that it can expire.

(6) Certain uncertainties determine whether an option is needed. The development of such uncertainties determines whether the options should be exercised or not.

In determining whether an investment should be made, real options provide greater value to an uncertain project than other valuation techniques, such as the net present value (Alessandri *et al.*, 2004). Some authors argue that real options can also be used as a way of thinking to obtain insight into how current actions can create opportunities for future flexibility (Miller and Lessard, 2001; Triantis and Borison, 2001; Miller and Waller, 2003; Alessandri *et al.*, 2004, Winch, 2010). Real options can be categorized based on their field of application and in the way they appear. In IT product development, Benaroch (2001) identifies technology options. In project management, de Neufville *et al.* (2008), identify real options 'in' the project and 'on' the project. Real options in the project are technological solutions that create flexibility while real options 'on' the project create flexibility in the process of project development. Parallel to the last type of real option, Ford and Sobek (2005) introduced the term 'managerial real options' to emphasize the non-monetary and decision-making aspects of real options, which is also the focus in this research. Many areas have been subject to research on the potential use of real options, such as project management in large engineering projects including infrastructure and irrigation (Miller and Lessard, 2001; Ford *et al.*, 2002; Ng and Björnsson, 2004; Ford and Bhargav, 2006; Michailidis and Mattas, 2007; Miller and Lessard, 2007; Smit and Trigeorgis, 2009), project management in ICT (Fichman *et al.*, 2005; Hilhorst, 2009), corporate strategies (McGrath and McMillan, 2000), natural resources (Cornelius *et al.*, 2005; Luong and Tauer, 2006), R&D (Pennings and Lint, 1997) and modular design (Baldwin and Clark, 2000). However, as pointed out by various researchers, the application lags behind its potential use (Lander and Pinches, 1998; Triantis, 2005; Garvin and Ford, 2012). Real options are recognized as valuable also in the area of real estate, although mainly in computational terms where only the market value of real estate is assessed. Real options are then mainly approached from an investor's perspective, while in corporate real estate management the primary aim is to facilitate the primary process, where many other interests and uncertainties are involved (Durmisevic *et al.*, 2009; van der Zwart, 2011). Besides, most research only deals with one particular real option instead of multiple options in one project. A related field of application is area development, but here also only few types of real options are recognized (Mayer and Somerville, 2000). The same goes for the application of real options in project coalitions (Garvin and Cheah, 2004; Liu and Cheah, 2009). As stated by Ford and Bhargav (2006), many real option models consider only few uncertainties while projects in health are often very complex. It is recognized that project managers use many forms of flexibility in construction projects that can be structured as real options (Ford and Bhargav, 2006). In addition, construction projects in health are different from most other large construction projects since these have to take place in close cooperation with the users. Most real option research on construction projects aims to support decision-making of project managers of the contractor, while in this research we look from the perspective of the client who has to develop real estate strategies. Our study is aimed at analysing the use of multiple options in real estate project management in both cure and care organizations.

Following the taxonomy of Amram and Kulatilaka (1999), real options can be categorized according to how they create flexibility. The taxonomy consists of investment and disinvestment options, timing options, contractual options and operating options. Investment and disinvestment options may significantly change the asset configuration by using scaling up, scaling down and growth options. Timing options, such as to delay or accelerate, also fall under investment and disinvestment options. Contractual options reflect contract terms that change the risk profiles faced by asset owners: the contingency adaptability in a project coalition (Luo, 2002). Since all types of options can be defined in contracts, they are all to an extent contractual options. Operating options relate to options linked to an asset in use, such as a switch option. A service can also be stopped (the option to abandon), or scaled up or down, and grow or shrink. The operating option can also be applied to the project development in which inputs of e.g. (sub)contractors and outputs (changes of the design during the design phase) can be changed.

In Table 2 the various types of real options are described with examples of application in construction projects. The most common types of real options are the options to defer, stage, grow/collapse, scale up or down, abandon and switch function. Fichman *et al.* (2005) notice that combinations of real options

Table 2 Types of real options and examples of application in construction projects

Taxonomy of real options (Amram and Kulatilaka, 1999)	Types of real options, e.g. Trigeorgis (1993) Sommer and Loch (2004), Fichman *et al.* (2005)	Project management (de Neufville *et al.*, 2008)	Examples of application in real estate construction projects in health
Timing option	Defer	'on' the project	When there is uncertainty on governmental regulation, the project might need deferral
Investment option, operating option	Growth, switch function	'in' the project	Other demands can necessitate switch function of expansion/shrinking of the real estate
Investment option, operating option	Growth, scale up and down, switch function	'in' the project	When demands of the organization change: expand the building, scale up or down and switch function
Operating option, disinvestment option	Abandon	'on' the project	When finance cannot be obtained, it should be possible to abandon the project
Investment option	Select	'on' the project	Select multiple architects to obtain knowledge on the best one
Investment option	Stage	'on' the project	A construction project is irreversible. By staging the project after each stage a go/no go point is implemented

exist. The select option is a seventh option which is recognized by Winch (2010) as an important real option to take into account in developing the strategy for the project, based on the selectionism concept of Sommer and Loch (2004). The select option implies that options are being developed in parallel, one of which can be chosen when conditions are better known.

Although research shows that much decision-making can be structured according to the real options concept, Triantis (2005) showed that the actual use of real options lags behind its potential use. In order to bridge the gap between theory and practice, Triantis (2005) proposes five challenges. One of these is that real option models should be more user-friendly. Triantis (2005) suggests that the development of heuristics should aid the further dissemination of real options application. The findings are synthesized in a framework which can be used by real estate managers to analyse their own situations. In this way, a heuristic is created that real estate managers can apply to their own situations. We focus on the various categories of real options applied and their conditions. We assume that understanding the various aspects of real options is a prerequisite to gaining insight into the flexibility needed and eventually expanding their use by valuing real options quantitatively. However, this is not necessarily a progression since the way real options are used depends on their purpose (Triantis and Borison, 2001). As suggested by Liu and Cheah (2009), having defined the real options, the important decision-making moments and their consequences, practitioners can optionally use other models such as binomial trees. The use of other methods such as scenario planning can complement real options analysis, as proposed for example by Miller and Waller (2003).

Method

Referring to Triantis (2005), Ford and Lander (2011) also emphasize the importance of knowing how practitioners perceive and value flexibility. By investigating the practice of real estate managers in health, which is a still unexplored research area regarding real options, we investigate whether real options reasoning is also used in this field and how it can be made explicit for improved risk management. The aim of the research therefore is to create more understanding of decision-making in health organizations related to flexibility. For this, a process study approach is applicable, along with a critical incident analysis, since each decision which is an investment or exercising of a real option, influences the process and therefore amounts to a critical incident. The two exploratory, in-depth and longitudinal case studies provide most information on the practice of dealing with real options, and the conditions for creating and exercising these. In this section we elaborate on the process vs. variance theory approach, and describe how we conducted our case studies.

Methodology: process vs. variance research design

In this research, we want to answer the question of *how* real options are created and exercised during the development of a construction project. As such, the process theory approach is very suitable (van de Ven, 2007). The philosophy of science from which perspective we view our research is critical relativism. This implies an objective ontology, which means that we see reality independent of our cognition. The subjective objectivism underlying this perspective implies that researchers can observe reality from different perspectives and various theories explain reality (van de Ven, 2007). The process theory approach is different from the variance theory approach as explained by Mohr (1982). In variance theory, the causal effects between variables are explained statistically whereas, in process theory, the process is more fine-grained and narratively analysed by identifying all events, activities and choices, on various levels, that influence the process. Furthermore, the time aspect is important in process theory since the entities acting on events change over time, as do the variables used in the research: namely, flexibility, uncertainties and real options. However, when generalizing events to the real options theory, we structure this according to the variance approach in which if–then relations are shown. The narrative descriptions of the specific contexts and conditions of the various real options provide richer information in order to enable better translation to specific contexts and the 'real' world. *Incidents* and *events*, and the distinction between them, in process theory can be seen as analogous to *variables* and *constructs* in variance theory. Langley (1999) argues against artificially separating variables and events, and for using both elements in research. We follow this by referring to flexibility, uncertainties and real options as variables, which are then reflected in incidents and events. Whereas incidents are directly observable activities, events occur on a more abstract level and might well have a longer duration. In our research, we define a critical event as a development with a relatively long duration that influences the direction of a process. For example, a policy change is a lengthy development which influences decision-making in an organization. Critical incidents are shorter events, such as a decision being made or a report being written. Here, we are interested in incidents that have an influence on the course of the project and relate to flexibility. When collecting process data, we therefore attempted to document as fully as possible the sequence of events that were pertinent to the processes being studied (Langley, 1999).

From these events, we distilled those events which could be identified as falling within the concept of real options. In the case studies, we chronologically described each incident, the development that motivated that incident, and the consequences in terms of flexibility.

Case study research

The value of an individual case study is that phenomena can be qualitatively described with greater nuance regarding their development than would be possible using a quantitative methodology (van de Ven, 2007; Yin, 2009). Each construction project has its own stakeholders and interests, and therefore its own dynamics. This makes every case unique and therefore also valuable since each can point at gaps in existing theory (Siggelkow, 2007). In the analysis of the case studies we make use of the structured strategy description tool developed by Ford and Bhargav (2006) and Johnson *et al.* (2006) in which the real options recognized in the cases studies are presented according to the characteristics of real options described above (under 'Real options and flexibility in corporate real estate management'). The characteristics for the specific real options in the cases are the asset that should be flexible, the driver of performance uncertainty, reference strategy (strategy without an option), alternative strategy (with option), signal for changing strategy (investing in real option), conditions for strategy change (change is investing in real option), actions required to obtain or retain flexibility, action required to change strategy (option premium) and the decision rule for changing the strategy. The framework is based on the approach of Ford and Sobek (2005) who describe decision-making in the form of real options and value flexibility as the difference of outcomes between the strategy with and without the real option. We added the expiration of the real option since this is also an aspect of the real option concept.

Development of an elderly care building

The first case study is referred to as Utopia, the contrived name of a building which is being redeveloped and forms part of the real estate portfolio of a large welfare organization. The welfare organization, called Ibis in this story, offers a range of welfare, living and care services. It is in the top 10 of Netherlands' largest care organizations, with around 2250 full-time equivalents. At the start of the project in 2005, Utopia was owned by Parrot which merged in 2008 with Crane to form Ibis. The case project consists of a large building complex existing of two parts: one for intensive elderly care, and a part for people with somatic disorders. The building parts were respec-

tively built in 1977 and 1994. The plan was to demolish and rebuild the former part, and renovate the second part. This was the point of departure of the project from 2005. During the design process, the idea arose to build in addition a unique wellness centre for special target groups. Duota, the real estate organization of Ibis, decided on a separated project coalition because they had experience with this type of project coalition. Several developments were not considered in advance by the organization and resulted in changes in the design. These developments were a merger, a new board of Ibis, new insights on healthcare concepts and the consequences of marketization. In 2005, this marketization received a new impulse through a policy change, often referred to as the 'new regime', which introduced a new system of compensation. Under the old regime, health organizations received full compensation for their infrastructure costs based on a calculation, with a permit from the Bouwcollege[2] serving as a bank guarantee. Under the new regime, health organizations are fully responsible for the funding and upkeep of their real estate. For a long time, the extent of the compensation for capital investments remained unclear.

The main internal stakeholders within the development project were Duota, the real estate organization of Ibis and responsible for the project management of Utopia, the direction of Duota, the board of Ibis and working groups of Ibis participating in determining the list of requirements and the patients of Utopia. The contractors are a consultancy firm participating in the project team, the architect and technical advisers. Other external stakeholders were a housing company which provided temporary housing and Pointcare, which was another health organization that would rent space in the new Utopia and thus also participated in defining the list of requirements. Since both Pointcare and Ibis provided different types of care, they expected mutual learning by this cooperation. The municipality was involved since it had to approve the design. The fire department was involved because of fire safety regulations.

Development process of a hospital

Manor is the second case study in this research. It is a regional hospital with around 500 full-time equivalents and an interesting case since it is the first Dutch hospital to finance its construction project at its own risk and on its own account. In addition, it fulfilled the design and construction of the new hospital in record time. In that sense, it is the opposite of the Utopia case. Asbestos problems in the old hospital made renovation too expensive. In January 2006, the board made its final decision to build a new hospital. Given the need to demonstrate financial credibility to financers and guarantee providers, the board put a tight deadline on completion, namely January 2010. When finance was approved by the bank, based on this business plan, the budget was also fixed. A tight budget necessitated more bed capacity within less space. A consultancy firm investigated the occupancy of spaces in the old hospital in order to determine the required surface areas of the new hospital. By means of splitting up the design process of the skeleton and the interior, the process could be accelerated. An innovative working concept of front- and back-offices requiring adaptation of the working process was implemented.

Because of experience of another construction project by the same hospital, the board member responsible for real estate decided to choose a mediated project coalition with a general contractor who was contact person for all contractors. Procurement of subcontractors was undertaken using a competitive dialogue because this would in the opinion of the project team yield a more suitable subcontractor. A project manager from a consultancy firm was appointed to guide the process, called the process manager in the case study. Maintenance of the building would also be done by the contractor.

The main internal stakeholders were the board, the medical staff who have a large say in Dutch hospitals because of their autonomous position, personnel represented by health managers and the patients represented by a patient organization. All stakeholders were either represented in the project management or had a say in the process during working conferences. Different steering committees and advisory groups were composed during different stages of the process. The points of departure were stated in a business plan of the organization, formulated with the assistance of a consultancy firm. External stakeholders were people living in the neighbourhood, having influence on the design by being represented in a sounding board. The municipality was involved because of urban planning issues. The hospital swapped land and had to discuss water-related issues with the water board. The province was involved since it financed an extra branch of a roundabout increasing the accessibility of the hospital.

Common factor in cure and care projects: the role of the board

It is clear from the case studies that the organizational vision is an important factor which determines the need for staging, deferral and even abandoning of the project. Large differences can be observed between Manor and Utopia. Manor developed a business case, where in the development process each specialism

defined its needed surface. During this process, a new working concept with back- and front offices was being developed while the planning was kept strict. In contrast, during the merger, Ibis was more concerned with management of the organization because of financial problems and switching of the board, rather than the Utopia construction project. This led to unpredictable decision-making and uncertainty as to the organizational vision of all stakeholders. Although both projects seemed urgent because of expiring permits, this sense of urgency was far more visible in the Manor case than the Utopia case. One reason could be that Ibis assumed that care can be delivered on a temporary location, which is not the case in the Manor case. The role of the board was crucial and determined the course of the projects in both cases.

Validation of the research

We obtained data by attending project meetings of the Utopia project. We analysed minutes from meetings in the past and other documents such as contracts and reports from different consultancy firms and governmental organizations. The Manor case was investigated retrospectively. We interviewed two project team members of Manor and three team members of Utopia and asked them for clarification if data were missing. If things were unclear or if data were missing to fill in critical incidents, we asked members of the project team for clarification. For triangulation the members of the project team checked the report with main critical incidents. Process data were analysed using visual mapping strategy tools (Langley, 1999). Additional advantages of this strategy on top of those gained from narrative approaches are that the tools '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, p. 700; see also Miles and Huberman, 1994). Critical incidents found within the information sources were coded. The mapping of these critical incidents was used to verify our findings during a workshop in which the participants could reflect and comment on our findings.

Although the two organizations operate within different health sectors (cure and care respectively), they face similar uncertainties, which justifies our comparison. Another difference is in the size and budget of the two projects. The ground area of the Manor project is about double that of Utopia, and the required investment approximately one-third greater. However, since the results show that these were not decisive factors in aspects such as the speed of the process, we believe our comparison remains valid.

The comparison focuses on the approaches used in the definition and design phase since the construction phase has yet to start in the Utopia project. However, since most uncertainties occur in the definition and design phase, and most changes in the design take place here, this phase is the most informative for our research.

Results

The findings of real options in the case studies are systematically described according to the structured strategy description tool developed by Ford and Bhargav (2006) and Johnson *et al.* (2006). After a short description of the critical incident that can be recognized as a real option, we structure the various aspects of the real option in a table. The various aspects we describe in the matrix are the uncertain performance measure which is the uncertain outcome of an investment, the driver of performance uncertainty which is the main uncertainty(-ies) that determines the outcome of the investment, the reference strategy which is the strategy without an option, and the alternative strategy, which is the strategy with an option. The difference between these last two determines the value of the real option. Other aspects described in the table are the signal for changing the strategy which means the critical incident that determines whether to invest in the real option, the conditions for investing in the real option, actions required to obtain or retain flexibility, action required to change strategy which is the exercising of the option, the expiring of the real option and the decision rule for changing strategy. For each case, three real options are analysed in the way just mentioned. Because of space limits, we could not discuss all real options in detail.

Real options in the Utopia case

Option to grow, switch and scale up or down

Although not the whole terrain around Utopia was planned to be used for Utopia in 2005, Ibis decided not to sell the remaining part. This is an option to grow, switch and scale, described in Table 3. The reason for this option was because several issues were still uncertain in the decision-making of Ibis. The first uncertainty was whether Ibis would develop houses and do this independently, or whether Ibis would hand this over to developing companies or housing corporations. The target groups for which the houses would be built were still uncertain in 2005 as well. The (future) capacity of the terrain was also dependent on the capacity of other buildings of the real

Table 3 An option to grow-switch-scale in the Utopia case

Uncertain performance measure	Available space needed in the future
Driver of performance uncertainty	Vision of organization on development of houses, cooperation with other health organizations, new ideas on health provision and corresponding design, capacities of other projects of the Ibis real estate portfolio
Reference strategy	Sell land
Alternative strategy	Keep land
Signal for changing strategy (investing in real option)	Decision made on developing houses, need for extra houses based on long-term housing plan, cooperation with other health organizations, etc.
Conditions for strategy change (change is investing in real option)	Having the land in ownership and retaining the land should provide added value related to town planning and the eventuality of developing other activities
Actions required to obtain or retain flexibility (option premium)	Retaining land. Because the land is not being sold, incomes arising cannot be subtracted from the investment costs and also maintenance costs increase, which can be seen as the option premium
Action required to change strategy (exercising option)	Developing the terrain
Decision rule for changing strategy	IF (the demand for care or income) > (investments in developing area) THEN (expand real estate) ELSE (sell area)
Expiration of real option	If there is no demand for land or more development it is not profitable to put or call the option. However this is very unrealistic

estate portfolio of Ibis. The long-term housing plan, in which this was defined, needed an update, depending on all kinds of external trends. Another uncertainty was cooperation with other health organizations who perhaps wanted to participate in the development and accommodate patients in the new Utopia, resulting in a larger project. The layout of the future real estate was another uncertainty, depending on the vision of the town planning professional and new market research. But also new developments in vision on providing healthcare in general reflected on the design and thus the available space needed. However, keeping the terrain would also imply additional costs and selling would reduce the costs of the Utopia project. The traditional strategy therefore was to sell the terrain. The alternative solution was to keep the terrain and wait until more information was available. The performance measurement that could be used was the available space needed when deciding to build houses for a certain target group. The value of this measurement that justified switching to the alternative strategy can be defined as the profits gained from exploiting the terrain in contrast to selling it. In order to have the flexibility the terrain should not be sold. To change strategies, the terrain will be developed.

Option to defer-stage-abandon

Several uncertainties made it questionable whether the final design delivered by the architect would meet the requirements of the organization. These were the extent of the remuneration of the government for capital costs and life cycle costs, the correspondence of the design with the vision of the organization and with new insights in health concepts in general in the Netherlands, marketability of the design and concordance with town planning visions. There existed two strategies which are described in Table 4: first to continue with the project and the second to defer and obtain more information on the uncertainties.

By opting for a separated project coalition, each phase in the development and construction process was separately procured and ended with a go/no-go decision to be taken by the board. The performance measure was whether the uncertainties mentioned above were acceptable. The signals to change the strategy were the many uncertainties foreseen. To create the real option, a separated project coalition should have been used, which means separate assignments for each phase and agreements with the contractors on changes in the process. The conditions that justified changing the strategy and thus investing in this option were the levels of uncertainties. If it was clear that uncertainties would not be resolved in a short amount of time, it was valuable to invest in the stage option, also making it possible to defer or abandon. The management of the organization should estimate the height of this threshold. Although it seemed well considered to choose for a separate procurement strategy, this was more a result of the experience of the real estate company. Other project coalitions could have had other advantages. Evaluat-

Table 4 An option to defer, stage and abandon the project in the Utopia case

Uncertain performance measure	Work delivered by contractors and project team after definition, conceptual and final design phase
Driver of performance uncertainty	External uncertainties: construction costs, government policy (are remunerations sufficient to let the real estate be rentable and demolish the old building or not). Internal uncertainties: organizational strategy is not clear (yet) which is partly dependent on the market situation of apartments and other services and new concepts in the health sector
Reference strategy	Continue the project with the same contractors
Alternative strategy	Abandon the project, change the design, continue with the project, and change contractors. Costs associated can be an extra risk for client but creates more flexibility for the client to decide later on matters
Signal for changing strategy (investing in real option)	Many uncertainties foreseen in financing and layout of real estate
Conditions for strategy change (change is investing in real option)	Estimated extent of uncertainties such as the outcomes of health concepts, construction costs, government policy. If the organization considers these to be too high, it is valuable to invest in the option. It is dependent on managerial capabilities to determine the conditional threshold
Actions required to obtain or retain flexibility (option premium)	Separated project coalition, procure every phase separately which costs time and money
Action required to change strategy (exercising option)	Obtaining more information to be evaluated in go/no go decision moments
Decision rule for changing strategy	IF (external uncertainties) $\neq$ (outcomes of project phases) THEN (have a separated project coalition) ELSE (mediated)
Expiration of real option	When the uncertainties are resolved, there is no continuing need for an option and therefore the option loses value

ing the two types of project coalitions therefore involved balancing several advantages and disadvantages, among which was the real option created by the separated project coalition. This was difficult to grasp in quantitative terms. For example, when one had invested more in the definition phase, the design was probably more according to the vision of the organization. Investing more in the definition phase by the client was often incited by a mediated project coalition. The project could have benefited by reducing some uncertainties already earlier in the process in this way.

Option to select

When, in 2010, the board wanted to defer the design process, the project group proposed a parallel development of a conceptual design for a wellness centre alongside a conceptual design for a 'normal' health centre in order to speed up the process. This was necessary for several reasons: first, deferring the project might mean that the working groups cooperating in the design lost commitment. Second, for fire safety reasons, the project could not be deferred much longer. Third, time is money. One advantage of deferral was that the value of real estate on the balance sheet diminished. However, it was decided not to invest in this option and instead use a stage option: the project team would continue with designing the residential part and defer the wellness concept. The ability to defer was the condition for changing the strategy, thus investing in this option. When this level was reached depended on managerial decision-making. The structure of the real option is presented in Table 5.

The critical incidents of the Utopia case from which the real options are derived are presented in Appendix A.

Real options in the Manor case

Option to grow-switch-scale

The challenge in the Manor case was dealing with the obsolescence of the hot floor of the hospital and the uncertainty on developments around the building. The hot floor with high technologies would become obsolete earlier than other parts of the building. Therefore, the building would have a comb structure which makes it possible to build a new hot floor on another part of the comb, and demolish the old one without obstructing the primary process. For that purpose, more space would be needed around the hospital. This space was created by the old hospital beside the new one which would be demolished, and

Table 5 Option to select in the Utopia case

Uncertain performance measure	A 'normal' health centre or a wellness centre
Driver of performance uncertainty	Lack of clarity of organizational vision
Reference strategy	Develop only one design or invest in a phase option to enable deferral
Alternative strategy	Develop two designs in parallel
Signal for changing strategy (investing in real option)	Degree of lack of clarity on the organizational vision
Conditions for strategy change (change is investing in real option)	Maximum level of ability to defer. This depends on among other things the loss of commitment from stakeholders and expiration of permits. When this level is reached is quite arbitrary and depends on managerial competences to estimate this
Actions required to obtain or retain flexibility (option premium)	Defer the construction phase. Make agreements with contractors on further deferral and eventually develop two designs
Action required to change strategy (exercising the option)	Assign the architect with another design. Managed by the project team and in cooperation and consultation with working groups on the design and develop another working concept which is necessary when choosing the wellness centre
Decision rule for changing strategy	IF (degree of lack of clarity on organizational vision) > (max. level of ability to defer) THEN (develop two designs in parallel) ELSE (develop only one design or invest in a phase option to enable deferral)
Expiration of real option	If organizational vision is resolved, there is no further need for the option

by exchanging land with the municipality and the water board to create optimal space. In this way a real option was created, described in Table 6. A good relationship with these parties made exchanging easier. Another uncertainty was whether additional functions were needed and desirable around the building, and which functions those would be. To retain flexibility to build a new hot floor and to eventually develop other functions, the land should not be sold. This again is dependent on external uncertainties such as governmental regulations, demography and developments in health. To evaluate whether the additional investments have to be made, there should be certainty on these uncertainties and a declaration of intention of possible parties that might settle on the terrain and the expected profitability of these activities. Another condition to enable construction of a new hot floor on another spot without obstructing the primary process is the layout of the building.

Option to accelerate

Because of the economic situation and the loss of guarantee from the government it was difficult to obtain loans from banks. However, when the loan was provided, the hospital wanted to finish the project as fast as possible without extension of the project, in order to keep credibility with the bank. In addition, the project needed speeding up for safety reasons because the old hospital contained asbestos. The option to accelerate was created by investing in the front-end of the project by determining a list of requirements and a business plan that remained unchanged starting points during the course of the project. One tried to keep strictly to the planning, which was enabled by a transparent decision-making procedure. This limited the flexibility of both the project management and the users of the building (medical staff, personnel and patients) but speeded up the process. Proposed changes by the users were implemented in the design if they did not violate the starting points. Otherwise clear arguments were provided why it was not possible to implement the changes. Four conditions were necessary to create this option: first, the attitude of medical specialists and employees was a determinant. According to the project manager, the medical staff had been rejuvenated and was forward looking, which enabled innovations. The atmosphere remained positive and criticism constructive. Besides, all interests were represented in the project team who promoted the project among their interest group. Secondly, because all interests were represented in the project team, short lines of communication were created which enabled fast decision-making. Champions among the health managers increased support for the new building and new working concepts as well. Thirdly, the new building was seen as an opportunity to adapt to changes and to trigger the new way of working. Finally, the new regime (see section on development of an elderly care building) had urged the employees for rapid progress and change in the working processes, and this smoothed the process. External stakeholders, which were inhabitants in the surrounding area, were dealt with in a supportive way as well. By involving these stakeholders early on, their comments could be considered in the design and,

Table 6 Option to grow/switch/scale in the Manor case

Uncertain performance measure	Obsolescence of hot floor or other developments on terrain. Governmental regulations, demography, developments in health
Driver of performance uncertainty	The hot floor becomes obsolete earlier, or functions should switch or additional functions are needed as a result of developments in health and governmental policy
Reference strategy	Sell land
Alternative strategy	Keep land and exchange with municipality
Signal for changing strategy (investing in real option)	Foreseen preliminary obsolescence of hot floor or even whole building. And eventually other complementing activities in area
Conditions for strategy change (change is investing in real option)	Investments on terrain: clear demand, clarity on governmental policy, profitability of other activities on the terrain. A condition for the replacement of the hot floor on another spot is the so-called 'Shell model'[a]
Actions required to obtain or retain flexibility	Retain land and exchange a part with the municipality. Maintaining good relations with the municipality is a condition
Action required to change strategy (option premium)	Demolish old part or whole building and redevelop or develop other activities on terrain
Decision rule for changing strategy	IF (the demand for care or income) > (investments in developing area) THEN (expand real estate) ELSE (sale area)
Expiration of real option	If there is no demand for land or more development it is not profitable to put or call the option. However this is very unrealistic

Note: [a]The 'Shell model' (College bouw zorginstellingen, 2007) distinguishes both specific and marketable parts in the building, which makes it easier to dispose of some parts and increase the cost-effectiveness of the building.

Table 7 Option to accelerate in the Manor case

Uncertain performance measure	Funding of new hospital
Driver of performance uncertainty	Opinion of banks on business case
Reference strategy	Project process for development at normal pace
Alternative strategy	Accelerate the process by investing in fast decision-making process
Signal for changing strategy (investing in real option)	Commitment from bank
Conditions for strategy change (change is investing in real option)	Attitude of users, all interests represented in the project team enabling fast decision-making and promotion of all interests of project, new building as opportunity for new way of working, sense of urgency with stakeholders and a forward looking attitude of medical specialists and employees, champions among health managers trust, frequent communication and consultation (bank, municipality, health experts). The mediated project coalition also facilitates a fast process because of close cooperation between all contractors and client
Actions required to obtain or retain flexibility	Determining starting points. Creating transparent decision-making procedure. Create project team representing all interests of organization
Action required to change strategy (option premium)	When the starting points are fixed, they do not change during the design process. These are described in the list of requirements and the business case. This means investing in the front-end of the process in commitment of stakeholders
Decision rule for changing strategy	IF (finance of new hospital) > (opinion of banks on business case) THEN (accelerate the process) ELSE (keep process at normal pace)

through this, support created. Consultation with other external parties such as the municipality, the bank and health experts also increased mutual trust and understanding and therefore the speed in the process. The option is described in Table 7.

Option to select

Contrary to common practice in Dutch health projects, the project manager of Manor advised selecting contractors using a public procurement process, to be followed by competitive dialogue. It is assumed that

Table 8 Option to select in the Manor case

Uncertain performance measure	Outcomes of negotiation in competitive dialogue
Driver of performance uncertainty	Difference in option on way of working between client and contractor which might result in poor cooperation. Examples are creating too much noise and inconvenience for patients
Reference strategy	Selection based on price
Alternative strategy	Public procurement followed by competitive dialogue. Selection based on process in which not only price is valued. Mutual knowledge increases, and it is expected that this results in a better risk allocation since it is known better who can best bear these risks
Signal for changing strategy (investing in real option)	Complexity is considerable (if it was not complex it would be easier to just select based on price)
Conditions for strategy change (change is investing in real option)	Enough and competent contractors
Actions required to obtain or retain flexibility	Setting out tender, engaging in dialogues
Action required to change strategy (option premium)	Invest time for dialogues, paying a premium for preparation by subscribers
Decision rule for changing strategy	IF (complexity of project is high) AND (minimum number of potential subscribers with potential) THEN (put out tender for competitive dialogue) ELSE (select based on price)
Expiration of real option	Date stated in tender

the dialogue would increase mutual understanding of visions and ways of working, which would improve cooperation, and the ultimate outcome of the project, beyond that which would have been achieved when selecting only on price. Moreover, a better allocation of risks between the parties would be achieved through working in a dynamic way during the price-making process. Other reasons to invest beforehand in selection are less complexity and renegotiation during the execution stage of the project (Hoezen, 2012). In order to have competition, sufficient parties need to subscribe, and this creates the option to select, presented in Table 8. Given the positive economic situation in 2008, only three parties subscribed but, nevertheless, the results of the negotiations were seen as positive.

The critical incidents of the Manor case from which the real options are derived are presented in Appendix B.

Case study analysis

Different options can be recognized in both cases. The analysis of the two cases considers the conditions under which real options can be invested in and exercised. First, we indicate the most important conditions for all the real option types, using the taxonomy of Amram and Kulatilaka (1999): investment and disinvestment, timing, contractual and operating options. Secondly, we address the role of different project coalition types in exercising real options. As a synthesis of our findings, we present in Figure 2 a framework in which we propose the relationships between project coalition types, real options and conditions for creating and exercising real options.

Real options analysis

Investment and disinvestment options

Growth-switch-scale option. Irrespective of the project coalition type chosen, both organizations in our study retained space around their new buildings to be able to develop other activities, i.e. a growth option, or to have space to replace one part of the building during its lifetime. The investment is in keeping the land rather than selling it. The main *condition* for investing in this option is having the ownership and opportunity to keep the land. Another *condition* is a cooperative attitude from other stakeholders such as the municipality, since they will have to approve any changes in the zoning plan or are a party to an exchange of land (as in the Manor case).

Defer-stage-abandon option. Utopia created this option by choosing a separated project coalition. In this way, Utopia created a lot of flexibility in the development process. A *condition* for exercising this option is the availability of sufficient time and where there is little short-term urgency to complete the building. Communication is an important *condition* for mitigating the negative consequences of employing this option and thus helps to maintain the value of the option. In the Utopia case, patients and their family members remained uncertain over the outcome

Taxonomy of options	Types of real options	Action taken to create real option	Project coalitions		Conditions
			Separated	Mediated (DBM)	
			Utopia	Manor	
Investment and disinvestment options	Growth-switch-scale	Retaining enough space	++		Having the land in ownership and retaining the land should provide added value related to town planning and the eventuality of developing other activities.
	Growth-switch-scale	Creating enough space		++	Investments on terrain: clear demand, clarity on governmental policy, profitability of other activities on the terrain. A condition for the replacement of the hot floor on another spot is the so-called 'Shell model'.
	Defer-stage-abandon	Phased procurement and contract with contractors	+		Estimated extent of uncertainties such as the outcomes of health concepts, construction costs, government policy. If the organization considers these too high, it is valuable to invest in the option. It is dependent on managerial capabilities to determine the conditional threshold.
	Stage-abandon	Contract with management contractor		+	Contract term, low urgency, availability of other comparable parties. Communication to maintain commitment with project and credibility of organization.
	Select	Competitive dialogue procedure in procurement		++	Enough and competent contractors.
	Select	Invite multiple interior and landscape architects	++		Dissatisfaction with current architect. Lack of vision on project by organization so creativity should come from outside.
	Select	Designing in parallel	++		Maximum level of ability to defer. This depends on among other things the loss of commitment from stakeholders and expiration of permits. When the maximum level is reached is quite arbitrary and depends on managerial competences to estimate this.
Timing options	Accelerate	Definition of points of departure Planning process Stakeholder management Decision-making procedure		++	Attitude of users, all interests represented in the project team enabling fast decision-making and promotion of all interests of project, new building as opportunity for new way of working, sense of urgency with stakeholders and a forward looking attitude of medical specialists and employees, champions among health managers trust, frequent communication and consultation (bank, municipality, health experts). The mediated project coalition also facilitates a fast process because of close cooperation between all contractors and client.
Contractual options	Stage-accelerate	Construction of skeleton, design of interior		+	Consortium, cooperation of contractors.
Operating options	Scale up/-down, switch of functions	Design, working process		++	Adaptive capabilities of users. Availability of (external) parties that might use parts of the building.

Figure 2 Framework showing the relationships between project coalitions and real options plus their conditions involved in the two case studies
Notes: ++ = real option not necessarily a consequence of project coalition. + = inherent in type of project coalition.

which could negatively influence the image of the organization. This view is subscribed to by Fichman *et al.* (2005) who state that the abandon option can carry intangible costs related to loss of credibility and morale. Communication on the Utopia project was perceived as problematic for reasons of deferment: the

board was considering strategic issues and did not wish this to be generally known.

Select option. The option to select can be recognized in both cases as well: in the case of Utopia by suggesting the design of two different plans in parallel; and in Manor through a public procurement of contractors. In the Utopia case, the condition for the select option was the maximum level of ability to defer. If the urgency of continuing with the project was greater than the advantages of having more time to decrease uncertainty on the final design, one should have made a decision to continue with only one plan. However in this case the board decided to continue with neither of the two strategies, and did not develop any plan at all, exercising the defer-stage-abandon option again. Regarding the select option of Manor, a *condition* was that sufficient competent contractors should be available to select from. In this way, the project team of Manor invested in selecting a contractor based not only on price, but also on other aspects.

Timing options

Option to accelerate. Whereas Utopia deferred the project to deal with uncertainty, Manor tried to accelerate the process by investing in a transparent and well-considered decision-making procedure. One *condition* for this fast trajectory was having a competent team with an appropriate constitution that represented the main interests of the organization on the strategic level: in the Manor project, major representatives were a board member, a director of facility management and housing, a cost controller and a member of the medical staff. In addition, the client organization had a say in the process. This make-up of the project team created short communication lines and enabled fast decision-making. The involvement of health managers who promote the new building, and its implications for adapting the organization, and the involvement of the board are other major *conditions*. The speed of the process also helped to keep users involved. Another *condition* is the involvement of stakeholders and, related to this, trust between project management and stakeholders. This is an important *condition* since the speed of the process limits the opportunities for feedback to users such that not all details can be discussed.

Communication is also a *condition* for using the accelerate option as it creates support. In both our cases, the project owners kept in frequent communication with external stakeholders such as the municipality in order to maintain trust which is important for cooperation. The cases differed in the amount of communication with internal stakeholders, although this was to an extent due to the two projects being in different phases.

Contractual options

Option to accelerate. Manor developed different aspects in parallel to prevent a slowdown and to create time to consider aspects that needed further development. This was enabled by having a mediated project coalition where all the advisers worked closely together in a consortium. Since this cooperation was stated in a contract, one can speak of a contractual option. A condition for such cooperation is that the different team members are able to cooperate. This was checked during a test period with the management contractor and eventually the decision was made to continue.

Stage option. Contractual options mainly mitigate the negative consequences of uncertainty. Contractual terms related to uncertainty contingencies cover the division of risks if a client wants to make adaptations, and terms on how to resolve conflicts. The stage options described above are also stated in the contracts: Utopia included a term in its contract with the architect and advisers such that, after each phase, it had the ability to choose whether or not to continue with the contractors. Manor could determine whether the management contractor would continue after the design phase. There were no countermeasures as compensation for the possible loss of the assignment by the architect or the contractors. Further, when the same architect and advisers were appointed in the relaunch trajectory of the Utopia project, they even reduced their prices.

Switch option. In the Manor project, the contract stated that adaptations could be made to the design to a certain extent by the client, and that at the same time efforts should be made to reduce construction costs by both the management contractor and the subcontractors. A *condition* that enabled such cooperation through contractual terms was good contracting and negotiating skills. External *conditions* also played a role, such as the situation in the market: the availability of competing parties, and the attraction of such project coalitions to contractors were essential, and there was a limited number of competent contractors. Using the stage option also implied certain risks for the contractor, and a *condition* was therefore that the contractors were willing to bear these risks.

Operating options: option to switch and scale

Switch and scale option. A commonality between both organizations is that they wanted to adapt to rising costs by reducing space and optimizing the working process during the building's exploitation phase. Both organizations were puzzling over how to find a balance between having enough space to carry out the primary process and the long-term cost-effectiveness

of the real estate. For this reason, both had invested in the switching option by creating flexibility to change functions and scale certain functions up or down and, in the Manor case, by investing in developing the new policlinic concept in order to match the new layout to the working process. Although both organizations had invested, Manor had invested more than Utopia in the option to switch functions and scale up or down: adaptations in the design enable the exchange of functions, such as standardization of the distance between supporting walls, and the possibility to dispose of some parts. Uncertainty over the healthcare to be provided has been high and therefore the option to switch was attractive and profitable. Utopia perceived less uncertainty and therefore adopted only the scaling option: adapting apartments to more or fewer occupants. The option was more a consequence of the organizational strategy than the type of project coalition selected.

An important *condition* was having cooperative employees since adopting the new policlinic concept necessitates adaptations to the working process.

Real options and project coalition types

The study shows that a separated project coalition mainly provides stage options and options related to that, such as stage-switch, scale and defer-stage-abandon. These options were all used to mitigate the consequences of uncertainty by providing more time to obtain information in order to reduce uncertainty, and to adapt to uncertainties.

The role of the separated project coalition

Within the category of contractual options, the stage option is the contract term that divided the risks resulting from the stage option within the investment/disinvestment options category, realized by the separated project coalition. Risks existed for the contractor who had no guarantee of being contracted for subsequent phases. The stage options also had negative consequences for other stakeholders, such as patients and clients that faced uncertainty on the progress of the project and therefore lost commitment. The client risked loss of credibility of both internal and external stakeholders. Therefore, a condition to exercise and keep the value of this option was to mitigate these negative consequences by keeping stakeholders informed and formulating the right contract terms.

The role of the mediated project coalition

The mediated project coalition mainly showed options to accelerate. Several conditions enabled the exercising of these options, such as the close cooperation between architect, advisers, building contractor and client. Other important conditions were the efficient decision-making procedure, efficiently planning the process and appropriately managing stakeholders and the attitudes of stakeholders. In this way uncertainties were decreased, as well as by determining and fixing the points of departure for a great deal at the start of the development process.

The mediated project coalition contained a switch option within the contract, enabling change of design. Risks are placed with the (sub)contractors who were obliged to decrease construction costs. One stage option was included after the design phase, in order to evaluate the management contractor. Although not created yet, the organization of Manor was considering outsourcing more services, which might involve a real option to scale up and down the provision of services. Since outsourcing of services becomes increasingly important in healthcare we mention it here.

Conclusion and discussion

The main objective of this research was to discover whether real options thinking is already being applied in healthcare-related building project coalitions. Following the structured strategy description tool of Johnson *et al*. (2006) and based on two in-depth case studies we provided some examples of real options and the conditions for these options to be created and exercised. By showing what flexibility, in terms of real options, is being used in project coalitions, we provide a framework that can be used to gain insights into, and generate greater flexibility in, project coalitions and construction projects in the health sector.

It is shown that flexibility and thus real options are more valuable to one stakeholder than to another, as concluded by Olsson (2006). Exercising the stage, growth and switch options mainly creates flexibility for the board and for other strategic functions in the client organization such as regional directors and financial controllers. These options create opportunities to develop ideas, and reduce uncertainty by obtaining additional information. Conversely, deferment and abandonment options often affect personnel and clients in a negative sense. Loss of commitment can result in even more delay. Therefore Manor tried to retain support among all stakeholders. Perhaps this is a larger issue in the cure sector than in the care sector since the medical specialists can be a significant obstructing factor.

Other investment/disinvestment options ‘on’ the project which can improve realization serve the interests of project management since realization is their responsibility, but the organizational strategy can be

better changed and implemented by means of flexibility as well. Investment/disinvestment options 'in' the project are more long-term solutions and can adapt to changes in the primary process, serving the interests of both the users and the organization. These operating options, such as standardization of the layout of the hospital, should reduce costs in facility management because of more optimal use of space and easier adaptations. Changing functions within a building during the operational phase involves an organizational decision, one often motivated by financial issues. Therefore, those responsible for managing the organization and its assets are mainly interested in such options. The care case invested to a lesser extent in the switch option than the cure case. Translating to real options reasoning, in a hospital more functions can be expected than in care organizations. As a result, the real option is less valuable in the care case and logically not invested in more than needed. More privacy for patients and clients is an important trend and therefore considered in both cases to increase marketability of real estate and thus creating a switch option.

Independent of the project coalition applied, both organizations had invested in both a strategic growth option and switch options in order to adapt real estate to a changing organization as the project developed. Striking is the difference between the two cases in the speed of the process although both organizations have to resolve uncertainties and make decisions. Nevertheless, in the care case a separated project coalition was chosen, providing a lot of flexibility to resolve uncertainties and because it was a known approach but in the cure case delay was not allowed. Since most uncertainties are related to the organizational vision which mainly has to be determined by the board, and also is being shaped during the development process in a construction project, a critical factor is the involvement of the board in this process. When these issues are resolved earlier in the process, also project coalitions that are in theory faster and more efficient, such as mediated and integrated project coalitions, can be applied. The most obstructing factor is often the decision-making by the board. However, we are aware that a large number of hospitals face once-in-a-lifetime construction projects and most care organizations have a large portfolio with many projects. It might not be feasible for the board to be intensively involved in all projects, but perhaps one additional board member should be assigned to participate in project teams. This is in line with the increasing recognition of real estate being an important strategic asset in the organization.

We have shown that the health organizations in our study reason according to real options thinking in their real estate management to deal with uncertainties, although they do not use the real options concept consciously. This confirms that, as in many other areas, real options thinking can be applied in real estate management in health. However, it is also one of the sectors that does not use real options tools like Triantis (2005) described. This research created more understanding on how practitioners deal with flexibility and real options, which is one step towards applying real options thinking in practice, as suggested by Triantis (2005) and Ford and Lander (2011).

Much of the literature only deals with the application of one real option, whereas this research shows that many types of real options can be recognized in one project, and even combinations of real options. Although some real options are independent of the form of project coalition, we show that the choice of a certain type of project coalition enables or rules out certain real options. Further, whether it is valuable to invest in or later exercise a real option depends on various conditions. Based on the findings of this study, a framework has been developed. This does not prescribe what form of project coalition to choose, but provides knowledge on current practices. Other health organizations can apply this knowledge to their own contexts to guide them in decision-making. Besides, the strategies might be useful for other sectors as well, such as schools and private businesses.

A limitation of this research is that only two types of project coalitions were analysed. In addition, the case studies provided the opportunity to describe some real options elaborately, which prevented describing other real options. Therefore the resulting framework is not exhaustive. The literature shows some advantages of integrated and mediated project coalitions. Within these two types of project coalitions, other *relational project delivery arrangements* have been distinguished (Lahdenperä, 2012). More case studies should be done which use these other project coalition types in order to complete Figure 2. More in-depth research on the consequences of the various real options should facilitate more informed decision-making on which type of project delivery to choose. Our case studies had not yet reached the construction and operation phase or just reached this phase, therefore some real options, such as those related to technical flexibility, could not be evaluated. Hence, it would be useful to follow these projects further or do case studies on projects which are at a more advanced stage. Finally, in the spirit of engaged scholarship, the results should be tested whether the conscious application of real options thinking supports real estate managers in thinking about flexibility and choosing the most appropriate project coalition type.

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Notes

1. Unmediated project coalitions, where the client directly contracts a number of suppliers and coordinates these suppliers, are not discussed. Such a project coalition requires a lot of in-house capabilities of the client, and these are often lacking in health organizations. Property developers are more used to this type of project.
2. The Bouwcollege (Netherlands Board for Healthcare Institutions) was a governmental institute established to effect the law related to healthcare provision. Prior to its demise in 2010, its tasks included determining performance indicators for building construction in healthcare, providing permits with relevant conditions for construction projects, and advising the Ministry and health organizations. Before providing any permit, the Ministry had to agree that the building construction was necessary.

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Appendix A

Critical incidents and critical events in the Utopia project

Project phase	Month	Critical incidents in Utopia project	Year	Organizational developments Ibis/Duota
Initiative phase		Feasibility study Utopia, technical research	2002	
Definition phase		Official decision to rebuild/renovate Utopia	2003	Long-term housing plan of Parrot
		Traditional procurement: appointing advisors Permit request at Ministry Decision not to sell part of terrain and acquisition of adjacent houses Masterplan and structure plan Cost estimate structureplan Second opinion by consultancy A	2005	
Conceptual design phase	Summer		2006	Merger into Ibis Duota established
	Autumn	Cost estimate by architect of conceptual design		
Final design phase	May	Permit provision by Bouwcollege	2007	
	July	Board approves conceptual design Advice by Bouwcollege on balance sheet problem		
Initiative phase	February	Cost estimate of final design by architect Project on hold	2008	
	September	Marketing research on apartments by *TNO*		
	December	Reverification report by consultancy B finished		
Definition phase	January	Starting up again of Utopia project	2009	Consultant B = New board temporary
	March	Cooperation with consultancy on vitality centre		
	July			
	September	Pointcare participates in project		
	September	Appointing architect		
	November	Structure plan approved by board		
	November	Document financial feasibility		
	November	Kick-off meeting preliminary design phase with working groups		
Conceptual design phase	February	Appointing advisers	2010	
	March	Board defers designing vitality center		
	April	Start conceptual design phase for living part		
	May	Project strategy by consultant		
	June	Selection of interior and landscape architects		
	June	Appointing cost adviser		
	December	Deferment of decision on final design phase		
Definition phase	January	Fire department warns of expiration permit	2011	
	February	One-day strategy session with decision makers: new starting points		
	June	Decision by board to reconstruct instead of renovate new structure		
	August	Decision by board to abandon the wellness centre development		
	November			
	January	New businesscase on Utopia	2012	New real estate strategy of Ibis

Critical events	External critical events
Ibis questioning how to manage real estate	
Transition period towards new regime. Uncertainty on compensation	
Running towards regime change	
New ideas on and development of health care concepts	
Free market system: competition is more important	
Questioning and refining starting points/list of requirement	
More cost control of design by project management	
	Larger role for municipality in regulation of provision of health
	Uncertainty on national policy on height of budgets for housing and compensations from government to solve balance sheet problem of health organizations/ uncertainty if Utopia can claim compensation
	Abolishment of 'building regime' in healthcare
	Introduction marketization law in healthcare
	Till 2012 full compensation for costs made in care delivered in elderly care houses, in contrast to cure who are fully dependent for income on own production

Appendix B

Critical incidents and critical events in the Manor project

Project phase	Month	Critical incidents in Manor project	Year	Critical events					External critical events	
Initiative phase	December	Assigning consultant A for advice during whole project Start letter of Ministry of Health, Welfare and Sport	2005							
Conceptual design/definition phase	January	Decision to rebuild and choice for location	2006	Developing starting points for design		Determining project coalition form, building method and design assignment			Introduction new health system based on marketization	
	March									
	April	Working conference on health concepts Consultation of care managers on spatial starting points				Selecting designing parties	Developing global list of requirements			Extramuralization'; longer staying at home while receiving care, started already from 1984. Nevertheless slow progress in reflection of this concept in architecture
	May	Choice for management contracting as building coalition								
	June	Business plan finalized Management contractor assigned Starts constructional structure plan			Developing structure plan					
	July	Appointing architect								
	August	Solutions for design flexibity					Developing spatial requirements			
	September	Ministry compensates for balance sheet problem and costs for removing asbestos								
	October	Finance and guarantee from Ministry obtained								
	November	Structure plan								
	December	Urban development masterplan								
Final design phase	January	Masterplan completed into zoning plan Approval zoning plan Defining spatial requirements	2007	Developing organizational concept, clinics, 'policlinic outpatients' department		Developing structural and functional design with users and experts			Larger role for municipality in regulation of provision of health	
	March	Permit requests Decision for incentive management contractor Agreement with psychiatric centre on use of part of the building for 20 years								
	May	Functional design skeleton								
	June	Choice for public procurement and competitive dialogue						Developing technical requirements		
	September				Functional design back- and frontoffice					
	October	Designing interior till March					Procurement			
	November									
	December									
Construction phase	April	Contracting subcontractors start construction	2008						Till 2012 full compensation for costs made in care delivered in elderly care houses, in contrast to cure who are fully dependent for income on own production	
	March	Delay construction time 9 weeks	2009						Abolishment of 'building regime' in care	
	August	Delivery	2010							