

## MASTER

### Putting the extra in basic education

how can a more sustainable value creating within primary schools by achieved?

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## Preface

Before you lays the report of my graduation project, being part of the master program of Construction Management and Engineering at Eindhoven University of Technology (TU/e). I have completed this graduation project in cooperation with HEVO, a project management and housing advice agency in the educational and healthcare sector, located in 's-Hertogenbosch.

When I look back I can say that my subject has chosen me more than that I have chosen my subject: I just rolled into the field of educational real estate. My switch from the master in Architecture and Urban Cultures to that in Construction Management and Engineering did not rob me from chasing my interest in creating value for the people behind the building; it just gave me the chance to do this from a process point of view instead of a design point of view.

I would like to thank my supervisors from the TU/e and HEVO for their guidance and I would like to thank my girlfriend, friends and family for their support during this period. I wish you a good time while reading this document and hope it might inspire you in contributing something to the field of primary educational real estate.

Ruud van Giels  
August 2012



## Management summary

Ever since the decentralization of the responsibilities for the primary educational real estate from the national government to the municipalities and school boards in 1997, the financing system has been subject of discussion. Since the municipalities were made ultimately responsible for the creation and the larger and primarily external maintenance of primary schools and the school boards were made responsible for the exploitation and the smaller and primarily internal maintenance of these buildings a conflict of interests has been created. The current financing system stimulates the municipalities to strive for an optimization of the investment costs, whereas the school boards are stimulated to optimize the exploitation costs of the building. This conflict of interest frustrates investments in the sustainability, and quality of the indoor climate of the building for example, as optimization of these topics requires larger initial investments which would repay themselves over the lifecycle of the building. However, since the responsibilities are split these kinds of investments are discouraged; resulting in primary schools of a less than optimal quality.

A first step within this research has been a literature study on the current financing system of primary educational real estate; the current problems that are caused by this system; possible improvement measures to optimize the system and on how to define this concept called sustainable value creation.

To start with the first, the current financing system allows for two scenarios: either the municipality is leading in the creation and external maintenance of schools, or these responsibilities and accompanying budgets are transferred to the school boards within this municipality. The second scenario is called advanced decentralization and is very rare, since this can only take place after an extensive process of intense collaboration on agreements between the municipality and the school boards within that municipality; and only if both parties agree. All kinds of factors influence this negotiation process, like municipalities not liking to give up the annual educational real estate budget which they receive from the municipal fund and municipalities questioning the financial management capabilities of the school boards. However, many consider this scenario as promising because of the fact that all responsibilities and budgets will be put into one hand; enabling the execution of an integral long-term housing policy focused on optimization of the buildings over the entire life-cycle.

Then, the Dutch Rijksbouwmeester has made the problems within the sector tremendously clear in her 2009 research report on the primary educational real estate sector. A combination of desk research and expert interviews has resulted in a broad overview of problems within the realms of the program of requirements, laws and regulations, quality assurance and monitoring, clientship and knowledge development, cooperation, research agenda and – most importantly for this research – budgets and cash flows. Regarding the latter, these problems have been pinpointed as a cause for the creation of schools of suboptimal quality. This insufficient quality level is backed-up by a 2010 user experience research amongst Dutch primary school teachers and principals. The main problem however is that, because of the split

responsibilities within the sector, there is a lack of a specific problem owner responsible for solving these problems.

Next, several improvement measures for the financing system are proposed by several actors, which can be roughly grouped into five scenarios: introducing the right on full advanced decentralization; increasing the budgets (by involving private parties, updating the national governmental standard allowances and earmarking of the municipal educational real estate budgets); enhancing the financial management (by benchmarking and increasing of the financial expertise); changing the program of requirements (by using quality demands and performance documents) and optimizing the maintenance policy (by introducing the right on renovation and the advanced decentralization of the external maintenance).

Finally, sustainable value creation is defined as achieving the highest possible initial value as possible and the lowest value decay over the life-cycle of the building as possible. For the definition of value, HEVO's concept of Sustainable Performance 2.0 is used which defines the value of a building in four main values being: user value, experiential value, technical value and economical value. The four main values are then again subdivided in a total of 36 elements, which together make up the total value of a primary school.

These four literature research tracks have provided the necessary input for the creation of a System Dynamics (SD) model of the primary educational real estate financing system. In this dynamic model the effect of implementation of the different proposed improvement measures on the sustainable value creation of the average Dutch primary school can be modeled. Both financing concepts of that of advanced decentralization and that of the regular way of governance are included in this model, as well as HEVO's definition of Sustainable Performance 2.0.

By conducting a questionnaire amongst users and architects of primary schools as well as municipalities and school boards – based upon the Analytical Hierarchy Process (AHP) – the relative importance of the 36 elements of value is determined as well as the evaluation of these elements in current primary schools. Next to this, the municipalities and school boards are questioned on their relative support for the proposed improvements of the financing system. The gathered insight in the relative importance and the evaluation of the value elements by these target groups is interesting for HEVO as, being a project management and housing advice agency in the educational sector, it provides the company insight on how to approach their clients and collaboration partners.

Next to this, the gathered data serves as input for the SD-model. Concluding, one can say that most general support exists for improvement measures focused on increasing the budget and changing the program of requirements. Apart from the general answers, several presumptions are confirmed as municipalities would like to see an increase of the financial management capabilities of school boards whereas school boards prefer measures considering advanced decentralization.

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## **1. Introduction**

### **1.1 Research subject**

This research will investigate the influence of the current financing system of Dutch primary schools on their quality and will try to quantitatively compare the influence of different proposed improvement measures for this system on the quality of these schools.

### **1.2 Construction Management and Engineering**

The master of Construction Management and Engineering (CME) is classified as a 3TU masters degree and in that capacity it is taught at the three universities of technology in the Netherlands, being Delft University of Technology, Eindhoven University of Technology (TU/e) and the University of Twente. In Eindhoven the masters program is facilitated by the two departments of Architecture, Building and Planning and Industrial Engineering & Innovation Sciences, reflecting the dual nature of the program. CME in Eindhoven deals primarily with the process management of complex urban (re-) development projects. The broad program can be characterized by its many cross-overs: between the expertise of the two departments, between project and process management and between society and technology.

### **1.3 HEVO**

HEVO is a consultancy firm specialized in project management and housing advice for institutions in the education and health-care sector. The company is located in 's-Hertogenbosch since 35 years and employs about 90 persons. It has a philosophy and tradition of knowledge development and knowledge sharing with collaboration partners in the sectors in which it is active. In this capacity, the company has had extensive experience in the cooperation with graduate students of different programs within the field of real estate development and construction management.

### **1.4 Relevance and goals of the report**

This report is three folded in its relevance and goals as it serves different purposes for the three main actors involved, being the TU/e, HEVO and the author.

#### **1.4.1 Relevance and goals for the TU/e**

The master program of CME for the students is heavily intertwined with the research activities of the staff members of the department. Within each graduation project the opportunities are investigated to guide the student in the direction of a graduation project which leads to a win-win situation. The student can dive into a topic of fascination for performing the academic exercise on, whereas the staff members get the chance to further develop the graduation thesis which they have guided into an academic article suitable for publishing within a relevant scientific magazine; which would then again also be attractive for the graduate student. A quantitative research approach on the perceived value of a building over the entire life-cycle – using a dynamic model to model the effect of different scenarios on this perceived value – might be a new approach which could increase the chances of getting a paper published on this topic.

#### **1.4.2 Relevance and goals for HEVO**

HEVO is a company which is very much interested in knowledge development and clustering as it can be seen from the many publications they have made on the topics in the field of housing advice and project management. More knowledge development on which elements of primary schools are considered as being the most valuable and how these elements are currently evaluated by the school principals, architects, municipalities and school boards can be very useful for the company as it provides more insight in how to approach these several actors with which the company collaborates on a day to day base. This knowledge, and that of the relative support for the proposed improvement measures for the current financing system, might also be very interesting for these actors. Therefore, the publication of an abstract of the results of this paper – targeted on these actors – could be an interesting way for HEVO to get some publicity and possible future acquisition.

#### **1.4.3 Personal relevance and goals**

The graduation project will be judged upon three main categories of assessment criteria being project, process and presentation. By following this course the author should prove that he can gather and combine valuable expertise within the field (project), in an autonomous and scientific way (process) and is able to present the gathered results in a convincing and professional way (presentation). Furthermore, teaming up with a company offers the author a chance to practice in combining the scientific interests of the TU/e and the economic interests of HEVO within one research. This is an exercise which is very useful for the author as the CME-program is preparing him for a type of professional position in which dealing with possible conflicting interests is a standard ingredient.

### **1.5 Reader manual**

This report is divided in 12 chapters. This first chapter is an introductory one after which in the second one the research design will be further elaborated upon. Chapter 3, 4 and 5 cover the three parallel tracks of the literature research after which in chapter 6 and 7 the theoretical context for the model is described, which itself is introduced in chapter 8. Then, in chapter 9 the theoretic context for the questionnaires for gathering the needed additional data is described after which these questionnaires themselves are discussed in chapter 10. After the implementation of the gathered additional data in the model the results of this modeling exercise, and of the questionnaires themselves, are described in chapter 11. Finally in chapter 12 these results will be put into context which leads to some conclusions and recommendations. The questionnaires are included in the appendices, as is a list of used sources and additional information on the model.

## 2. Research design

In this chapter the research design will be described, covering the problem description and definition, the goal and boundaries of the research, ending up with the research questions, research model and the expected results.

### 2.1 Design of the research

#### 2.1.1 Problem description

The average Dutch primary school is 35 years old (Midden, G. J. van 07-03-12). Although specific nationwide data is lacking (Pol, L. van der e.a. 2009) one can imagine that, given that 83% of Dutch municipalities use a lifetime of a school of 40 years in their accountancy reports (Langen, J. van 2012), a considerable amount of schools need to be renovated or rebuild in the coming years. Next to that, many current schools lack in the fields of indoor climate and in the proper facilitation of the educational vision (Pol, L. van der e.a. 2009).

This large (re-)development task is facilitated by a fragmented financing system which can be characterized by its separation of cash flows and accompanying responsibilities (Uhlenbusch, M. e.a. 2011). Municipalities get money via the municipality fund of the ministry of Internal Affairs and Kingdom relationships for the creation of a new school after which the economical ownership of the school is being transferred to the school board; who in their turn get money in the form of the lumpsum financing from the ministry of Education, Culture and Sciences for the operational expenses and daily maintenance (Fig. 2-1). The municipality remains responsible for the major maintenance issues. The way in which these responsibilities are divided implicitly stimulates the municipalities to focus on the optimization of the initial investment costs instead of on the optimization of the lifecycle costs, whereas we can see that, even when the staff costs are excluded, the investment costs merely account for 41% of the total costs (Fig. 2-2 and 2-3).

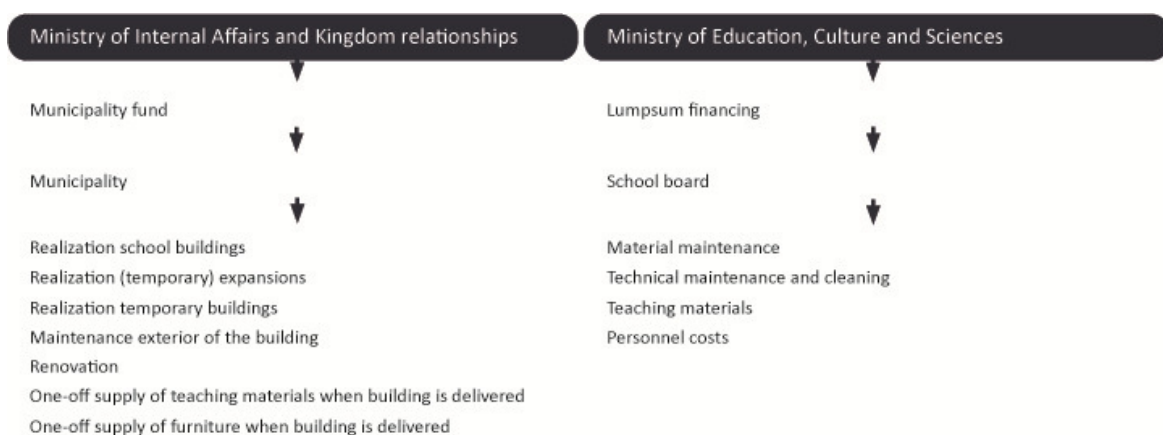


Figure 2-1: Separate cash flows (Uhlenbusch, M. e.a. 2011)

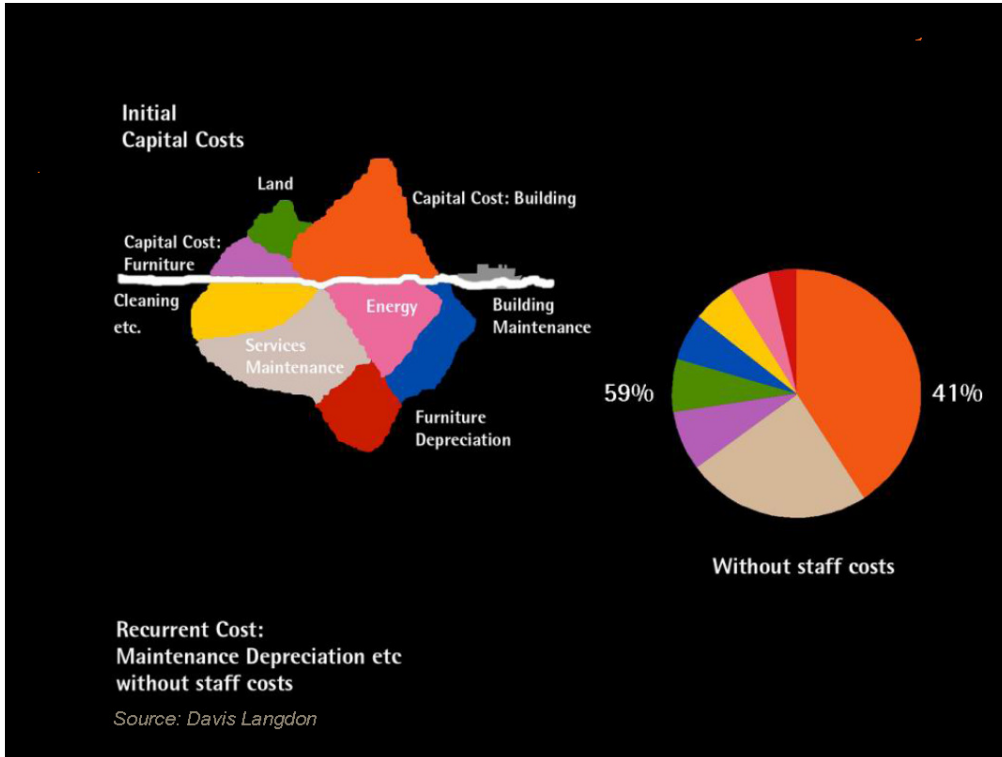


Figure 2-2: Exploitation versus investment costs excluding staff costs (Turner, M. 2006)

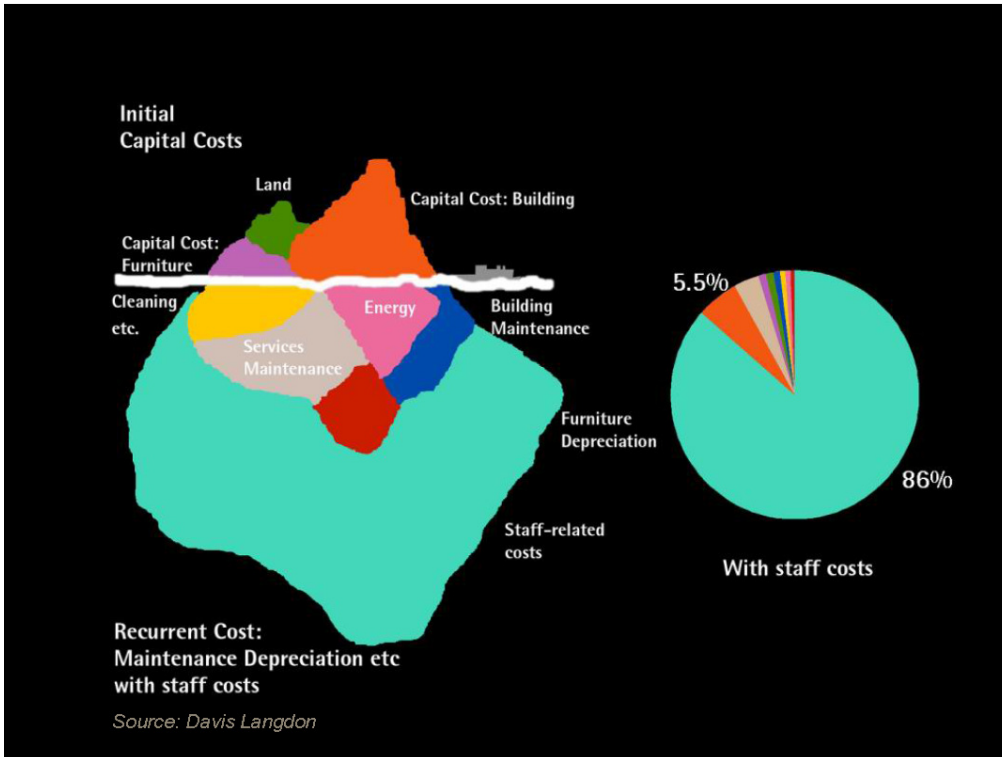


Figure 2-3: Exploitation versus investment costs including staff costs (Turner, M. 2006)

The notion that the current financial system is less than optimal is shared by many (Pol, L. van der e.a. 2009; Barendregt E. e.a. 2010 and Gramberg, P. e.a 2010 for example). The excessive focus on optimization of the investment costs is linked to the inferior indoor climate and to difficulties in the implementation of sustainable features within the building, as these measures might ask for higher investment costs in the beginning, but might be able to recover their investment costs over the exploitation period. However, because of the lack of a clear director over the entire life cycle of a primary school, the life cycle costs and performances of the current Dutch primary schools are less than optimal. At this point in time, when research results warn us that if we keep going the way we are going we will need three Earths to meet our needs by the time we reach the year 2050 (Langen, J. van 2012), we cannot ignore the importance of sustainable (re-)development of our buildings. Since the current financial system is a threat for the efficient and sustainable value creation within primary schools, it needs to be optimized.

### 2.1.2 Problem definition

To summarize the previous paragraph: the current ways in which primary schools are financed leads to a suboptimal value creation within these schools.

### 2.1.3 Goal of the research

The goal of the research is to quantitatively compare the impact of different proposed improvement measures for the current financing system of primary schools in order to find out which measures could lead to the highest sustainable value creation in these schools.

### 2.1.4 Boundaries of the research

The research will focus on the optimization of the value creation within Dutch newly to be built primary schools by means of optimization of the financing system for these schools. The research will run from February to August 2012.

## 2.2 Research questions

This description of the research problem and boundaries results in the definition of the primary and secondary research questions.

### 2.2.1 Primary research questions

The first primary research question tries to determine the relationship between the financing system of educational real estate and the quality of the schools which are generated within the context of this system:

1.	<i>Does the current way of financing of educational real estate influence the value creation within primary schools in a negative way?</i>
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If this relationship is evident and been proven, one could easily guess the second research question:

2.	<i>Which changes in the way of financing of educational real estate could enable a higher and more sustainable value creation within primary schools?</i>
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### 2.2.2 Secondary research questions

For being able to constructively answer the two primary research question, the necessary knowledge on the educational real estate sector and on value creation needs to be gathered. The answering of the six secondary research questions below should result in the right amount of knowledge and context for being able to answer the two primary research questions.

I	<i>How is the current financing of educational real estate organized?</i>
II	<i>What problems are currently present within the educational real estate sector?</i>
III	<i>What solutions are possible for creating more value in the educational real estate sector?</i>
IV	<i>How can sustainable value creation be defined?</i>
V	<i>Which factors are most influential on sustainable value creation?</i>
VI	<i>How can these factors be quantified?</i>

### 2.3 Research model

The research can be roughly divided in four parts being literature research, scientific modeling, quantitative research and the conclusions and recommendations section (Fig. 2-4). The chapters which were introduced in the reader manual (paragraph 1.5) are put into context here. Chapters 3 through 6, in which the first four secondary research questions are answered, are all results of the literature research. The first three of these deliver the necessary practical input for the scientific modeling in the 2<sup>nd</sup> part; the last one of these, together with the chapters from the quantitative research part, serves as the theoretic context for the modeling. Chapter 7 describes the research method of System Dynamics which is used for the creation of the model in chapter 8, which than automatically answers secondary research question V.

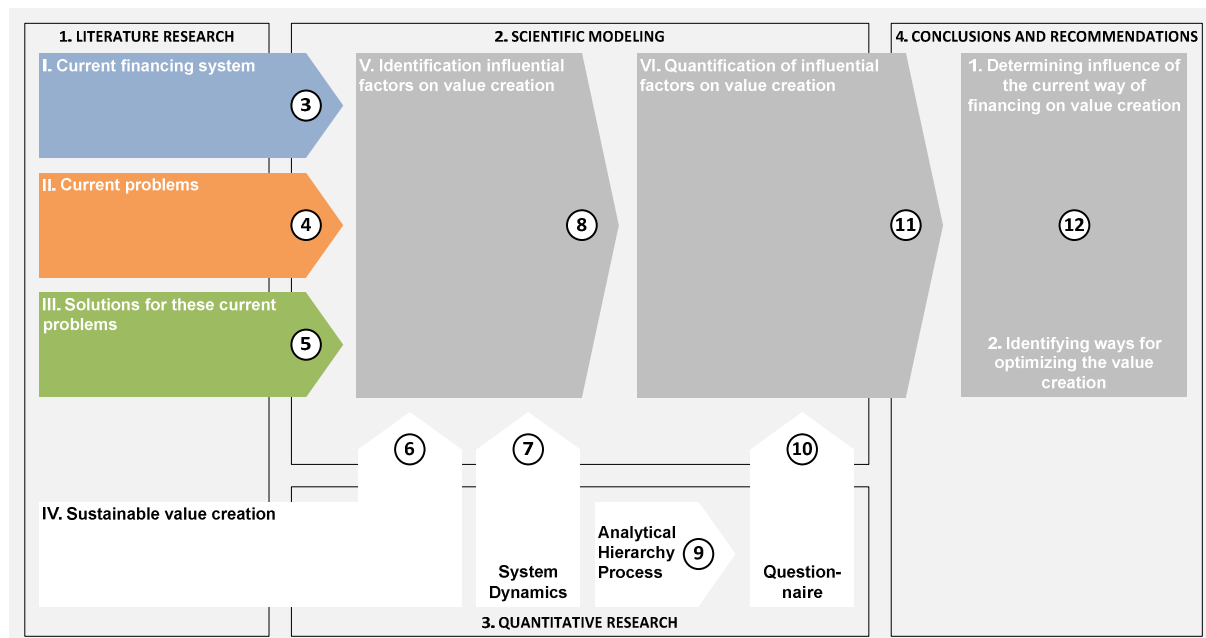


Figure 2-4: Research model

The Analytical Hierarchy Process is introduced in chapter 9 and this research method is then applied in chapter 10 in which the questionnaire is created that is used for gathering the necessary quantitative data to be able to answer secondary research question VI in chapter 11. After the answering of the secondary research questions I through VI it is possible to answer both primary research questions in the 4<sup>th</sup> and final part of the research.

#### **2.4 Expected results**

Regarding the primary research questions it is expected that there does exist a relationship between the financing system and the realized quality of primary schools. Next to that it is expected that there will be several ways in which the financing system can be optimized in order to optimize the value creation within these schools.



### 3. Financing of educational real estate

#### 3.1 The journey to autonomy

In 1801 the first law on primary education was implemented which started the concern of the national government with the education of children. Educating children stayed a matter of national importance until a shift in thinking entered in the mid 1980s, when the economic crisis and the increased complexity of the society led to a lot of criticism on the welfare state. This inspired the national government to the introduction of the 'six big operations' which were: deregulation, reconsideration, decentralization, privatization, reorganization of governmental agencies and reducing the number of governmental staff. Regarding the educational sector the topic of discussion moved from decentralization of responsibilities from national to provincial or municipal governments to deregulation and increase of autonomy (Majoor, D.J.M. 2000).

This took concrete shape in the form of the LONDO-norms which were allowances for expenses on costs for teaching materials, maintenance and cleaning of the building and non-personnel costs for administration. These norms were introduced in 1985 accompanying the youngest law on primary education and were an attempt to objectify the costs and expenses on creating 'simple and efficient' school buildings since the expenses on school buildings which were done by municipalities would differ that much per municipality that this would sometimes lead to court cases against the national government. The general thought in these developments is that by giving the schools more autonomy, the policy they choose will be the most effective. Also a more flexible adaptation to local needs is possible which would lead to a greater sense of satisfaction. Comments that are made regarding the increase in financial autonomy of schools is that the financial flexibility of schools would still be limited because of a lot of costs being already present and unchangeable, like for example personnel costs. A main condition for success in this regard is a sufficient level of financial management skills present within the school organization, which should also not be at the expense of the school's primary process: educating children.

Nowadays, the way in which the government tries to influence the educational sector is still primarily in a financial way, but has changed from a more restrictive way – by earmarking the money upfront and restricting the way to spend it – to a more supportive way – in which schools are given a budget to spend at will and are stimulated to perform certain actions by means of the provision of extra subsidies. Nevertheless, perhaps as a counter-reaction on the deregulation, pretty recently the secretary of state restricted schools to invest in their housing, revitalizing the tendency of the earmarking of the budgets as he refers to the limitations of the Lumpsum-financing which was implemented in 2006 (Rouvoet, A 06-2010). Before this Lumpsum-regulation schools were allowed to invest in their housing; but only from surpluses of the maintenance budget. He understands the need for schools to invest in their housing if they consider the budget for building schools as being too low, but wishes to further investigate whether these wishes are reasonable or not and, if so, agrees to investigate the heights of the standard allowances.

However, the housing of schools primarily remains a municipal responsibility, since in 1997 the responsibility for building and maintaining school buildings of ‘adequate quality’ has been decentralized from the national government to the municipalities. The municipality gets money from the municipality fund, which is funded by the Ministry of Internal Affairs and Kingdom relationships, for the realization of school buildings including their first inventory of teaching materials and furniture. After this, the school building is transferred to the school board, which is responsible for the technical and material maintenance, the cleaning, the replacement of teaching materials and the personnel costs. The school gets money to pay for all these expenses by means of the Lumpsum-financing which it receives from the Ministry of Education, Culture and Sciences. In short one could say that the school is responsible for the interior maintenance and the municipality for the exterior maintenance, as the latter should also provide in the realization of (temporary) expansions or buildings and renovation (Fig. 3-1).

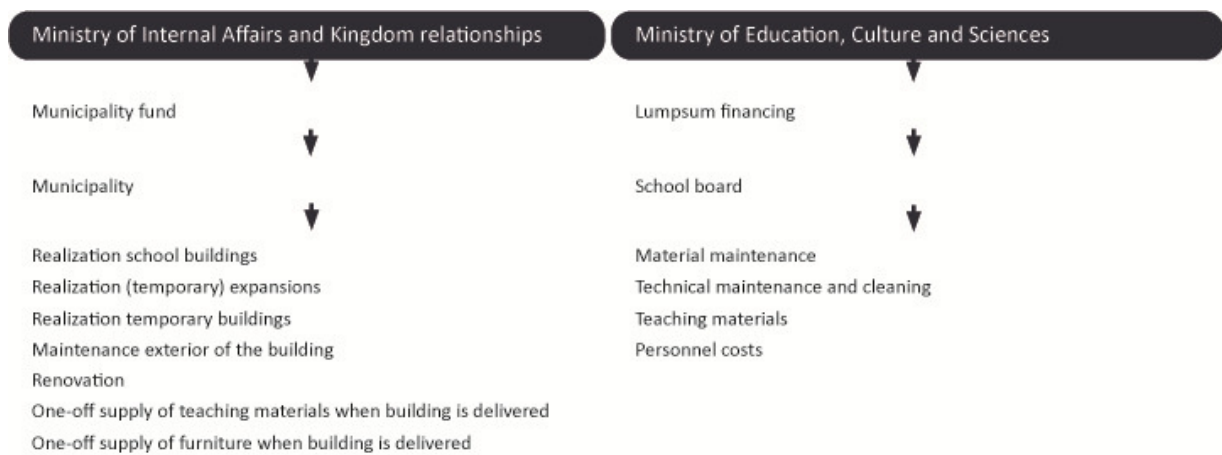


Figure 3-1: Separate cash flows (Uhlenbusch, M. e.a. 2011)

The municipal government needs to govern the process of the housing of primary schools within its municipal boundaries. In order to do so it has defined a regulation in which the procedures of applying for and the height of allowances are put down. Also, every year the municipal government needs to define a budget limit on how much they are willing to spend on educational housing in the coming year as they are not obliged to use all of the money they get from the municipality fund for educational purposes since this budget is not earmarked. One year this could be less than the amount received, the other year it could be much more; this all depends on the municipal planning. Also, the municipality is free to spend extra budget on the housing of schools. In order to make this process run more smoothly and transparent often Integral Housing Plans are created. An Integral Housing Plan is a document which foresees the future developments of all schools of all school boards within the municipality concerning the number of pupils and need for exterior maintenance, renovation or extension. This document is created in cooperation with the school boards and in this way enables a clear and honest division of municipal educational funds over the different schools in the municipality while reducing the administrative bureaucracy of having to deal with applications of schools for maintenance over and over again.

### 3.2 The concept of advanced decentralization

Next to this division of responsibilities an alternative is possible: advanced decentralization. If the municipality and school boards can come to an agreement, than the responsibilities regarding the housing, along with the accompanying budget, can be transferred to the schools. However, this happens rarely as there are several consequences regarding advanced decentralization according to article 111 of the law on primary education (Uhlenbusch, M. e.a. 2011):

- Advanced decentralization is an agreement between a municipality and the school boards within that municipality
- The municipal council takes a decision according the public law, which enables the possibilities of objection and appeal
- Advanced decentralization must be approved by the municipality and can't be obliged by law, in spite of the possibilities of school boards to object or appeal
- The agreement is valid within municipal boundaries. If a school board has buildings within different municipalities it also has to make separate agreements with the separate municipalities
- The municipality sets conditions in consultation with the school boards
- Advanced decentralization is only possible for schools that are not already maintained by the municipality
- A yearly payment for the purpose of housing will be done to the school boards
- Only the responsibility for the housing and the budget will be transferred to the school board
- The 'duty of care' remains at the municipality

Several possibilities of advanced decentralization are possible, from partial – transferring for example only the exterior maintenance – to full transfer of the entire housing responsibility including the economical claim right. Below the risks and chances of this financing structure are summed up (Tab. 3-1).

	Risks	Chances
<b>Municipality</b>	<ul style="list-style-type: none"> <li>Less financial capacity</li> <li>Less possibilities for policies on integral accommodations</li> <li>Can school boards handle the responsibilities?</li> <li>Not all school boards will join</li> </ul>	<ul style="list-style-type: none"> <li>More stable expenses</li> <li>Less (large) financial risks</li> <li>Lower costs on personnel</li> <li>Less policy areas to focus on</li> <li>Stimulant for integral policy creation</li> </ul>
<b>School board</b>	<ul style="list-style-type: none"> <li>Financial means are insufficient</li> <li>Lack of knowledge and experience</li> <li>Loss of economies of scale</li> <li>Uncertain future factors like the number of pupils</li> <li>Extra costs on personnel because of the housing policy</li> </ul>	<ul style="list-style-type: none"> <li>Autonomy on decisions on investments</li> <li>Shorter decision-making procedures</li> <li>Increase in autonomy</li> <li>More stable way of income</li> <li>Combination of activities</li> <li>Pre-investments and exploitation costs</li> <li>Ability to make own choices on housing, for example renting</li> </ul>
<b>School buildings</b>	<ul style="list-style-type: none"> <li>Insufficient capacity</li> <li>Vacancy</li> <li>Changes in legislation</li> <li>New educational developments</li> <li>Insufficient spread and accessibility</li> </ul>	<ul style="list-style-type: none"> <li>Better match with educational vision</li> <li>More possibilities for alternative ways of financing</li> <li>More efficient usage (building compactly and sustainable)</li> <li>Temporary vs. permanent buildings</li> </ul>

Table 3-1: Risks and chances for advanced decentralization (Uhlenbusch, M. e.a. 2011)

The advantages of advanced decentralization are a less extensive administration and a clustering of decision power closest to the matter. However, small school boards might not be willing to take the responsibility and municipalities might not trust the school boards' expertise enough to transfer the responsibilities. Also school boards with schools in different municipalities need to make several agreements with several municipalities. In general one could say that key factors for a successful advanced decentralization agreement are willingness, commitment and transparency at both parties. Below the regular financing structure and the concept of advanced decentralization are visually summarized in a flowchart (Fig. 3-2).

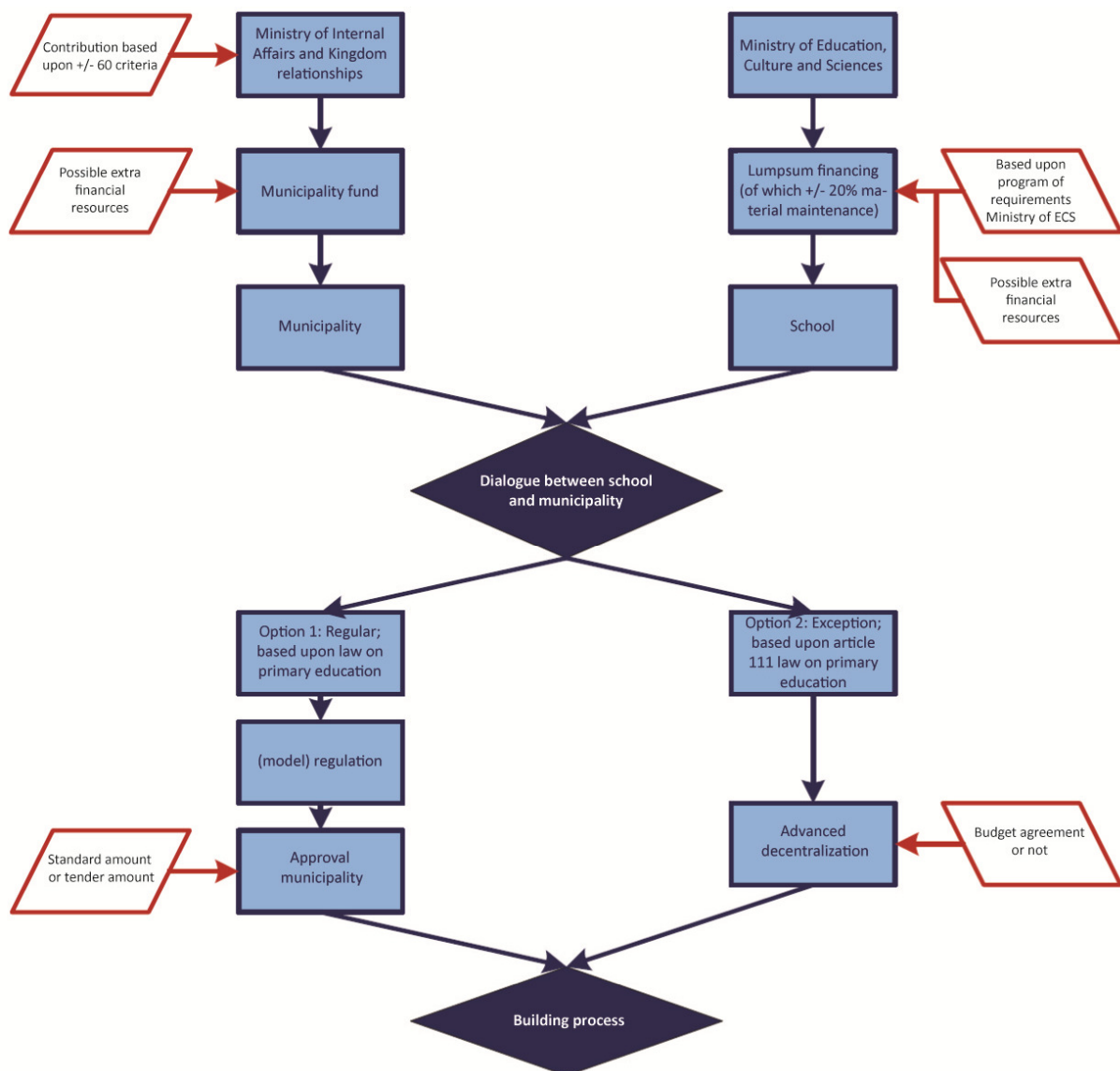


Figure 3-2: Cash flows within educational real estate (Wolff, R. 2011)

### 3.3 Other actors involved and the roles they play

#### 3.3.1 Advising role of the Vereniging van Nederlandse Gemeenten (VNG)

The VNG's most influential advice is that on how much money a municipality should grant to a new school building, put down in the model regulation, and the accompanying checklist in which the separation of responsibilities between the municipality and school board are put down considering the maintenance of the building. The abstract model regulation has been put into context by a translation of its budgets into design possibilities (Fig. 3-3), identifying which quality level could be attained by spending the norm budget, and which design decisions can only be financed when extra budgets are involved.

The model regulation has had a paradoxical effect: once formulated as a guideline to start helping municipalities in formulating a minimal program of requirements for the primary schools in their area, currently it is often used as a binding program of requirements without being interpreted within the context of a municipal vision or concrete wishes from the school boards. In smaller municipalities with a small overhead on education and less experience the model regulation is used without questioning resulting in a program of requirements and thus primary schools which are indeed 'simple and efficient'. Also, apart from the expertise the financial capacity and focal policy issues differ per municipality resulting in differences in the willingness of municipalities to spend extra budget on schools or not. This can be easily linked to the personal financial investments by school boards in the housing of their school board offices; specific constructional needs to facilitate their educational vision and in energy or maintenance cost reducing measures (Rouvoet, A. 06-2010); which are identified by the secretary of state but forbidden at the same time.

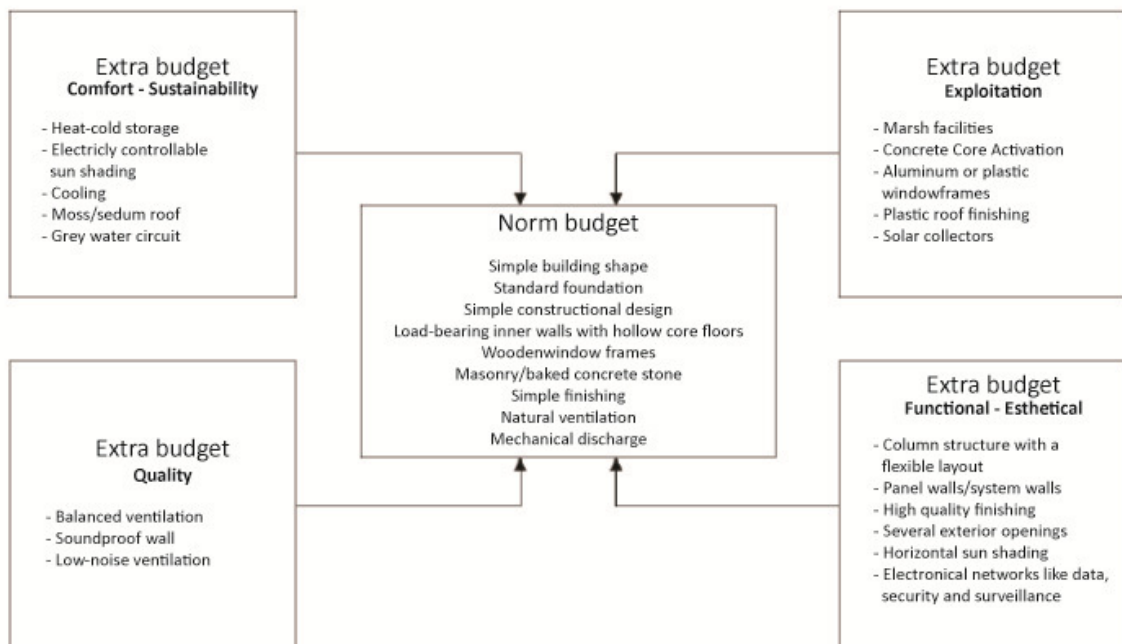


Figure 3-3: Translation of VNG's model regulation budgets into design possibilities (Wolff, R. 2011)



Next to the model regulation and checklist, the VNG also advises on things to consider when municipalities want to hand over their responsibility on the housing of schools and choose for advanced decentralization (Schraven, J.W. e.a. 1997), as well as in the opposite case when they want to keep direction over the housing themselves and want to make an Integral Housing Plan (Rutjes, F.e.a. (red.) 2007).

### **3.3.2 Advising role of the PO-raad**

In previous paragraphs the quality of the financial management has already been mentioned as being a key factor for the municipalities on deciding to implement the advanced decentralization procedure or not. In order to strengthen the power position of the school boards in this regard the branch organization offers guidelines to its members on how to improve and professionalize their financial management (Basari, K. (red.) 2011 and Fuite, M. e.a. 2011). The organization also advises members that are in the regular governance situation with a leading municipality, on how to effectively apply for external maintenance or extra (temporary) housing (PO-raad).

### **3.3.3 Controlling role of the national government**

After the national government has decentralized the educational housing responsibility towards the municipalities its role has changed from a provider to a controller of schools of decent quality. The impact of and support for the ever evolving decentralization policy is investigated on a regular base (Lubberman, J. e.a. 2003; Aarsen, E. van e.a. 2006; Bergen, K. van e.a. 2010 and others), as well as the support amongst school boards and municipalities for the mandatory decentralization of the external maintenance responsibilities (Diepeveen, M. e.a. 2004 and Berndsén, F.E.M. e.a. 2012).

Next to this, researches on the management of the Dutch primary schools in general (Turkenburg, M. 2008 and Kuhry, B. e.a. 2012) and the financial management in particular are ordered. Considering the latter, researches concern the spending of the decentralized budgets by the schools (Bergen, C.T.A. van e.a. 2003 and Bergen, C.T.A. van e.a. 2004), and that of the lumpsum-financing which replaced these budgets in 2006 (Bergen, K. van e.a. 2010) as well as research on the financial management of schools in the broadest sense of the concept (PriceWaterhouseCoopers, 2008; Don, H. e.a. 2009; Loep, R. 2010 and Inspectie van het Onderwijs 2011).

It was especially the 2009 research by the Don committee (Don, H. e.a. 2009) which enlightened some negative behavioral consequences of the current financing system. Many school boards lack thorough financial expertise which causes them to reserve budgets for unexpected events in an excessive way; which is at the expense of its primary process of educating children. Enhancing the financial knowledge of the school boards by supporting them in this regard might stimulate them in creating financial multi-annual plans which could lead to a better and more effective spending of the available budgets; something in which the PO-raad has already supported like it was described in the previous paragraph (Basari, K. (red.) 2011 and Fuite, M. e.a. 2011). Furthermore, the committee pleads for a better regulation of the possibility for school boards to borrow money for investments; which should reduce the feeling of the

necessity of saving money. On the other hand, from the periodic maintenance report of the municipality fund, it becomes clear that municipalities also spend less money on education – being primary, secondary and adult combined – than appointed, namely €330 million (Rouvoet, A. 06-2010), of which €150 million characterized as budget intended to spend on educational housing (Donner, P.H. 29-11-2011).

These investigations support the national government in creating a well-founded educational policy; as for a recent example the secretary of state proposed to implement the mandatory advanced decentralization from the year 2014 (Bijsterveldt-Vliegenthart, M. 16-03-12) as a result of the positive results of the recent research report on the support for this measure (Berndsen, F.E.M. 2012). Also the mentioned Don committee report (Don, H. e.a. 2009) has resulted in the necessary policy measures taken by the government (Plasterk, R. e.a. 2009), like adding the inspection of the quality of the financial management to the responsibilities of the Dutch educational quality inspection organization (Inspectie van het Onderwijs 2011).

### 3.3.4 Participating role of private actors

The fact that advanced decentralization is only applied in few cases is supported by many. A way to enhance this development might be the application of Public Private Partnerships (PPP's) (Sande, L. E. van de 2009). In this report PPP is defined by the following definition:

*“A PPP is a partnership between government and businesses with the goal to, while preserving their own identities and responsibilities, realize a common project based upon a clear task and risk division. The goal of the cooperation is adding value: getting a qualitatively better product for the same amount of money, or the same quality for less money.”*

Different types of PPP's can be decided upon, depending on in which phases of the building life cycle – being Design, Build, Finance and Maintenance – the cooperation is desired (Tab. 3-2).

Phases	program	design	realization	maintenance	exploitation	management
<i>contract type</i>						
Build						
D&B						
DBM						
DBFM						
DBFMO						

client
  contractor

Table 3-2: Responsibilities in traditional contracting and PPP-contracts (Service Centrum Scholenbouw 2009)

The key of the concept is that a school building can be integrally procured to a consortium of building, designing and advising agencies, which results in an efficiency gain because of the integral procurement procedure and integral responsibilities of the consortium; as opposed to the traditional way of building in which every phase of the building procedure should be

procured to different agencies all looking to make a living – and thus a profit. Next to that PPP releases the client, albeit a municipality or a school board, from a lot of concerns concerning the building process. When PPP is applied in the context of advanced decentralization this means that the school board can focus its attention more on its primary process of educating children instead of having to deal with the building process. The incentive for a private actor to enter a PPP is the profit it can generate from combining its facilities in the proximity of public functions like a primary school, whereas the incentive for the public actor is that the risks in the project are being dealt with by the private actor; since this actor has the most experience with dealing with risks in building projects.

However, the more phases the integration should contain, the more complex the project and the contracts become and thus the higher the transaction costs become. This means that, dependent on the type of project a minimum project size of €12 million is needed to be able to apply the PPP-concept in a profitable way (Sande, L. van de 2009). Furthermore, entering a PPP means entering a long-lasting commitment of 20-30 years, in which the client pays an annual fee to the consortium, as well as a complex development procedure which asks for a sound project manager with a lot of expertise of the sector at hand.

Taking these considerations into account one could say that a traditional PPP – concerning the Design, Build, Finance and Management phase; or DBFM-contract in short – is not applicable when building a primary school, because this type of projects does not exceed the necessary threshold of €12 million. Because of the economies of scale, only the 10% of school boards which consist of 4 schools or more might enter in such a PPP within the context of advanced decentralization. Nevertheless, if the primary school is not included in the development of a larger community school or Multi-Functional Accommodation which could exceed the threshold, a solution for the other 90% of the school boards is present in the shape of PPS-light, a concept developed by HEVO which can be seen as an integration of the first two phases – meaning a Design and Build-contract – which could possibly be extended with elements of the other subsequent phases. In this type of contract HEVO releases the client from its worries and responsibilities and applies its extensive knowledge in the building process of schools in the cooperation with other building actors who also apply their extensive more project-oriented knowledge on the building of schools. It is this type of PPP which is advocated that could result in a more extensive usage of the advanced decentralization policy instrument since one of the primary concerns of the municipality, being the questioned expertise of the school boards, is eliminated by the experience of the project management company involved. Furthermore, within this context the schools can focus more on their primary process and the private actor remains responsible for the maintenance of the building (Sande, L. van de 2009).

In the last decade the concept of PPP has become more and more popular, leading to evaluative researches on the applicability of the concept on the governmental policy fields in general (Ministerie van Financiën 2010) and the secondary educational sector in particular (Andersson Elfers Felix 2005 and Beek, H. e.a. 2006). Next to this the concept of PPP has been advocated by several graduation reports on the suitability of PPP for primary schools (Bosch, S. van den 2007 and Proosdij, E. van 2007) and the influence of the application of PPP on the

quality of the primary schools (Wolff, R. 2011); who unanimously plea for a further exploration and application of the concept in the primary education sector. These researches, next to investigated best practices from neighboring countries like England, Belgium and Germany (Vermeer, D.M.M. 2006 and Vermeer, D.M.M. 2009), resulted in the initiation of a Service Centrum Scholenbouw which should promote the application of PPP in the educational real estate sector.

### **3.3.5 Advising role of the Service Centrum Scholenbouw**

The Service Centrum Scholenbouw states that the application of PPP is useful in three types of educational real estate projects: construction or replacement; multi-functional accommodations containing a mix of public and or private functions; and renovation and maintenance contracts of an existing school building (Sande, L. van de 2009). It promotes this type of contracting by promoting the earlier mentioned advantages of the method in articles in the media in general (Boendemaker, C. e.a. 2009; CoBouw 01-2009 and Kort, T. de 2010); the possible linkage between PPP and advanced decentralization in particular (Schraven, J. 2008; Leenten, M. van e.a. 2009 and Schraven, J. 2009) and by providing in more detailed information and guidelines for primary schools on the verge of the initiative phase of a new school (Service Centrum Scholenbouw 2009; Schraven, J. e.a. 2010 and Heijnders, L. 2011).

## **3.4 The rise of the community school**

From the previous paragraph it became clear that PPP's are a good way to facilitate community schools in which different public and/or private functions are mixed. Next to this the development of community schools is actively stimulated by the national government as it has implemented several regulations; for example the obligation for schools to offer child daycare in 2007; measurements which should be further implemented and facilitated however (Vermeij, A. e.a 2005 and Schraven, J.W. 2009).

Next to this the partnering process of the cooperating actors within a community school is a complex one. It is important to find out which combination of functions are desirable (Oomen, C. e.a. 2009) and in which environment the MFA could be feasible (Griemink, F. e.a. 2007). Also, it is important to find out what the motives of the most common private actor in PPP's – the housing corporation – are (Frijns, W.M.M. 2007 and Dortland, E. 2010) and to define a clear unambiguous program of requirements which is satisfactory for all actors involved (Kloet, T. 2008). Finally it is important that sound agreements are made between the co-users of the building upon management and exploitation issues (Huisman, N.S.L. 2009 and Knaap, R. van der 2009). Luckily for the school boards, the Service Centrum Scholenbouw has also provided in a guideline on the partnering process within the context of building a community school in a PPP-construction (Schraven, J. e.a. 2010). The way in which the building process of multi-functional accommodations influences the eventual quality is outstandingly described by Architectuur Lokaal (Bergvelt, C. e.a. (red.) 2010). This publication which was presented during a conference (Jansen, C. e.a. 17-03-2008) where many of the common themes described were confirmed. One can imagine that the governance of this complex building process containing several stakeholders is of the utmost importance. This is also the reason why several graduation reports have already resulted in an extensive overview of recommendations to project

managers of the building project of a community school (Giebbels, E. 2002; Steltenpool, R. 2007 and Vries, T.A.J. de 2008).

### **3.5 Conclusion**

In this chapter the current financing of primary schools has been described. The history and reasoning behind this current policy is described, as well as the actors involved and the possibilities within the current financial system. Finally, implications of the current system are discussed on an abstract policy level. In the next chapter the implications of the current system are being made more insightful as the consequences for the day-to-day users are being discussed.

## 4. Problems in educational real estate

The main problems within the educational real estate sector can be reduced to two categories: problems related to shrinkage and problems related to suboptimal value creation. Since this research focuses on the optimization of the value creation in primary schools the problem of shrinkage will not be discussed here as this problem is still relatively local, whereas the problem of suboptimal value creation is currently present nationwide. However, if interested, plenty research literature on shrinkage in general (Derks, W. e.a. 2011; KcBB 2011 and PBL & CBS 2009), on policy strategies to deal with shrinkage on different policy levels and in different policy fields (Deetman, W.J. e.a. 2011; Garretsen, J.H. e.a. 2011; Gemeente Borger-Odoorn 2010; Rijk VNG IPO 2009 and Verwest, F. e.a. (red.) 2010) and on how to deal with shrinkage in the primary education sector in particular (Douma, K. e.a. (red.) 2010 and Heijltjes, H. 05-03-12), is available.

### 4.1 Research report Rijksbouwmeester

Next to having a controlling role on the financial management of both municipalities and school boards, the national government has also initiated researches on the quality of primary schools; and especially that of the indoor climate. Problems with a lack of ventilation, excesses of dust and fungi, and uncontrollably hot indoor climates in the summer, resulting in concentration problems of children and unfit working conditions for teachers, are identified through a literature study by Delft University of Technology's research institute OTB (Meijer, A. e.a. 2007). Research institute TNO has experimentally determined the relationship between the quality of the indoor climate and the quality of cognitive performances of the school children involved (Gids, W.F. de e.a. 2007). Problems of insufficient air quality, noise pollution and a less controllable indoor temperature during summers are due to regulations, the way these are complied to and behavioral aspects (Versteeg, H. 2007). Too often minimal norms for ventilation put down in governmental regulation like the Building Decree are being interpreted as the target value as opposed to the starting value for the discussion on what kind of ambition regarding the indoor climate would be appropriate. Also, the norms in the Building Decree are based upon average occupancy rates as opposed to maximum rates. Concluding, one could say that the goal of the national government that school buildings should be 'simple and efficient' is not realized considering the interior climate. These researches made clear that at eight out of every ten schools the interior climate is very poor (Leun, A. van der (red.) 2009). This means that, considering the Netherlands having over 7000 schools inhabiting around 1.5 million children (CBS 2009), the cognitive performances of over 1 million children is at stake as well as the working conditions of their teachers; something which is hard to reconcile with the ambition of becoming one of the top five knowledge economies in the world.

The results of these researches finally resulted in a vision of the national government on the indoor climate of schools (Cramer, J. e.a. 2007), which consisted of two main targets for improving the indoor climate of primary schools in the next 15 years: improving the indoor climate in a constructional way during the moments of renovation which many schools will face in the coming years and creating more awareness amongst the users of the buildings as to how

their behavior influences the quality of the indoor climate. During the debate that started on discussing this vision the need arose to look at this particular problem in a wider perspective. In the end the concrete request for advice from the Dutch Rijksbouwmeester Mrs. Liesbeth van der Pol was the following:

*“What is your vision on future-proof construction of schools? Next to a good indoor climate, aspects like sustainability, quality, innovation, but also possible functions of a school building and the position of a multifunctional school building in a district come to mind. Which partners could be interested regarding expertise and financial capacity? I request you to advise us on a future-proof way of constructing schools in a broad sense (amongst which specifically the relationship with the indoor climate) and the possible consequences for (building) regulations and the financing of schools.”*

Since the topic of constructing schools was already put on the agendas of the State’s architectural memorandum (Plasterk, R. e.a. 2008) and the commission of State advisors (Pol, L. van der e.a. 2009), this request – and its extension – from the minister to the Rijksbouwmeester did not come as a surprise. This request finally resulted in a report, based on a thorough literature study and interviews with several groups of experts, giving an extensive insight in the problems with which the sector has to deal (Pol, L. van der e.a. 2009).

Next to the previously described performed researches, the Rijksbouwmeester in cooperation with the Stimuleringsfonds voor de Architectuur asked Delft University of Technology to perform an exploratory research on the actual amount of schools to be built and the standard allowances and cost overruns during the construction of schools (Arkesteijn, M. e.a. 2009). They have found out that in some municipalities at nearly 80% of the projects the budgets are overrun. This is not only the case in small municipalities but also in larger municipalities (Swart, M.A. 2009). Causes for budget overruns that are mentioned are: delay of the project, market circumstances, outdated budgets in combination with gradually increasing requirements and insufficient professional financial management. Other budget overruns are caused by design decisions like dimensions and number of floors of the building and the level of finishing, as well as having to comply with possible urban design constraints which could influence the shape of the building.

During the creation of a simple office building three times the money is available than for the creation of a simple and effective school building, apart from the fact that a school building is used much more intensely than an office building. The lower budget per user negatively influences the indoor climate of the schools. Apart from that the indoor climate is an ideal topic to cut on when actors find out that because of possible budget overruns cuts need to be made during the process; because of the fact that the project most likely is already in the execution phase so the design can’t be adjusted anymore, but the ventilation installations can. Canceling the more expensive mechanical ventilation and choosing natural ventilation while the rest of the building was not designed to support that might enable the project managers to dodge budget overruns, but it will also result in the building having a suboptimal indoor climate. Next to this the researchers identify a severe lack of data on schools to be built within the next 10,

20 or 30 years and advice to perform research on this topic. Also research needs to be done to the quality of schools which have indeed been built within the boundaries of the standard allowances and budgets. Can this quality be compared to the schools which have been nominated for the Scholenbouwprijs in the last few years? The previously described literature study and the expert interviews that have been held finally resulted in the following recommendations.

#### 4.1.1 Update the programs of requirements to fit the current standards

Considering both the indoor climate and the spatial usage, the programs of requirements need to be adjusted to current societal developments, as compared to for example 25 years ago:

- **The nature of the usage has changed**  
The introduction of computers and whiteboards has changed the requirements for heating capacity and sunlight.
- **The intensity of the usage has changed**  
Traditional classroom education is alternated with individual education or education in small groups. The trend of independent learning has reached the primary education in the capacity of Het Nieuwe Leren (Blok, H. e.a. 2006). This has decreased the intensity of the usage inside the classroom but increased the intensity of the usage outside the classroom.
- **The duration of the usage has changed**  
Since 2007 schools are legally obliged to offer facilities for children to remain at school during lunch breaks. This trend, in accommodating so-called dual-earner families, seems to be persevered as more and more schools offer pre-school childcare and after-school childcare creating almost a 07:00-19:00 arrangement in some schools.
- **The physical condition of the pupils has changed**  
More and more pupils are diagnosed with allergies related to asthma and/or are suffering from obesity.
- **The type of pupils has changed**  
More and more physically and/or mentally handicapped pupils are visiting a regular school. This trend will only increase because of the Wet op Passend Onderwijs which is currently proposed by Minister Van Bijsterveldt (March 2012).

These societal developments do not only require more from ventilation installations; it also requires more from the spatial designs of school buildings. Regarding the latter, subjects that need to be further investigated are: entrance of daylight, views through the building and from the inside to the outside, differentiation and variation in the height of floors and ceilings and the shape of spaces, the quality of the outdoor area, the orientation of the building towards sun and wind, spatial consistency and integrality within the building, flexibility of the indoor area, urban relationship of the school with its surrounding area and, finally, the expression of the schools identity by its materialization. Directions to investigate in enhancing the spatial quality of schools are the relationship between spatiality and sustainability and the older schools, like the ones designed by Dudok, which were built before the efficiency urge to save on elements like ceiling height and spatiality.



The program of requirements should also be updated concerning the indoor climate. A better balance between energy efficiency, costs and health should be made. Schools should be encouraged in trying to achieve a class A, or at least class B indoor climate regarding the standards of Agentschap NL 2010 (Agentschap NL 2010). Integrity during the building process should be maintained in order to not let the ventilation installations be cut because of budgetary reasons.

#### 4.1.2 Update the laws and regulations to fit current standards

In the previous paragraph several changes in the usage of school buildings have been described which increase the CO<sub>2</sub> concentration within school buildings. Regulations have failed to keep up with these societal developments and are still focused on the average occupancy rate instead of the maximum occupancy rate. In combination with a lack of productive ventilation behavior from the staff this results in an indoor climate which is even worse than that of the average jail (Fig. 4-1). Regulations concerning air quality standards need to be updated and better ventilation behavior should be promoted.

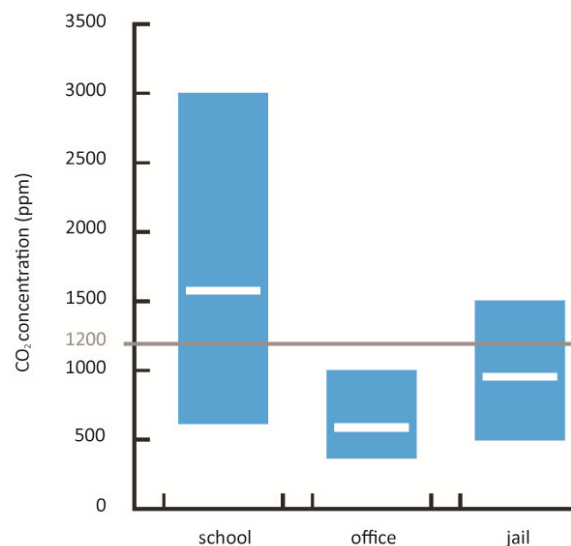


Figure 4-1: Minimum, maximum and average CO<sub>2</sub> concentrations (Pol, L. van der e.a. 2009)

In addition to the ventilation also the regulations considering the thermal conditions of the indoor climate should be updated in order to be able to cope with the changing climate by creating indoor climates which can withstand the increasingly extreme weather conditions, like hot summers and strong rainy storms in the fall and winter.

#### 4.1.3 Fix the budgets and match the cash flows

Better matching of cash flows should enable a more efficient use of the available money. In 2008 a new way of calculating the allowance for the construction costs has been created; at the moment the amounts of classrooms and m<sup>2</sup> are critical for the determination of the allowance. However, the amount of pupils seems to be a better way of measuring considering the relatively high occupancy rate of the schools for primary education (Fig. 4-2). This is also the reason why currently this measuring method is used.

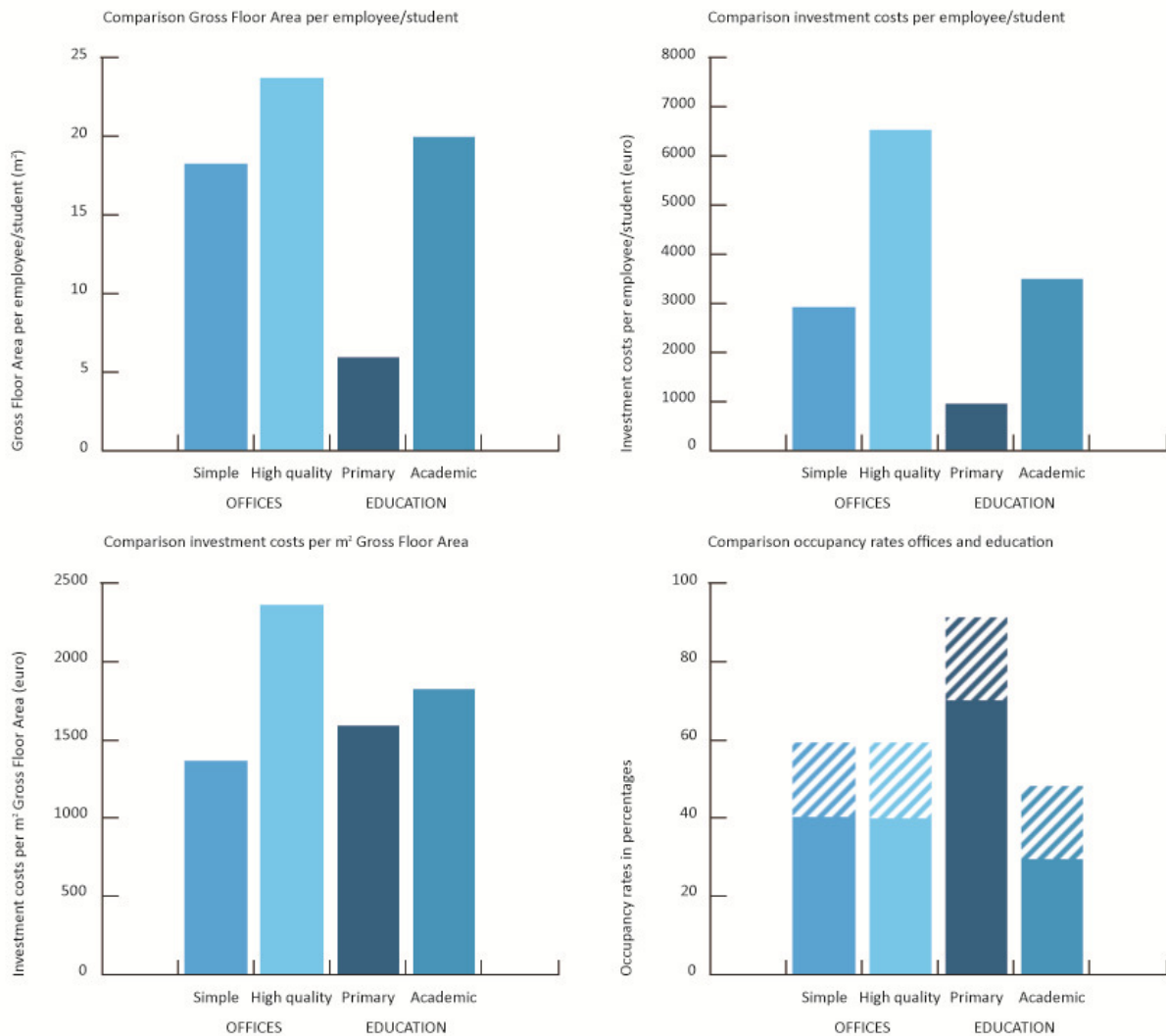


Figure 4-2: Investment costs and occupancy rates (Pol, L. van der e.a. 2009)

Next to this, budget overruns are caused by a too low of a budget accompanied by insufficient financial management. The Rijksbouwmeester considers the building of a simple and efficient school building according to the present-day norm is feasible, if an integral approach is used accompanied by sound financial management and the right decision making early on in the process. However, if it is desired that the schools of the future will be suited for the updated programs of requirements considering the spatial quality and the indoor climate, more budget needs to be cleared for educational real estate. This allegation is confirmed by other research which states that the average difference between the amount of standard allowance and the actual costs of an average school building are about 30% (Leun, A. van der (red.) 2009). Also, the Rijksbouwmeester states that new ways of matching the separate cash flows of municipality and school board need to be investigated in order to be able to create a better school.

#### **4.1.4 Facilitate quality assurance and monitoring**

Unlike with other utility buildings, in the school building sector it is not yet common to create ambition documents, create a clear program of requirements and critically follow the execution phase delivery and operation phase of the buildings. Better quality assurance and monitoring is needed, for example by changing programs of requirements into performance requirements documents instead of vague multi-interpretable documents. Clients within the educational real estate sector tend to be less assertive because of less experience with the building process. A performance based program of requirements can prevent installation advisors, as well as other parties, from searching for cheaper and qualitatively less solutions for the problems to solve as soon as they have won the procurement procedure. Next to this municipalities are encouraged to fulfill their controlling role being ultimately the client as they are responsible for a qualitative sufficient education within their region. Specifically mentioned is the possibility for the municipality to check the calculations of the installation advisor during the preliminary design phase.

#### **4.1.5 Improve and support clientship**

Because of the incidental nature of the creation of a school building process taking place most clients, albeit municipalities or school boards, can be considered as inexperienced ones. In this way they are not able to judge the advice of architects or other advising agencies in a thoroughly underpinned way. Support to these inexperienced clients can be given by creating one central information point which informs objectively. A clustering of the widely spread knowledge amongst the several foundations and information points is desired. The Service Centrum Scholenbouw seems to be an ideal actor for providing this nationwide. This could also be done on a more regional level, making the knowledge more adaptable to the specific situation, like it is done with the Scholenbouwmeester. This initiative from the provinces of Drenthe, Groningen and Friesland focuses on informing school boards on dealing with the consequences of shrinkage. In bigger cities the role of informing party could be done by the city architect or local architectural centre.

Another often mentioned solution is the adaption of Public Private Partnerships. In this way not only a qualitative better building is created because of the combination of the design and exploitation phase, but the quality in all these phases is also enhanced because of the intense cooperation between both parties in which it is more likely that the wishes and needs of the client will be shaped in a better way compared to the more distant relationships in the traditional building organization model. The cooperation with housing associations could lead to better buildings since these actors have more experience with building projects in general and long-term investments, complex ways of financing and buildings as investments. In this way they have gained a lot of knowledge on coherency between design, building process and maintenance. Current regulations could be further adapted to accommodate these kinds of cooperations. Finally, apart from which contract form is chosen, Total Engineering could help the clients in getting more value for their money. The commitment of a Total Engineer should be higher than that of the average advisor since that actor would be responsible for the entire building process, even for the choice of the contract form. On the next page, all recommendations are summarized (Tab. 4-1).

Bottleneck	Solution	Actor
<b>Program of requirements</b>	<b>Updating, upgrading and supporting innovate programs of requirements</b>	
Spatial programs of requirements for primary schools are often outdated	Development of some present-day, inspiring and innovative spatial programs of requirements for primary schools; schools have to be able to possess an accommodation which fits the contemporary functional requirements	Ministries of OCW and VROM, architects, architectural institutions
Programs of requirements for a decent indoor climate do not have a clear rank and lack sufficient financial support for execution	<ul style="list-style-type: none"> <li>- Considering building en renovating: establish class B, preferably class A, of the ISSO-publication <i>Binnenklimaat scholen</i> as being a good indoor climate as being the level of ambition</li> <li>- Support municipalities who are striving to realize quality class A</li> </ul>	Ministries of OCW and VROM
<b>Laws and regulations</b>	<b>Update the Building Decree</b>	
The regulations of the Building Decree considering the ventilation capacity are not sufficient for primary schools	Adapt the Building Decree in such a way that the formulated demands on air quality could actually be achieved: <ul style="list-style-type: none"> <li>- The ventilation capacity needs to be sufficient during the actual usage of the building (<i>will be adapted in the 2012 version of the Building Decree</i>)</li> <li>- Reconsider standards for spaces with a multifunctional character</li> <li>- Re-establish the demands on ventilation on the level of the requirements of the model building code</li> </ul>	Ministry of VROM
Regulations on temperature control are not sufficient	Define stricter requirements for being able to achieve a future-proof thermal indoor climate	Ministry of VROM
<b>Budgets and cash flow</b>	<b>Match budgets to present quality standards and neutralize disadvantages of separated cash flows for building and exploitation in a structural way</b>	
The standard allowance for building a primary school is hardly sufficient	Find out which consequences the current spatial programs of requirements and the <i>PvE Frisse Scholen</i> have on the standard allowance	Ministries of OCW and VROM
Separated cash flows to municipality and school board hamper effective spending	The national government should make agreements with the VNG and the PO-raad in order to neutralize the disadvantages of the separated cash flows in a structural way in order to enable the realization of sustainable and energy efficient schools	Ministries of OCW and VROM, VNG, PO-raad
<b>Quality assurance and monitoring</b>	<b>More supervision on the execution, checking, quality assurance and monitoring of installations</b>	
The checking, execution and maintenance of technical installations in primary schools is not standardized	<ul style="list-style-type: none"> <li>- Development of examples of spatial programs of requirements and programs of requirements on indoor climate which contain accountable performance requirements</li> <li>- Secure inspection and maintenance by means of a contract</li> </ul>	Ministry of VROM, installation industry and architects
Insufficient compliance with the building regulations	<ul style="list-style-type: none"> <li>- Adapt the new <i>VentilatiePrestatieKeur</i> for dwellings on primary schools</li> <li>- Make clear in the building regulations who is responsible for the preservation of the quality of the installations during their lifespan</li> </ul>	Ministry of VROM
<b>Clientship</b>	<b>Professionalization and more support</b>	
Clients are insufficient supported	Investigate in what way regional centers of expertise, city architects and local architecture centers could contribute in the enhancement of the quality of schools	Ministry of VROM
Insufficient knowledge on new ways of contracting	Support the development of pilots in the field of PPP and Total Engineering which could specifically enhance the spatial quality and that of the indoor climate	Ministries of OCW and VROM, Service Centrum Scholenbouw
Knowledge and experience from corporations are not utilized	When legal regulations would allow, cooperation with corporations could be useful	Service Centrum Scholenbouw, Aedes
Contributions to the <i>Scholenbouwprijs</i> do not have qualitatively proven their selves in every aspect	Adjust the regulations of the <i>Scholenbouwprijs</i> in such a way that only schools that are at least one year in use could participate. In this way the schools have proven their quality in every season	Ministry of OCW
<b>Cooperation</b>	<b>Institute a nationwide information centre</b>	
There is no central office with information on the creation of schools	Clustering of knowledge and information is necessary. The job description of the Service Centrum Scholenbouw could be extended to fulfill this function.	Ministry of OCW, involved organizations, Service Centrum Scholenbouw
<b>Research agenda</b>	<b>Initiate further research</b>	
Lack of nationwide data on cash flows and amount of schools to be built	Initiate further research on cash flows and amount of schools to be built which is relevant for policy making.	Ministries of OCW and VROM

Table 4-1: Summary of recommendations of the Rijksbouwmeester; translated from (Pol, L. van der e.a. 2009)

#### 4.1.6 Conclusion

A lot of knowledge is present on the building of schools and the indoor climate; however it is very fragmentally divided amongst the several organizations and institutions: VNG, Agentschap NL, GGD, Bond voor Nederlandse Architecten (BNA)'s Staro, Vereniging Platform Onderwijshuisvesting, Scholenbouwmeester, Onderwijsraad, Architectuur Lokaal, Stimuleringsfonds voor de Architectuur, Nederlands Architectuur instituut (NAi), local architectural institutions and, finally, the Service Centrum Scholenbouw. Like the Onderwijsraad (Onderwijsraad 2009) also the Rijksbouwmeester suggest to cluster the knowledge at one institution, suggesting this to become the new and enhanced Service Centrum Scholenbouw. The Rijksbouwmeester mentions in her report that a leading role for the clustering of knowledge on the building of schools could be given to the Stimuleringsfonds voor de Architectuur since they already performed research on the subject, with an accent on the design task perspective on the matter (Leun, A. van der (red.) 2009). Further knowledge development by means of further research is desired nevertheless. The following topics should be researched:

- The amount of schools that are to be built
- The relationship between standard allowance and quality
- Additional financial resources for the building of schools
- The possibilities and effects of integration of the cash flows for building and exploitation
- Effective municipal real estate strategies
- New typologies for(re) building schools in combination with the experiences of function mixture as experienced by users of multi-functional accommodations

#### 4.2 Research report Onderzoekslab

The report of Onderzoekslab (Bakers, J. e.a. 2010) states that previous studies on the quality of the educational real estate repeatedly identified a thorough lack of user-perspective knowledge. Also, the research team puts that quantitative measurable requirements are getting more and more attention at the expense of immeasurable requirements like the appearance of the building and the experience and atmosphere of the interior. Reason enough to perform a thorough research on the quality of educational real estate from the user-perspective. A literature study and expert interviews provided the researchers with enough input for being able to identify relevant themes and problems which are present in the educational real estate. Finally, the team identified five themes consisting of 20 variables in total. They approached primary schools nationwide with a basic questionnaire which, after some general questions about the school, asked them to rate their opinion on how well this variable of their school building performed on a scale of 1 to 10 and how much priority they attach to each variable. Because of the basic set-up of the questionnaire the team was able to obtain 258 responses; a number which indicates a certain amount of commitment of the respondents to the cause and gives the results a certain amount of reliability. Results are related to the construction year of the buildings in which they are group every 10 years, except for the period 1921-1940. The following two tables show the results of this questionnaire; the first ranking the separate variables from bad to good (Tab. 4-2), the second ranking the themes as a whole from bad to good (Tab. 4-3).

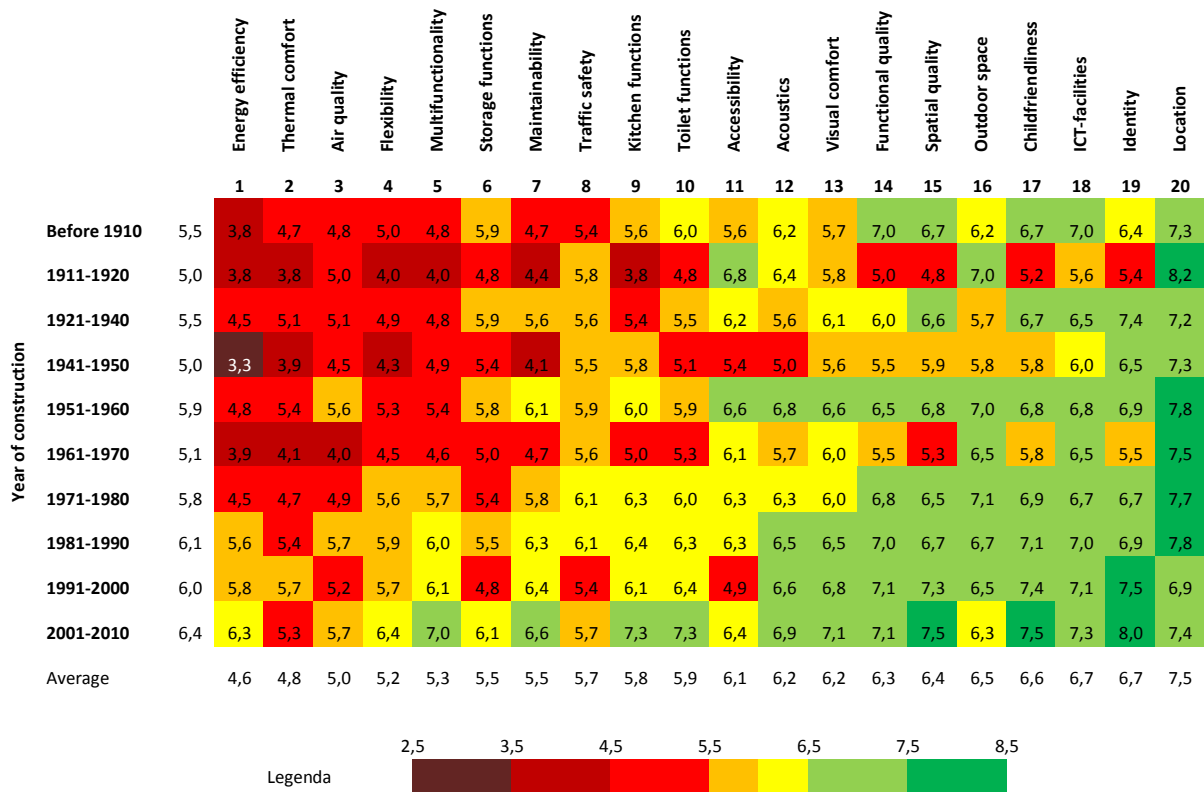


Table 4-2: Research results Onderzoekslab: all results (Bakers, J. e.a. 2010)

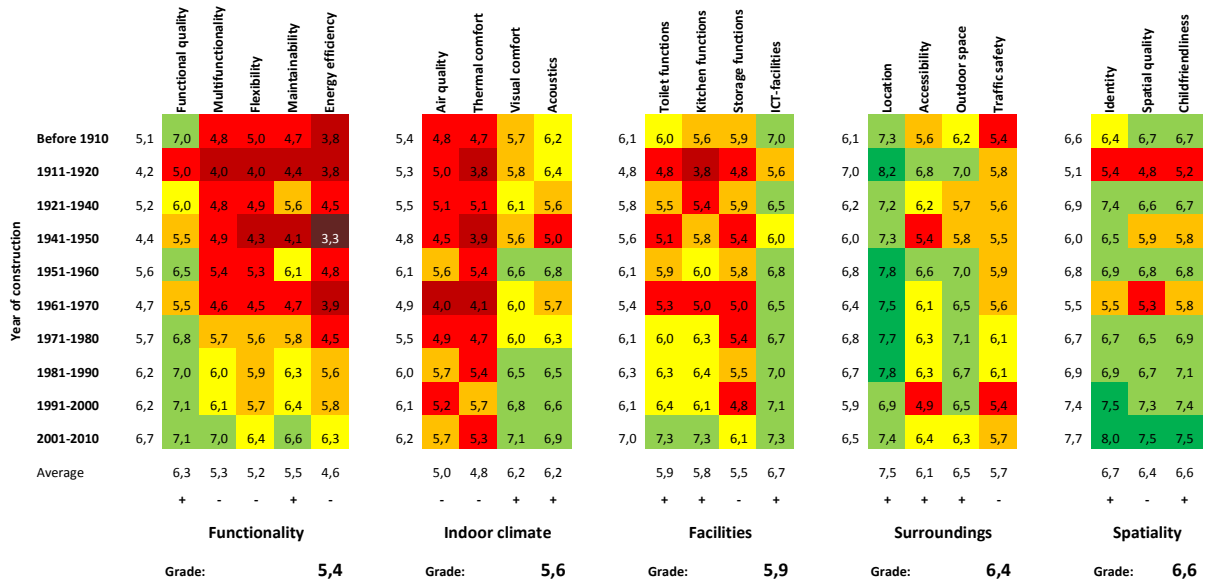


Table 4-3: Research results Onderzoekslab: ordered by theme (Bakers, J. e.a. 2010)

Looking at the themes over time we can see that they gradually improve over time, except for the indoor climate (especially due to the air quality and thermal comfort). Regarding the functionality we can see that new schools score better in this regard. Striking is the lack of growth in energy efficiency regarding the grown attention for this topic nowadays. Also noticeable is the low review of the storage functions, probably because of the easy cuts on these types of functions during the construction process. Also, flexibility is reviewed as low, but this might have to do with disappointed users because of high expectations which could not have been lived up to.

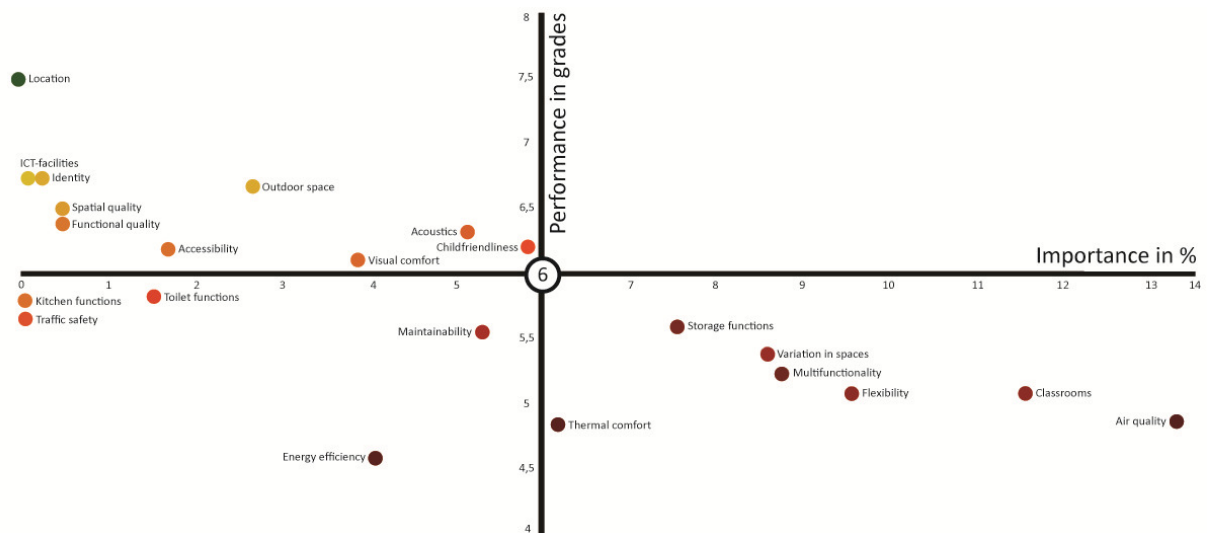


Figure 4-3: Priority of variables in relationship with their score (Bakers, J. e.a. 2010)

Next to the 20 graded questions one open question was asked as to which variables should be paid more attention to in the creation process of a school. Next to enhancements in the 20 already defined variables, two other improvements were requested: larger classrooms and more variation in spaces, which could provide more differentiated forms of education. Noticeable is that, next to these two newly introduced variables, the previously top five of bad scoring variables are also the ones which is asked the most attention for; except for the energy efficiency, which is the lowest scoring variable in the research (Fig. 4-3). Apparently nevertheless the energy efficiency is considered as being terrible this is still a topic considered irrelevant by the users; while making a building more energy efficient could result in severe financial and environmental benefits. The team concludes its report with some concrete advice:

### 1. Learn from experiences

- The user experience should be evaluated in a systematic way. This is something which has not been done before in this type of scale, but it should be done more often on a regular basis.
- End-users should be helped in the formulation of their ambitions. One way this problem could be tackled is by using a common language – like the Scholenbouwwaaiertool that has been designed by the research team – which prevents abstract multi-interpretable visions and programs of requirements from being written.

## **2. Share knowledge**

- Centralization of gathered recommendations and knowledge from the field can prevent schools from having to invent the wheel over and over again, which could result in considerably amounts of savings in time and in money. Possible vehicles for this clustering of knowledge could be the VNG or the Service Centrum Scholenbouw on a national scale and initiatives like the Scholenbouwmeester on a regional scale.
- Further investigation on flexibility and multifunctionality can be useful. These two variables have scored very badly in the questionnaire but it is yet unclear why this is exactly, because of the wide range of interpretations both variables could lead to. They can be seen as 'container concepts' in some way and when investigated more thoroughly one might see that a wide range of diverse explanatory stories are behind these low scores. Suggested is to investigate schools of 30-40 years of age on their multifunctionality, since current schools seem to lack in this need, compared to older schools that do seem to be able to fulfill this need.

## **3. A good role division**

- A responsible actor for the quality of the housing should be appointed. Professionalization on the side of the client is required. The research has indicated several times that there is a clear lack of a problem owner; the municipality in general does not yet seem to have gotten used to their role as director of the creation of qualitative housing for schools within their entire domain.
- Direction, vision and overview for the long term are needed. The lack of problem ownership is felt also on a more abstract long-term level. The current creation process is fragmented and involves too many actors. Social work and community centers should be integrated more intensely in the creation of community schools.

## **4. The school as example**

- The school should be an inspiring example in the realms of indoor climate, embedding in the surrounding area, architectural quality, but – most important – in energy efficiency. This topic is the worst scoring variable from the questionnaire, but considered as not being that important. It should definitely be given more attention.

## **4.3 Conclusion**

Janny Rodermond summarizes the problems of the educational real estate in a clear way in her essay which is the introduction to the series of interviews with experienced practitioners of the field; being the architects themselves (Leun, A. van der (red.) 2009). The title already speaks for itself: *School building does not have a problem owner*. Looking at how the school building process is organized (chapter 3) and what problems are present (previous paragraphs) it is not difficult to see a cause and effect relationship between these two. The privatizing drive of the government is not being considered as successful by everyone. Rodermond cites an essayist from the essay bundle on commercially operating government called *The ten plagues of the state*:



*“It is if like a giant blind elephant was let loose in our backyards, who, not being watched by anyone, could freely cause the greatest of destructions. And like with the blind elephant, it is not a matter of aggressive behavior as more a matter of the government, which should embody our collective will, having lost its democratic grounds.”*

Every actor, whether it's the pupil, teacher, parent, municipality, advice agency, school board, scientific world or national government recognizes the problems but either does not have the power to or does not benefit from possible solutions for these problems. The main issue is how to eliminate these problems as still every actor agrees that the daily living environment of 1.5 million of our nation's youngest children should be enhanced. That there are many different ideas about the way to go coming from the many different actors in the field may be clear; these solutions are discussed in the following chapter.

## 5. Solution scenarios

In the previous chapter, next to pointing out the current problems within the primary educational real estate, the several researchers also pointed out some solutions for solving these problems. Next to these, other solutions that are mentioned for creating more value are optimization of the cooperation (Appel, P. e.a. 07-03-12 and Migchielsen, H. 07-03-12) and building process (Giebbels, E. 2002; Steltenpool, R. 2007 and Vries, T.A.J. de 2008). However, since this research focuses on the optimization of the value creation within primary schools by optimization of the financing system the subject of this chapter will be on proposed improvements of the financing system.

### 5.1 Optimizing the financing system

In 2010 the PO-raad asked the REBEL advisory group to come up with a fresh alternative for the way of financing primary schools (Barendregt, E. e.a. 2010). HEVO has compared this fresh alternative with the current possibility of advanced decentralization (Uhlenbusch, M. e.a. 2011), since this fresh alternative can be considered as a specific and extreme way of advanced decentralization. According to this research, larger school boards which consist of multiple schools were more in favor of the plan than school boards which consist of only one school. The latter group envisions more problems in the fields of the necessary knowledge development and fears that the increase in market dynamics and loss of back-up of the municipality will lead to a heightened risk on bankruptcy and a less likely geographical spread of schools. These were also the reasons why the VNG reacted somewhat less enthusiastic on the report of the REBEL advisory group as the PO-raad did (Vereniging van Nederlandse Gemeenten 2010). They asked themselves openly which alternative is being offered as they consider the fresh alternative as just another way of current-day advanced decentralization, with a few adjustments however. It are these adjustments that they deem to be inappropriate as, for example, the municipalities are being put aside considering the housing procedure and are allowed to have little influence on this process, but if the financing by means of the guarantee fund fails in the end, the municipalities are proposed to be the ones to save the day.

In the same year as the PO-raad presented the fresh alternative another exploratory research on alternative scenarios for the financing of schools took place (Gramberg, P. e.a. 2010). This research performed by a joint venture of researchers from Oberon, Research voor Beleid and the Stichting Brede School Nederland commissioned by the governmental department of Education, Culture and Sciences was built around two central research questions:

1.	<i>“Which possibilities are present (within the existing system) to enhance the quality of educational real estate and to ensure a more integral consideration between initial investment costs and structural maintenance, cleaning and energy costs?”</i>
2.	<i>“In which ways could the educational real estate system (responsibilities and cash flows) be organized differently and in a better way?”</i>

Scenario 0: Current situation	Scenario 1: Clustering budgets and responsibilities at schools	
Strengths	Opportunities	Threats
1. Democratic legitimization public funds	Democratic legitimization by regulations national government	No control by municipal council any more
2. Extra investments by municipalities		Less financial means for municipalities to invest in integral real estate. Extra investments dependent on relationship school and municipality
3. Stimulating an integrated accommodation policy and community school development	School board becomes mature partner for cooperation	Directive role municipality disappears
4. Link to demographic and spatial developments and policies	School board will be financially encouraged to strive for exploitation efficiency	School boards will not likely build new schools in shrinkage areas or deprived neighborhoods
5. School boards are at little financial risk and can focus on educational content	School boards get the chance to optimize match between educational vision and school building	Real estate activities could be at the expense of the schools primary process of educating children. Risk of prestige-projects.
Weaknesses	Opportunities	Threats
1. School board and municipality are condemned to each other	Less negotiation necessary between municipality and school board	
2. Separated responsibilities and cash flows	School boards can make an integral consideration between investments costs and exploitation costs	
3. Burdensome and bureaucratic procedures	Time gain because of loose of application procedure	Building procedure remains the same
4. Rigid standard allowances	More freedom on how to spend the budget	Degrees of freedom considering spending of budget are limited, because of limited budget
5. Underinvestment	No more competition between education and other municipal policy fields. National government could perform as external financier.	Reservations for the future will lead to possible initial underinvestment. More need for external money but less credibility to get it.
6. Little linkage between educational vision and school building	Better match between educational vision and school building	
7. Political horizon municipalities is often short	Horizon school boards is longer than that of municipalities, so better possibilities for a sound long term planning	
8. No clear data on the quality of schools		Will not be improved
9. Suboptimal quality of school buildings	School boards can act more quickly compared to current application procedure	This scenario gives no guarantee for quality improvement
10. Lack of knowledge and expertise on the field of educational real estate	New responsibilities force new knowledge development. Chances for local or regional clustering of knowledge.	
		Financial issues, like the transferring of €15 billion worth of schools which have to be dated and of which some are financed with borrowed money; the issue of ground possession. Municipalities are likely to want financial compensation; school boards are likely to want initial investment funds.
		Higher risks for smaller school boards and those in areas which deal with demographical shrinkage
		Unwanted scaling up of school boards, risk of prestige-projects

Table 5-1: Scenarios (Gramberg, P. e.a. 2010)

Scenario 2: Clustering budgets and responsibilities at municipalities		Scenario 3: Optimizing current situation	
Opportunities	Threats	Opportunities	Threats
Remains the same			
Because of full responsibilities municipalities might invest extra in educational real estate	Investments in education fully dependent on municipal priorities on policy fields		
Because of full responsibilities municipalities might invest extra in community schools			
Up-scaling could lead to efficiency gain regarding costs and vacancy rates. Facilities in shrinkage areas and small villages can be sustained.			
More room for school boards to focus on their primary process of educating children			
Opportunities	Threats	Opportunities	Threats
Less negotiation necessary between municipality and school board		<b>9. Introduce right on advanced decentralization</b>	
		Incentives for clustering of expertise, an integral approach, cooperation and optimal usage of buildings, shorter procedures, clearer interests and quicker reactions on time-bound demands; in the school boards wishes to.	Could lead to a major fragmentation of the system as every school board could apply for and obtain advanced decentralization, instead of it being discussed municipality-wide. This could make it more difficult to create Integral Housing Plans.
Municipalities can make integral choices. Clear problem owner for problems like bad indoor climate.		<b>8. Transferring external maintenance to schools</b>	
		Efficiency gain in maintenance schedules. Increased autonomy and independence for school boards.	It might be hard for smaller school board to reserve the sufficient financial means. Good agreements are necessary for the exterior maintenance of multi-functional accommodations.
	School boards will get even less influence on the building procedure and more dependent on the municipality		
If education is an important policy field for the municipality the standard allowances will be cast aside	If education is not an important policy field for the municipality the standard allowances will be strictly applied	<b>2. Quality requirements instead of standard allowances</b>	
		Could improve schools because of focus on meeting the quality standard instead of meeting the standard allowance.	Who should decide on the quality requirements? Municipalities or school boards? And who should decide upon the costs per quality requirement? Requirements should be made objective and old school buildings need to be updated to match these requirements, which is expensive.
	Risks for underinvestment is increased as investments in education are now fully dependent on municipal priorities on policy fields	<b>6. Earmarking of educational budgets municipality fund</b>	
		Money intended to be spend on education will indeed be spent on education.	More bureaucracy. Might lead to inefficient use, because of obligation to spend. Will decrease extra municipal investments.
Right to be able to fulfill the educational vision could be added to the newly to be developed quality guideline for schools	Poorer match between educational vision and school building. Rise in bureaucracy.		
Possibilities for securing long-term planning by means of laws and regulations	School boards will be fully dependent on local political decision-making. Fear for cutbacks on educational housing and mismatch between desired long-term policy and short-term municipal governmental focus.	<b>1. Long-term policy on educational real estate</b>	
		Less details, more flexibility, more variation, better fit to local situation and strengthening long-term vision and policy	Could even further increase the inequality between school boards and municipalities, since the prioritizing of education differs per municipality.
	Will not be improved	<b>3. Benchmarking</b>	
		Benchmarks could give insights in relationships between investment and quality and which aspects are influential. It could help school boards and municipalities in reflecting on their behavior.	Benchmarks could lead to self-fulfilling prophecies: if a lot of money intended for education is not invested by municipalities for example, the budget for education from the municipality fund might decline
Municipalities are financially encouraged to invest in high-quality schools with high investment costs but low exploitation and life-cycle costs, which also enhances the sustainability of the schools		<b>5. Introduce complaints desk</b>	
		Could lead to more attention for the current quality of school buildings. Could give users the chance to ventilate frustrations if complaints desk could force municipalities to act within a reasonable range of time.	Complaints are always present when there is already a problem. A clear distinction of the type of possible complaints is necessary. Trying to specify vague complaints could be time consuming.
Expertise of municipalities will grow. Cooperation with other municipalities or professional advisors might help.	Small municipalities might not have financial room for clustering the expertise	<b>7. Increasing expertise municipalities and school boards</b>	
		Increase in power position of client when dealing with professional advice agencies.	Investing in knowledge costs money. The knowledge is vulnerable as experts could leave.
Integral municipal policy on education is stimulated	Implementation will encounter a lot of resistance because of current trend of decentralization	<b>4. Reward and condemn</b>	
		A clear honest comparison can be made.	Sentiments can be created which could worsen relationships between school boards and municipalities. Independent supervision is necessary.
	Rise in costs as result of a possible lack in energy efficiency at the side from the school boards		

Desk research, stakeholder interviews and expert meetings finally resulted in the description and creation of four scenarios which are described in more detail on the previous pages (Tab. 5-1). First the current situation is described with its strengths and weaknesses. Then two extreme scenarios are introduced, being the clustering of budgets and responsibilities at the side of the schools and at the side of the municipalities, after which the effect of these scenarios on the (dis-) advantages of the current situation, are described. The final scenario which is introduced is a package of measures and can be seen as an optimization of the current scenario in terms of improvement of quality, transparency and expertise.

The scenario of (re-) nationalizing the primary school sector has been left outside of the scope of this research as it is seen as most unlikely to happen considering the trend of decentralization. The optimization scenario seems to be the easiest to implement because some of the proposed measures will most likely have enough support and could result in a reasonable or good quality profit; however this scenario does not solve the central problem of the separated responsibilities. The support for the scenario which clusters the power at the municipality seems to be the lowest since it increases the dependency on the municipality and probably also the administration. The implementation will take much time and effort since this scenario is in the opposite direction of the current trend of decentralization and the expected quality profit is limited. The scenario which clusters the power at the school boards can expect split reactions. Problems are foreseen regarding the smaller school boards within the primary education. The central question regarding this scenario therefore is whether the clustering of power at the school boards should be obliged or offered as a choice. The core task of primary schools is often mixed with other societal supportive organizations which seems to plea for this being a municipal task. Also the dealing with financial fluctuations and the build-up of expertise on educational housing seems to benefit from the economies of scale of the municipality.

## 5.2 Conclusion

Although the PO-raad has opted for an alternative financing system for quite a while in the shape of the fresh alternative, their current focus primarily lies on the optimization of the current financing system (Midden, G.J. van 07-03-12). This seems to also be the scenario which is primarily supported by the politicians in The Hague regarding the proposal of minister Van Bijsterveldt-Vliegenthart to transfer the exterior maintenance from municipalities to school boards by 2014 (Bijsterveldt-Vliegenthart, M. van 16-03-12), since there is nowadays enough support from the primary schools themselves for this plan (Berndsen, F.E.M. e.a. 2012) compared to an earlier research (Diepeveen, M. e.a. 2004). Also the debate on changing the possibility on advanced decentralization to a right on advanced decentralization (March 2012) seems to contribute to this presumption as both measures originate in the optimization of the current situation scenario as it has been described in the previous paragraph (Gramberg, P. e.a. 2010). Other optimization measures which are currently being investigated by the market are the benchmarking of primary schools by HEVO (Adriaansen, W.J.A. e.a. 2011) and the development of quality requirements which could replace the system of the standard allowances. These were developed by the VNG in cooperation with the PO-raad from which the latter however has taken the leading role since the former has quit participating in the developing process (Midden, G.J. van 07-03-12). The increase of expertise has already assumed

the concrete shape of the Scholenbouwwaier (Zandwijk, M. van e.a. 2011) which has been developed by the researchers of Onderzoekslab; whose research on the user experience of primary schools has been discussed in the previous chapter. Also the VNG (Rutjes, F.e.a. (red.) 2007 and Schraven, J.W. e.a. 1997) and the PO-raad (Basari, K. (red.) 2011 and Fuite, M. e.a. 2011) contribute to the expertise of their members, stimulating them in formulating a long-term policy on their educational real estate.

Focus	Measure	Proposed leading actor for implementation	Actual leading actor
<b>Quality</b>	1. Long-term policy on educational real estate	National government	VNG and PO-raad
	2. Quality requirements instead of standard allowances	VNG	VNG and PO-raad
<b>Transparency</b>	3. Benchmarking	VNG and PO-raad	HEVO
	4. Reward and condemn	VNG and PO-raad	
	5. Introduce complaints desk	VNG and PO-raad	
	6. Earmarking of educational budgets municipality fund	National government	
<b>Expertise</b>	7. Increasing expertise municipalities and school boards	VNG and PO-raad	VNG, PO-raad and Onderzoekslab
	8. Transferring external maintenance to schools	National government	Secretary of State
	9. Introduce right on advanced decentralization	National government	Parliament

Table 5-2: Overview of optimization measures and actors who are implementing them (based upon Gramberg, P. e.a. 2010)

These improvement measures of the financing system (Tab. 5-2) and those coming from the Rijksbouwmeester (Pol, L. van der e.a. 2009) and Onderzoekslab (Bakers, J. e.a. 2010) researches will be investigated more closely further on in this report. But first, how to define this concept called value creation?



## 6. Definition of sustainable value creation

The previous three chapters were more of a descriptive nature, covering the current financing system of, problems in and solutions for the problems within the educational real estate sector. From this chapter the more theoretical part of this report will start as the current financing system for educational real estate factor, and the possible changes therein, will be modeled. An important question which needs to be answered in order for being able to do this is how the concept of sustainable value creation can be defined. First, ways to define the value of a primary school will be dealt with, after which the same will be done for the concept of sustainability; adapted on the building sector. Subsequently, these two will be combined in the section on sustainable value creation. Finally, this approach on sustainable value creation will be compared to other approaches towards value creation within international scientific literature.

### 6.1 Value creation

Many researchers have performed research on the concept of value creation and have come up with different elements of which the quality of schools consists of (Adriaansen, W.J.A. e.a. 2011; Bakers, J. e.a. 2010; Roemaat, W.J.J. 2011; Walraven, A.R. 2008 and Wolff, R. 2011). Although these lists of elements of qualities differ from research to research a general underlying division can be noticed in all of them: the threefold division of qualities as it was made by the Roman architect Vitruvius about 2000 years ago (Vitruvius, 1<sup>st</sup> century BC), being *utilitas*, *firmitas* and *venustas* which, translated to current day English, mean something like functional, technical and visual quality (Fig. 6-1).

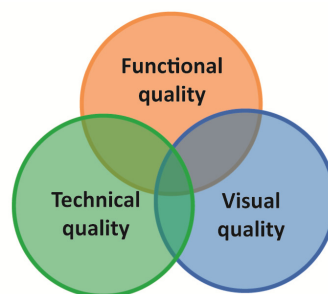


Figure 6-1: Three types of quality according to Vitruvius (Wolff, R. 2011)

As it can be seen in the figure above these three qualities cannot be distinguished totally from each other as they have some overlap. For example some qualitative elements can be called both functional and technical like the indoor climate or energy efficiency. Other elements can be called both visual and functional like spatial quality. What is noticeable is that some researchers have used this division quite explicitly to form their value elements tree, whereas others seem to use it almost implicitly. These researches do not all have the same central goal or purpose. Some are evaluative researches of the user experiences of schools already currently built; others are prospective researches of what users might like to have incorporated in the building.



As described earlier in this report, Onderzoekslab has tried to obtain more insight in the user experience of primary schools (Bakers, J. e.a. 2010) The user experience has been also investigated by a Construction Management and Engineering graduate in order for Heijmans to be able to position itself better in the primary educational real estate market (Walraven, A.R. 2008). A practical bachelor Facility Management graduate has done the same for HEVO (Adriaansen, W.J.A. e.a. 2011). Next to these user experience researches, an evaluation technique for primary schools has been designed by an Architectural Design and Management Systems (ADMS) post-master graduate (Roemaat, W.J.J. 2011) on behalf of the Platform Onderwijshuisvesting and the Service Centrum Scholenbouw. Finally, the influence of the adaptation of Public Private Partnerships in the building process of primary schools on their eventual quality has been investigated by a Delft University of Technology Real Estate & Housing graduate on behalf of the Service Centrum Scholenbouw (Wolff, R. 2011).

This broad spectrum of different researches shows that several actors, being either directly involved or not, have discovered the use of the academic world in helping to bring the optimization of the value creation within primary schools step by step closer; as does this report itself. The need for more scientific research as it was touched upon by the Rijksbouwmeester in her 2009 report (Pol, L. van der e.a. 2009) is starting to be satisfied.

## 6.2 Sustainability

### 6.2.1 Definition of sustainability

The importance of sustainable redevelopment of our buildings has been already touched upon in the second chapter of this report when the problem definition was introduced. Sustainability is one of the most cited concepts in the recent years. However, one of the most used definitions is still that of the United Nations World Commission on Environment and Development 1987 report (Brundtland 1987):

*“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”*

Since this definition is still pretty abstract three often used elaborations on the sustainability concept will be discussed: one from a life-cycle perspective, one from an energy usage perspective and one from an actor perspective.

### 6.2.2 The life cycle perspective: Cradle to Cradle

A first way to elaborate on the concept of sustainability is from a life-cycle point of view. The Cradle-to-Cradle concept looks at materials, energy and water from a life-cycle point of view (Braungart, M. and McDonough, W. 2002). In this context building a building is not just using materials and then throwing them away after the lifespan of the building, it is just temporary assembling materials and re-using them after the building is disassembled. In this philosophy, materials from one building project, which previously would be considered as being waste, can become resources for the next. The same philosophy can be applied to the energy and water usage of a building.

### 6.2.3 The energy usage perspective: the trias energetica

The concept of the trias energetica approaches sustainability from an energy usage perspective and distinguishes three levels of measures people should take in their behavior for creating a more sustainable world in descending preference being: the reduction of energy usage, the usage of sustainable energy sources and the efficient usage of finite energy sources (Fig. 6-2; Lysen, E.H. 1996).

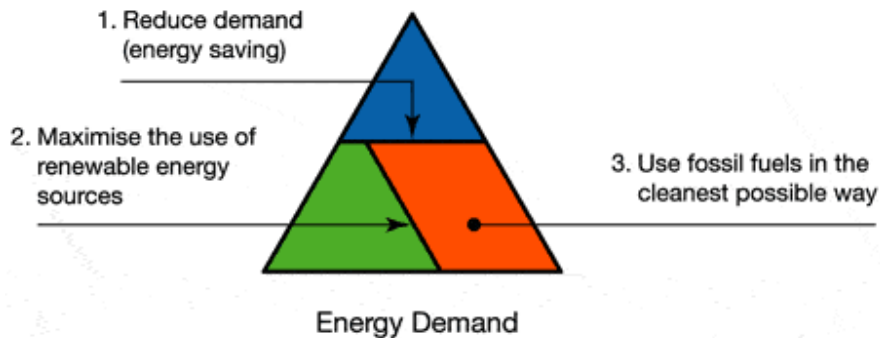


Figure 6-2: The Trias Energetica (Lysen, E.H. 1996)

### 6.2.4 The actor perspective: the triple bottom line

And finally another often used elaboration on the sustainability concept is that from a stakeholder point of view when the distinction is made between people, planet and profit (Fig. 6-3). This elaboration takes the sustainability discussion from the theoretical realm into the practical since sustainability decisions are related to dealing efficiently with energy demands in such a matter that the resources for future generations are not unevenly exploited (planet), but are part of a bigger picture since the main goal from the building project still remains to create a suitable building for the users (people), which should be financially feasible (profit). This is also the reason why this definition of sustainability is the most suitable to use for project management agencies like HEVO in their communication (Uhlenbusch, M. e.a. 2011).

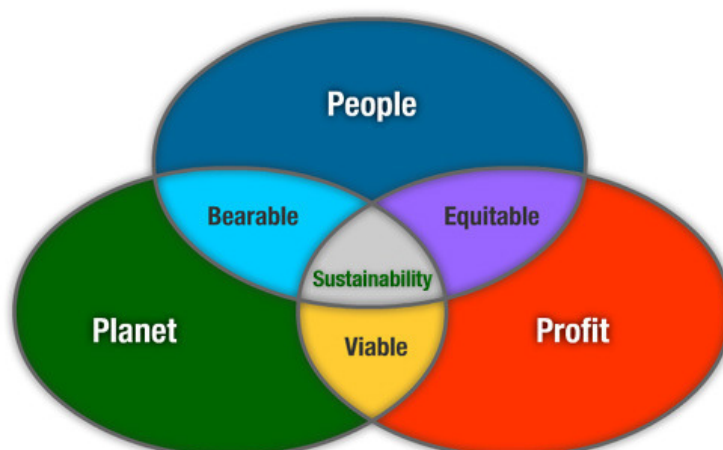


Figure 6-3: The Triple P bottom line (Langen, J. van 2012)

### 6.2.5 Application of sustainability in the building sector

The definitions of sustainability in the previous paragraph are still pretty abstract. In order to make the concept more concrete and quantifiable to be able to adapt it on the building sector in a proper way several sustainability certificates for buildings have been developed in the recent years (Langen, J. van 2012).



The Energy Performance Coefficient (EPC) is instituted in 1995 and obliged when Dutch clients apply for a building permit. It has a strong focus on energy usage and is a comparative label from A to F with A being the best.



BREEAM is originally developed in England and approaches sustainability on nine different themes being: management, health, energy, water, materials, waste, pollution, transport and ecology & land usage. It consists of scores on a scale being 'pass', 'good', 'very good', 'excellent' and 'outstanding'.



LEED is developed by the US Green Building Council and has a comparable division of themes and scores like BREEAM has.



GPR gebouw is developed by advisors of the municipality of Tilburg and focuses on five areas, being energy, environment, health, user value and future value. Per area a grade from 1 to 10 is appointed in which a 6 can be read as meeting the Building Decree, a 7 as sustainable and an 8 as very sustainable.



GreenCalc+ has been developed by the Sureac foundation and focuses on three areas being material usage, water usage and energy usage.

### 6.3 Sustainable value creation

In the previous paragraphs the concepts of value creation within primary schools and sustainability in the building sector have been introduced. The question which imposes itself is how to combine these concepts. This is where HEVO comes in. As a project management and housing advice agency for the educational and healthcare sector, with an ambition towards the creation of buildings for their clients in the most sustainable way possible, the company heavily invests in knowledge development and clustering in the realm of sustainability. In this paragraph, the vision on Sustainable Performance 2.0 as it has been launched by HEVO in the first half of 2012 is further elaborated upon (Adriaansen, W.J.A. e.a 09-01-12 and Bloois, R. van e.a. 03-04-12).

Also HEVO defines the concept of sustainability with the Brundtland definition and further elaborates on the concept from both the actor and the life cycle perspective.

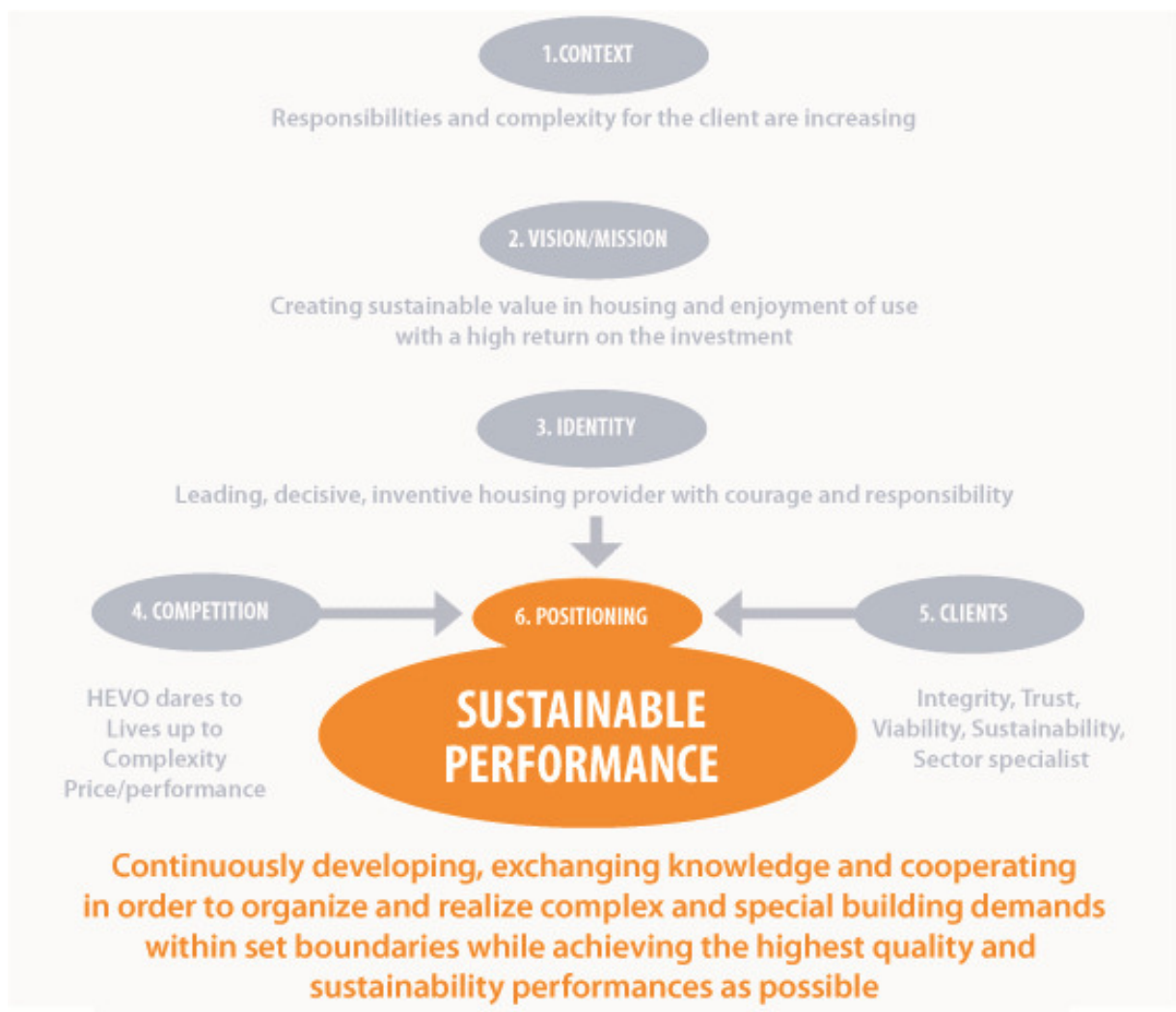


Figure 6-4: The context for sustainable performance (Adriaansen, W.J.A. e.a. 09-01-12)

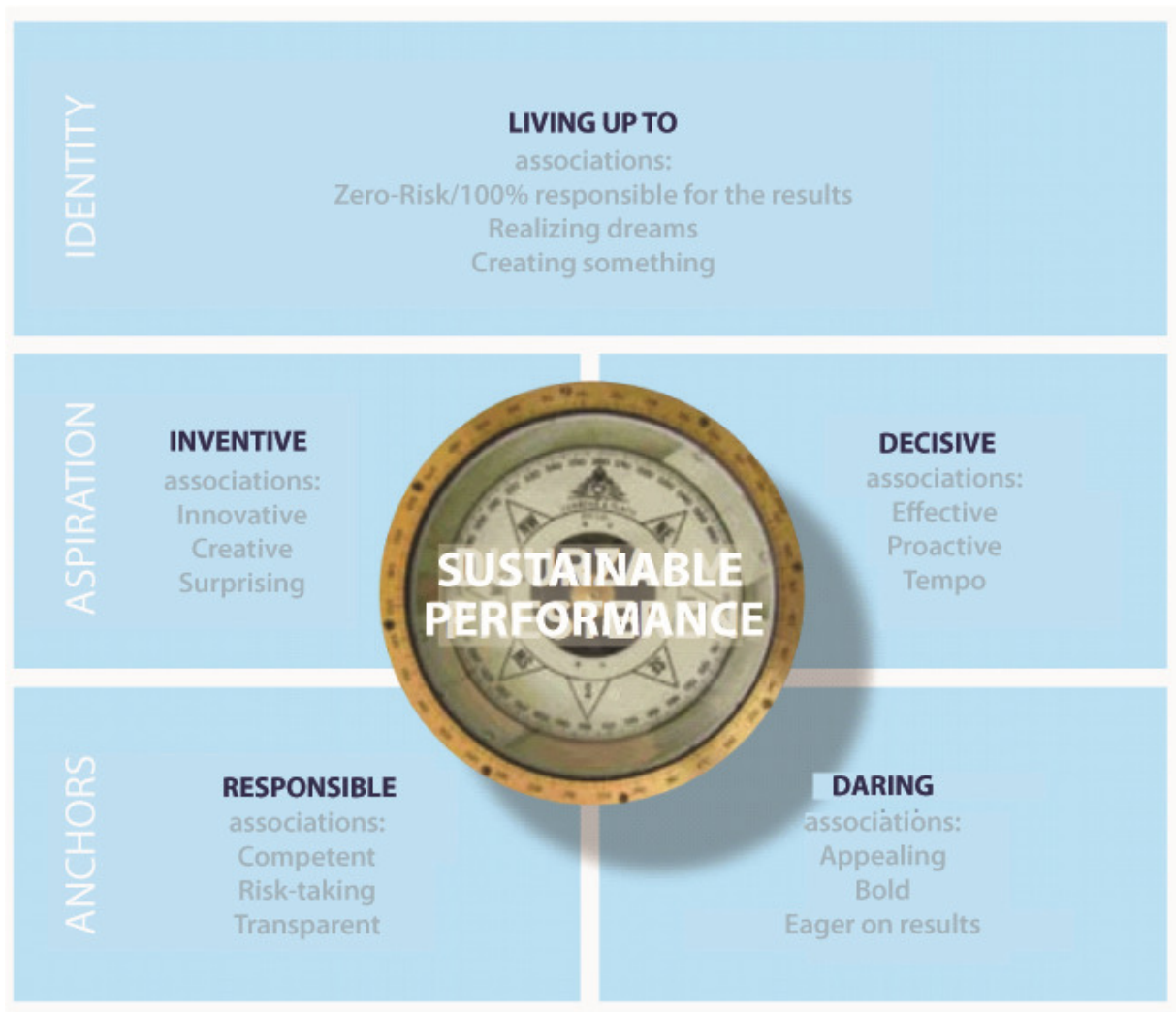


Figure 6-5: Core values of sustainable performance (Adriaansen, W.J.A. e.a. 09-01-12)

The context (Fig. 6-4) and core values (Fig. 6-5) regarding sustainable performance lead to the company's ultimate goal or so-called North Star: surprising every client and user continuously with the added value of the housing by creating an effective working and living environment for the clients and users. The way the company wishes to achieve this is by continuously and integrally directing on creating added value of the housing for users and clients, while taking life-cycle effects into account and safeguarding performance requirements. This ambition is further elaborated upon in the five elements of Sustainable Performance 2.0:

1. Continuous focus on creating added value for the client and the users
2. Determining, achieving and safeguarding performances; warranty included
3. Focus on total life cycle effects
4. Integral attitude
5. Long-term cooperation

The added value is approached from four different perspectives and therefore divided in four different values, being the user, experiential, technical and economical value. The desire of the

user and/or client is leading as to which value is pursued in what amount. The four different values and their subdivisions in a total of 38 elements create an effective communication tool between the company and the client (Fig. 6-6). The privilege of HEVO's value definition over those which were discussed in the first paragraph of this chapter is that it, next to Vitruvius threefold division of functional, technical and visual quality, also includes an economical value component; resembling the profit value driver from the actor perspective on sustainability.

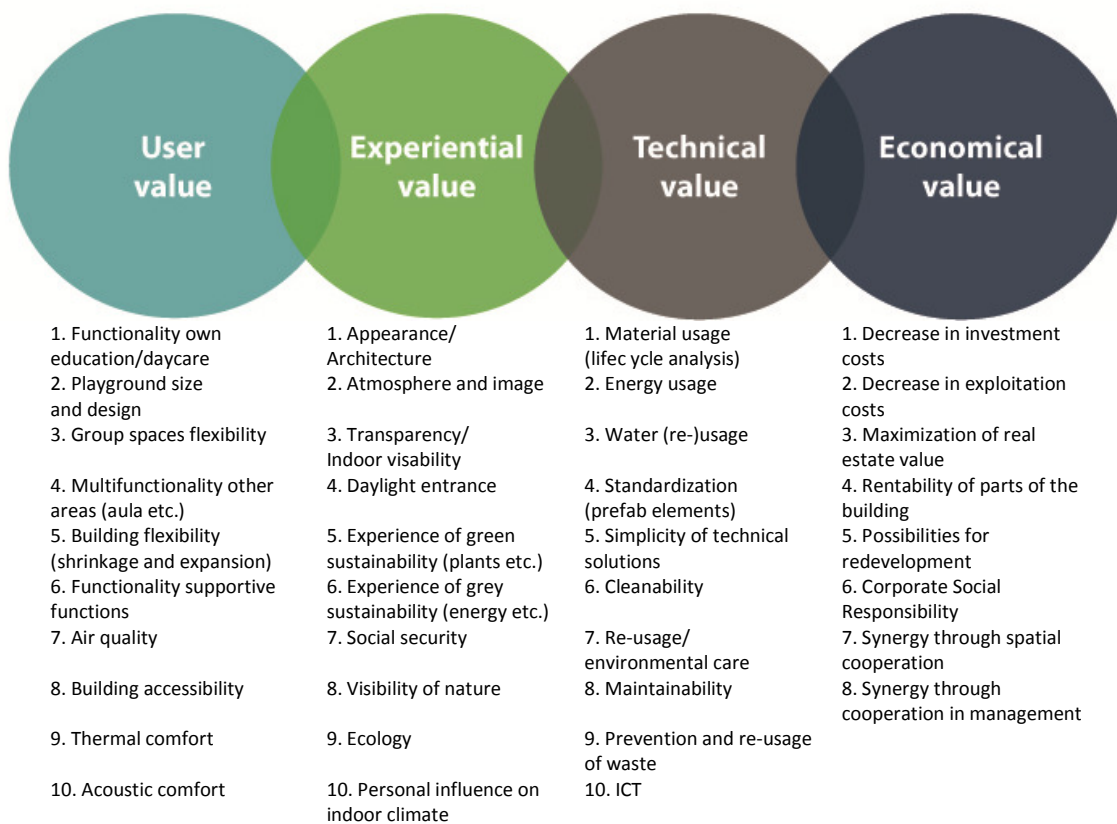
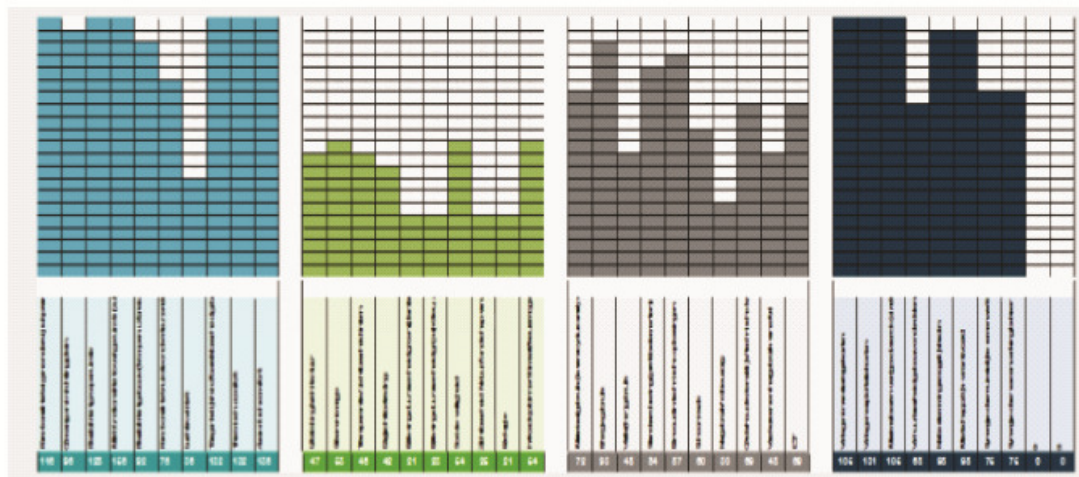


Figure 6-6: Definition of value by HEVO (Bloois, R. van e.a. 03-04-12)

This is also the reason why, for safeguarding building performances considering sustainability, HEVO prefers to use the GPR-gebouw label since this label contains a future value component; resembling HEVO's economical value. The safeguarding and warranting of building performances is important for the company as it offers a service called Integral Project Management (IPM), taking all risks during the building process out of the hands of the client and, by doing so, separating the company from its competitors in the business in a beneficial way.

Considering the company goals of continuously focusing on adding value for the client and users from a life cycle perspective and in an integral kind of way, the concept of sustainable value creation will be:

*A combination of optimization of the total initial value creation and the optimization of the total value decay over the entire life-cycle of the building*

Within this definition, the definition of value by HEVO as it is depicted on the previous page will be used.

#### **6.4 International research on value creation**

In the previous paragraphs a definition of sustainable value creation has been constructed on the base of a literature research on Dutch researches on the primary educational real estate sector. This makes sense, since the focus of this research is on enhancing the quality of Dutch primary schools. However, for putting this paper into a broader context, it can be useful to position this research within other international scientific literature on value creation within real estate in general and primary schools in particular. For doing this the internet research engines ScienceDirect and GoogleScholar have been used to investigate the search results of combinations of the following keywords: measuring, value creation, quality, life-cycle, dynamic, buildings, real estate, and primary schools.

Logically, not all search results were directly related to the measuring of the value of primary schools. Some search results were more in the realms of industrial engineering as they consisted of publications on value creation within the context of optimizing a production line. Some were related to the optimization of organizations, Information Technology systems, real estate portfolios from a macro and investor point of view, or building projects from a process point of view. Other hits were on the influence of factors like ways of management, ways of education, culture and geographical location, private investments or the indoor climate quality on the quality of the educational process and on its output in ways of academic achievements of the pupils. Subsequently, other hits tried to identify the influence of the quality of the primary education on future academic success and personal and societal benefits, as well as on the housing prices of houses that are located in the neighborhood of schools.

However, there were some researches that did touch upon the importance of educational real estate as they proposed integral ways to optimize the educational quality; including the educational housing as one of many elements (Stukalina, Y. 2010 and Ramdass, M. e.a. 2012).

Some researchers that were more clearly focused on optimizing the building quality have developed assessment models for school performance with an accent on the indoor climate quality (Hasbullah, A. e.a. 2011), combining user and technical value elements. Other researchers have chosen a sustainability point of view. Some have investigated the sustainable building within an urban context and created an assessment framework on measuring the sustainability of a building within the context of its surroundings (Conte, E. e.a. 2012). Others have developed new sustainability assessments and building rating methodologies, comparable to the several Dutch sustainability certificates that have been discussed before (Mateus, R. e.a. 2011). Some have created a real estate project success assessment framework over the life-cycle from a stakeholder and process management point of view (Niu, J. e.a. 2010). And finally, some have investigated the literature on Intelligent Buildings and while doing so, like in the Dutch primary educational sector literature, also touching upon the conflict of higher initial investments which could repay themselves over the lifetime of the building (Wong, J.K.W. e.a. 2005).

What these researches have in common is that they are all qualitative researches, developing frameworks for the measurement of building quality alike the sustainability labels we have seen earlier on in this chapter. Furthermore, the researches on value creation within the building itself tend to approach value as something which can be assessed only at the creation of a project, making these researches rather static. On the other hand, the researches that apply a life-cycle point of view focus more on the accompanying process than on the eventual building quality.

The surplus of this research is that it embodies a quantitative assessment of a case study, in the shape of the Dutch primary educational real estate sector, which is the input for a dynamic model of the perceived value of these buildings over their lifetime. This combination of a quantitative approach to the value creation in or quality of a building, modeled over the entire lifetime is something which is not seen elsewhere. The suspicion that a dynamic quantitative research approach toward the measuring of sustainable value creation could be a relatively novel one within the scientific world, like it was suggested in the first chapter of this report, seems to be supported by this quick scan of scientific literature on value creation within real estate. In this regard, a publication on the concept of this new approach towards the measuring of the value of a building – and the adaptation of this research method on the Dutch primary schools case – could be feasible and fruitful for the university. Several magazines could be suitable to be approached for a possible publication like *Building and Environment*, *Building Research & Information* and *Journal of European Real Estate Research*.

## **6.5 Conclusion**

In this chapter the concept of sustainable value creation has been discussed. First inventories of how value creation within primary schools can be defined and of how the concept of sustainability can be elaborated upon were made. After this HEVO's integral approach to sustainable performance is described and linked to information in the preceding paragraphs. Subsequently, a definition for sustainable value creation is given and this approach to the concept is compared to other approaches in international scientific literature towards value



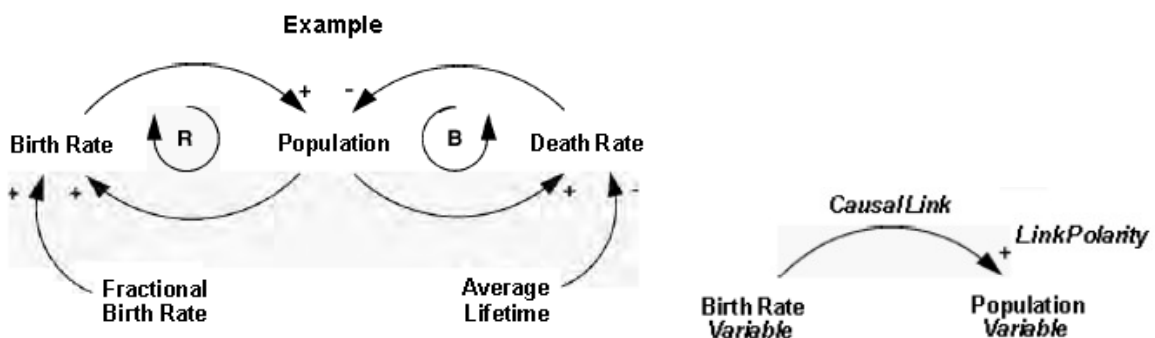
creation within buildings in general and primary schools in particular. It is the approach of HEVO towards sustainable performance which will be used to define value creation within the model which will be introduced later on in this report. But first, the modeling technique of System Dynamics needs to be introduced.

## 7. System Dynamics

Now that the context of the research problem is described and the concept of value creation has been defined in the chapters of literature research, the financing system of primary schools can be modeled by using System Dynamics. This chapter serves as an introductory one on this research method.

### 7.1 Principles

System Dynamics is a quantitative research method which is suitable for investigating and comparing different scenarios within a complex system – like the educational real estate sector is – from a top-down point of view by creating a scientific model of the complex system (Sterman, J.D. 2000). This can be done by using the VenSimPle software program. The first step in the modeling process is to include all variables and their relationships in a causal loop diagram (Fig. 7-1 and 7-2). For each relationship the impact can be resembled in a visual way by adding plusses and minuses to the arrows, which implicate the relationships. A plus means a positive relationship; if the value of one variable will rise then the value of the related variable will also rise, and vice versa. A minus means a negative relationship; if the value of one variable will rise then the value of the related variable will diminish, and vice versa. Some specific structures of relationships can be distinguished: loops. There are two types of loops; balancing and re-enforcing loops. Balancing loops occur when a number of interrelated variables create a system that enables the key variable to approach a minimum or maximum value. In the example given below the death rate has a balancing effect (this explains the “B” in the middle) on the population, which is the key variable. A re-enforcing loop on the other hand occurs when a number of interrelated variables create a system that enables the key variable to grow infinitely positive or negative. In the example below the birth rate has a re-enforcing effect (this explains the “R” in the middle) on the population.



Figures 7-1 and 7-2: Example and principle of a causal loop diagram (Sterman, J.D. 2000)

The next step is to transform the causal loop diagram in a stock and flows diagram. The structure of the causal loop diagram will largely be maintained. However, it will slightly change in appearance because of the mathematical layer that is added in this step. In the causal loop diagram the relationships between the variables are being made clear in a visual way; in the stock and flow diagram equations are added. These equations can be added by double-clicking on a variable in the VenSimPle software package. Logically, only variables that are linked to this variable can be included in its equation. Also, (relative) importance factors, deducted by the performance of a questionnaire for example, can be included in the equations. These should then first be normalized in a way that they equal a numerical value of 1 or higher for numerical reasons. Important additions in comparison with the causal loop diagram are of course the stocks and flows. When deciding whether to change a variable of the causal loop diagram into a stock or a flow the hydraulic metaphor, as shown below, can be useful (Fig. 7-3). A stock can be seen as a gathering of a substance, which can be added to by an inflow and deducted from by an outflow. Several other variables can then influence the in- and outflow, and thus its equation, but they can never influence a stock itself. This has to do with the mathematical nature of stocks and flows; since a stock is the integral of its flows.

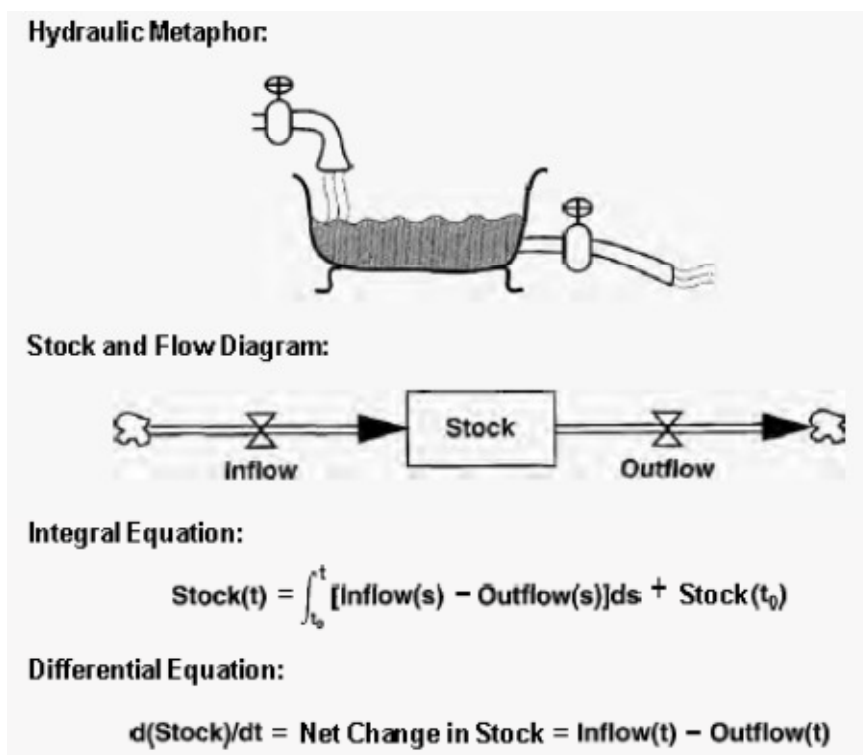


Figure 7-3: Explanation of stock and flow principle (Sterman, J.D. 2000)

This introduction to the System Dynamics research methodology might seem a bit abstract; it just serves as the context for the next chapter in which the gathered knowledge in the literature chapters on the financing and problems of primary schools, the solutions for these problems and the way to define sustainable value creation will be translated to actors, factors, relationships and stocks and flows in order to be able to suit the model.

## 7.2 Context

The research method of System Dynamics is introduced in the master of Construction Management & Engineering at Eindhoven University of Technology by means of an introductory theoretical course (Dellaert, N. e.a. 2010) which uses the reference of the previous paragraph as a theoretical backbone. The course introduces System Dynamics as a way of looking at the world in a feedback view instead of a linear view, like most people are used to. People tend to look at problems in a linear, cause and effect relationship, kind of way as they are trying to reach their goals within a certain situation by taking decisions. The surplus of System Dynamics is that it takes the unintended side effects of those decisions into account, as well as the interaction between the changing situation and the decisions (Fig. 7-4). An example of this can be seen in the horizontally moving sidewalk – or escalator – which was initially designed to move people faster across airport terminals, but which has resulted in the opposite as people subconsciously slow down their pace as a result of the distorted cognitive functions that interrelate the human body with its surroundings.



Figure 7-4: A feedback view on the world (Dellaert, N. e.a. 2010)

## 7.3 Conclusion

Since the world of the primary educational real estate can be characterized as a complex system – because of its many factors, actors and their split incentives – System Dynamics is a suitable research method for further investigation on the matter at hand in a quantitatively way. The extensive experience of the author with this research method (Cesarani, G. e.a. 2010; Dellaert, N. e.a. 2010 and Giels, R. van e.a. 2011) contributes to the choice for this method.



## 8. Modeling of the system

Now that the research methodology of System Dynamics has been introduced the system can be modeled. However, this research methodology will be adapted in a slightly different way than it is done regularly. The goal of the creation of a causal loop diagram is to identify actors, factors and relationships. Since this has already been done by the creation of a mind map in the literature research part, and because of the limited time scope of this research, the step of creating a causal loop diagram will be surpassed as a stock and flows model will be created directly.

### 8.1 Mind map

As mentioned before, the mind map has been created during the literature research part and contains (almost) all of the literature references on the educational real estate sector that are mentioned in this report. It is based upon the threefold division of literature research tracks covering the context of the educational real estate sector (Fig. 8-1). The first three secondary research questions – on the current financing systems and current problems of primary schools, and the solutions which are proposed to solve these problems – have been answered with the help of this mind map, which resulted in chapter 3, 4 and 5 of this report. Also, the different ways in which sustainability, value creation and sustainable value creation are defined in chapter 6 stem from reports which were included in this mind map.

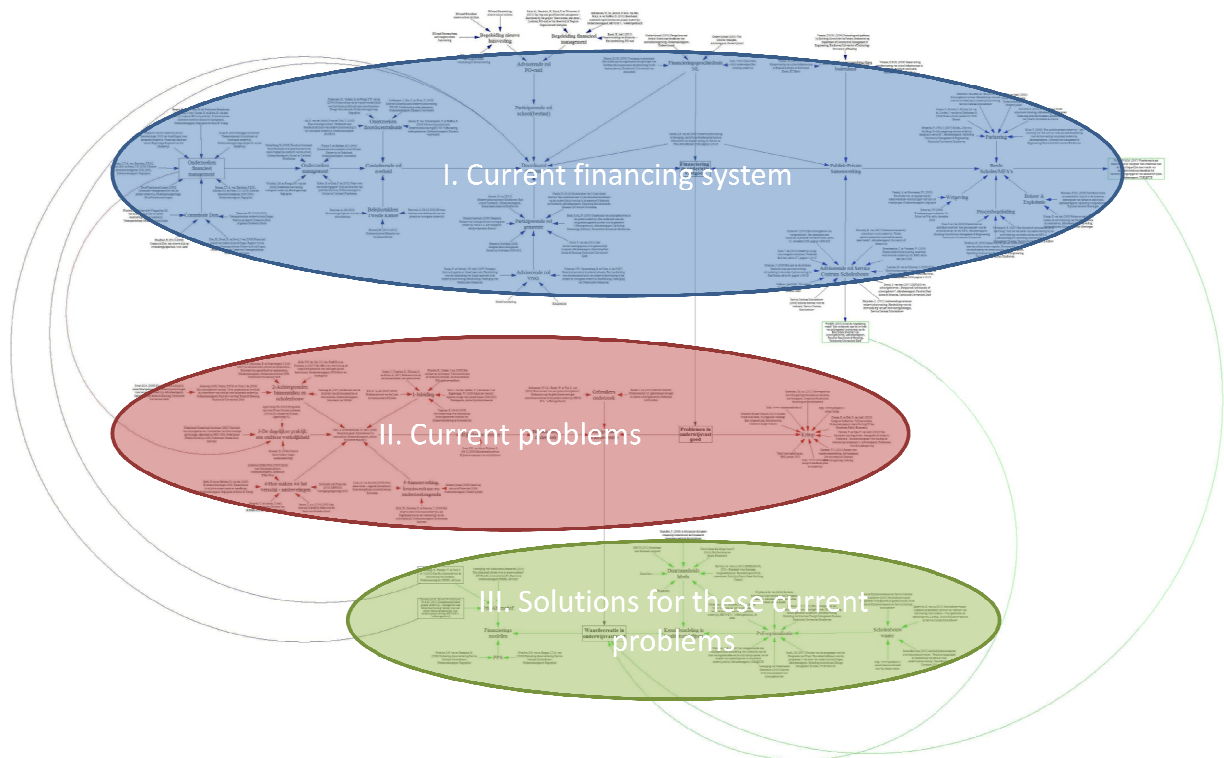


Figure 8-1: Mind map

## 8.2 Modeling of sustainable value creation

As it has been described in chapter 6 the definition of sustainable value creation will be:

*A combination of optimization of the total initial value creation and the optimization of the total value decay over the entire life-cycle of the building*

This is resembled in the model of sustainable value creation which is depicted on the next page and will now be described from right to left (Fig. 8-2). Firstly, for being able to optimize the value creation the currently perceived value creation within primary schools needs to be made insightful. This can be done by obtaining the relative preferences and performance grades for the 38 value elements as they have been defined by HEVO in the 6<sup>th</sup> chapter from target groups who deal with these schools on a day to day base. Together these data will end up in performance grades for the average Dutch primary school within the realms of user value, experiential value, technical value and economical value.

The performance grades of these experienced values will then function as a starting point for the modeling of the optimization of these four values. Because of the fact that sustainable value creation is defined as optimization of the total initial value and optimization of the total value decay over the entire life-cycle of the building, these two elements of optimization are also included in the model. Furthermore, these elements of optimization are split up by value, because of the fact that the different values have different depreciation periods; causing them to contribute to the total possible value creation in a different way. The determination of these depreciation periods is somewhat arbitrary as different elements within the values can be attributed different depreciation periods to and some value elements are even difficult to attribute any depreciation period to. Nevertheless, in cooperation with HEVO, some general assumptions on the depreciation periods are made. Given that, from an economical point of view, 83% of Dutch municipalities use a lifetime of a school of 40 years in their accountancy reports (Langen, J. van 2012) the economical value depreciation period is set at 40 years. The technical value depreciation period is set at 20 years, because of the larger maintenance issues that are included in this category and the quickly changing needs regarding the ICT-facilities which also fall within this category. The latter argument is also applicable on the educational concept resulting in, together with the higher maintenance demanding indoor climate installations, a user value depreciation period of 20 years. Finally, the experiential value depreciation period is set as 40 years since this value mainly consists of the consequences of design choices of the architect which, in principle, makes this value timeless.

So, the performance grades of the experienced values are multiplied by initial value optimization factors after which these form the input for the possible initial value stocks. The depreciation periods are multiplied by value decay minimization factors, which influence the possible value decay outflow from the stocks. The creation of these initial value optimization and value decay minimization factors are discussed on the next pages, where the modeling of the influential factors is discussed. Finally, the possible value creation stocks are multiplied by their accompanying relative importance factors, resulting in the total possible value.

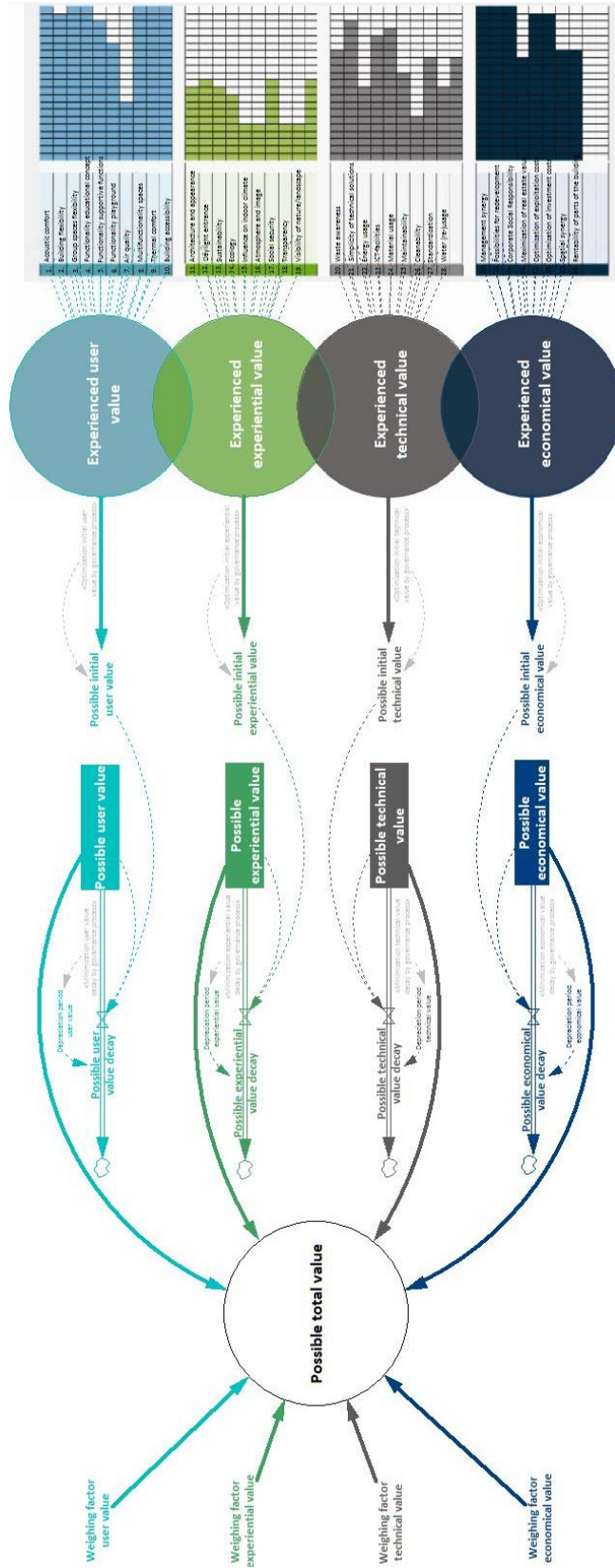


Figure 8-2: Modeling of sustainable value creation



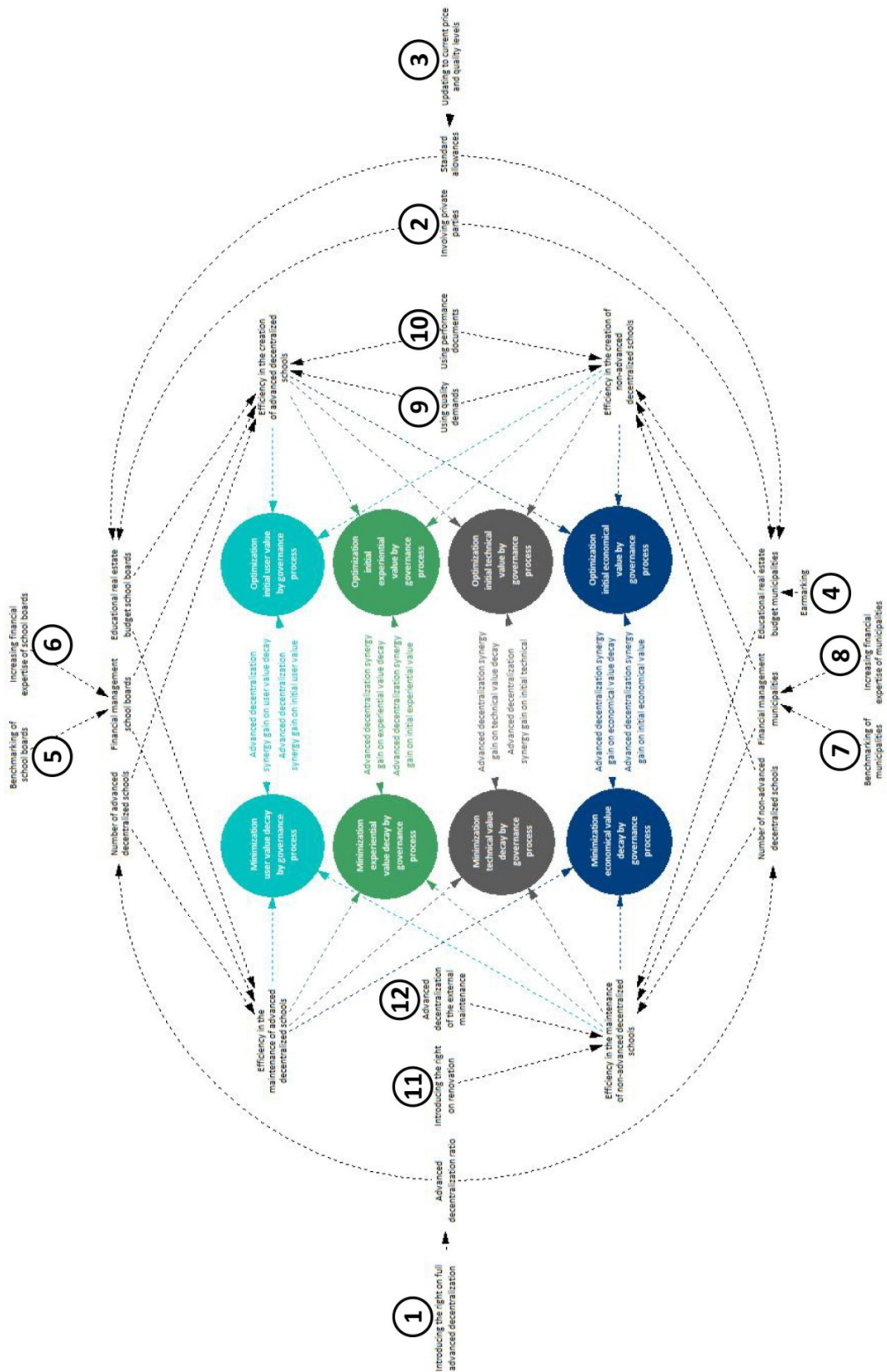


Figure 8-3: Modeling of influential factors on sustainable value creation

### 8.3 Modeling of influential factors

In chapter 4 on the problems within the primary educational real estate, already several solutions were proposed for solving these problems. Furthermore, in chapter 5 several optimization measures for the financing system have been discussed. The overview of optimization measures from the previously discussed Oberon e.a. report (Gramberg, P. e.a. 2010) is used as backbone for mapping the improvement measures proposed in the literature; since the focus of this report is on the optimization of the current financing system. These measures have been supplemented with measures from other literature sources previously discussed in this report (Leun, A. van der (red.) e.a. 2009; Pol, L. van der e.a. 2009; Bakers, J. e.a. 2010; Barendregt, E. e.a. 2010; Uhlenbusch, M. e.a. 2011; Appel, P. e.a. 07-03-12; Migchielsen, H. 07-03-12; Midden, G.J. van 07-03-12 and Bloois, R. van e.a. 03-04-12). After this gathering of measures, a selection has been made to only include the measures that have a binary character: they are either implemented or not. Too vague of improvement measures like optimization of trust between cooperation partners have been eliminated, since these factors are hard to grasp within the context of a quantitative model. Also improvement factors that had too little to do with the financing system have been eliminated. This ended up in the overview of improvement measures from the literature research as depicted in the table below (Tab. 8-1). This overview has then been verified in cooperation with HEVO, finally ending up in a total of twelve improvement measures that will be further investigated by modeling them.

Scenario	Improvement measures from literature research	Improvement measures after verification
<b>1</b> Introducing the right on full advanced decentralization	Introducing the right on full advanced decentralization	<b>1</b> Introducing the right on full advanced decentralization
	Enhancing the financial management of school boards	
<b>2</b> Increasing the budgets	Involving private parties	<b>2</b> Involving private parties
	Updating the standard allowances to current price and quality levels	<b>3</b> Updating the standard allowances to current price and quality levels
	Earmarking of the municipal educational real estate budgets	<b>4</b> Earmarking of the municipal educational real estate budgets
<b>3</b> Enhancing the financial management	Benchmarking of school boards	<b>5</b> Benchmarking of school boards
	Increasing financial expertise of school boards	<b>6</b> Increasing financial expertise of school boards
	Publishing rankings of well and bad managing school boards	
	Stimulate the usage of multi-annual financial plans by school boards	
	Benchmarking of municipalities	<b>7</b> Benchmarking of municipalities
	Increasing financial expertise of municipalities	<b>8</b> Increasing financial expertise of municipalities
	Publishing rankings of well and bad managing municipalities	
	Stimulating the usage of multi-annual financial plans by municipalities	
	Strengthening the juridical status of municipal financial multi-annual plans	
	Introducing a complaints desk on municipal educational real estate policy	
<b>4</b> Changing the program of requirements	Using quality demands	<b>9</b> Using quality demands
	Using performance documents	<b>10</b> Using performance documents
<b>5</b> Optimizing the maintenance policy	Introducing the right on renovation	<b>11</b> Introducing the right on renovation
	Advanced decentralization of the external maintenance	<b>12</b> Advanced decentralization of the external maintenance

Table 8-1: Selected improvement measures after verification

Like shown in the model overview on the previous pages (Fig. 8-3), these twelve improvement measures influence five important leverage points within this model, being the advanced decentralization ratio; the financial management of both schools and municipalities; the educational real estate budgets of both schools and municipalities; the efficiency in the creation of schools and the efficiency in the maintenance of schools. These twelve measures are therefore grouped in five scenarios, which will be discussed further on in the report:

1. Introducing the right on full advanced decentralization
2. Increasing the budgets
3. Enhancing the financial management
4. Changing the program of requirements
5. Optimizing the maintenance policy

The verification of the improvement measures has been done by using the practical experience of the HEVO members of the graduation committee as to estimating which measures are indeed influential, quantitatively measurable, feasible for execution, possibly successful and feasible for gaining enough support from municipalities and/or school boards.

After the determination of the influential factors they have been included in the model on these factors, which is in its turn linked to the sustainable value creation model. The eight circles represent the initial value optimization and value decay minimization factors on the four values, which have already been discussed in the previous part. All the proposed improvement measures are ultimately linked to these eight circles and function as possible multiplication factors. Further definitions on the improvement measures are included in the questionnaire to the school boards which is included as an appendix to this report.

The model includes the two financing scenarios that have been described in chapter 3 being the regular financial scenario including a leading municipality and the scenario of advanced decentralization, implicating that the school boards are leading. Currently, only 7% of all schools and 8% of all municipalities state that they make use of the instrument of advanced decentralization; in which in somewhat more than half of these cases this is restricted to the advanced decentralization of external maintenance and only 1 in 5 of these cases concerns a case of full advanced decentralization (Berndsen, F.E.M. e.a. 2012). The advanced decentralization ratio that depicts the division between both scenarios will therefore be 0.075. The two financing scenarios are further included in the model by including the financial management and educational real estate budgets of school boards in the top of the model and those of the municipalities at the bottom of the model. In both scenarios the actors receive budgets by means of the national government's standard allowances, which is depicted at the right of the model. The expected synergy gain factors of advanced decentralization, as a result of combining all responsibilities and accompanying budgets concerning the primary educational real estate at the school boards, are included in the middle of the model. Finally, the advanced decentralization ratio, financial management and educational budgets in both scenarios end up in four factors being the efficiency in the creation of advanced decentralized schools, the efficiency in the creation of non-advanced decentralized schools, the efficiency in the maintenance of advanced decentralized schools and the efficiency in the maintenance of non-

advanced decentralized schools. These four factors, together with the advanced decentralized synergy gain factors finally influence the initial value optimization and the value decay minimization within the sustainable value creation model.

All factors included in this model are multiplied or divided depending on their relationship, and – apart from the advanced decentralization ratio – are appointed a value of 1 in the current standard situation; having a neutral effect on the sustainable value creation model. The exact equations underlying both the sustainable value creation model and the influential factors model are included in the appendixes. At several locations of the model the proposed improvement measures serve as multiplication factors. It is by manipulating the values of these multiplication factors that the influence of the several proposed improvement measures of the current financing system on the sustainable value creation of primary schools can be modeled.

#### **8.4 Conclusion**

In this chapter the System Dynamics model has been introduced. First, a short general recap of the literature research is given as the mind-map is discussed. After this the stock and flows model is introduced by the explanation of how sustainable value creation will be modeled. After this the influential factors on sustainable value creation are determined from the literature research after which they are verified. The remaining factors are included in the model and grouped into scenarios. Now that the influential factors on sustainable value creation have been determined it is time to gather the data still needed. But how can this be done?



## 9. The Analytical Hierarchy Process

Now that the influential factors on the value creation in primary schools, and the elements it consists of, are identified and included in a model, they need to be quantified. The method of the Analytical Hierarchy Process, which will be used for quantitatively defining the relative importance of the value elements and the relative importance of the different proposed improvement measures for the financial system, is introduced in this chapter. Next to that it is compared to other quantitative research methods like the Likert-scale, the Analytical Network Process and the method of Conjoint Analysis.

### 9.1 Pair wise comparisons

Now that HEVO's concept and definition of sustainable value creation has been introduced and included in the model of the complex system, the next step is to quantify the relative importance of the elements it consists of. This can be done by using the Analytical Hierarchy Process (AHP) (Teknomo, K. 2006). AHP is a multi-criteria decision making method that can be used to create questionnaires in which the respondents are forced to make a relative choice between two alternatives, or when applied to a research topic which includes many variables, two variables (Faber, C. e.a. 2011).

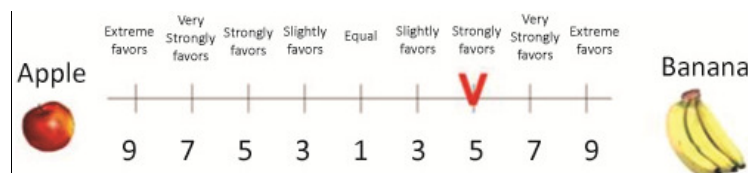


Figure 9-1: Example of a pair-wise comparison (Teknomo, K. 2006)

In the example above a respondent strongly favors a banana over an apple, stating his relative preference on a normative scale which consists of nine different adjacent answers (Fig. 9-1). The numbers below the answers are a mathematical representation of the answers above them which are needed for the mathematical operations later on in the AHP procedure. The example above is suitable for a choice experiment between two alternatives and so one question is sufficient. However if an extra alternative is introduced, in the shape of a cherry, three decisions on relative preference are needed (Fig. 9-2).

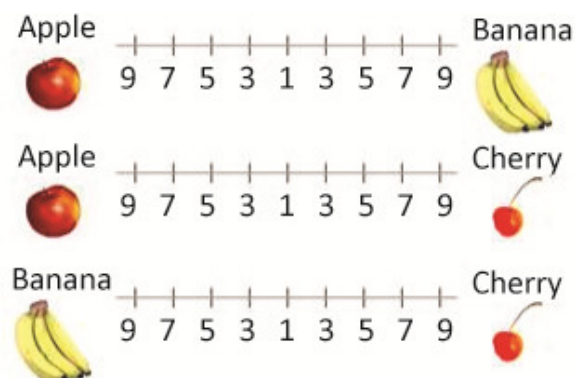


Figure 9-2: Pair wise comparison amongst three alternatives (Teknomo, K. 2006)

In general one can relate the needed number of questions for the questionnaire to the number of variables in the way that is shown in the table below (Tab. 9-1).

Number of variables	1	2	3	4	5	6	7	$n$
Number of pair wise comparisons	0	1	3	6	10	15	21	$\frac{n \times (n-1)}{2}$

Table 9-1: Number of comparison related to the number of variables (Teknomo, K. 2006)

## 9.2 Finding the relative weights

A respondent on the three alternatives experiment might answer in the way below (Fig. 9-3). The question which imposes itself is then which alternative he prefers the most. A way to find this answer is to create a reciprocal matrix.

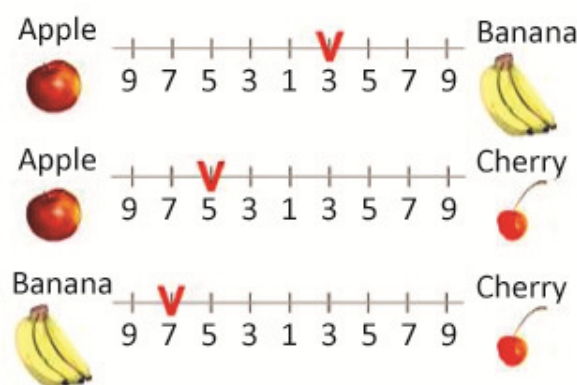


Figure 9-3: Example of a three alternatives pair wise comparison experiment (Teknomo, K. 2006)

The reciprocal matrix for this experiment with three alternatives will logically be a three by three matrix in which all three alternatives will be related to each other. The mathematical representations of the choices will serve as input for the matrix. However, since the mathematical representations range from 9 to 1, to 9 again, they need to be put in the same spectrum. A way to do this is to decide that for all mathematical representations on the left side of the 1 the actual value will be used, whereas for all mathematical representations on the right side of the 1 the reciprocal value is used (Fig. 9-4).



Figure 9-4: Translation of the mathematical representations (Teknomo, K. 2006)

When an alternative is related to itself the relative preference will logically be 1; which creates a diagonal symmetry axis of values of 1 within the matrix. The translated answers from the questionnaires will be entered in the top right corner of the matrix. Since every alternative is mentioned twice in the matrix, also every relationship is included twice. Thus, the values which have been entered in the top right corner are reciprocated and mirrored in the earlier mentioned diagonal symmetry axis. These procedures end up in the following reciprocal matrix (Fig. 9-5).

		Apple	Banana	Cherry	
Apple	[	1	1/3	5	]
Banana		3	1	7	
Cherry		1/5	1/7	1	
Sum		21/5	31/21	13	

Figure 9-5: Reciprocal matrix (Teknomo, K. 2006)

The next step in the finding of the relative weights is to square the matrix. To find the value of the top left corner (Fig. 9-6: square AA) of the squared matrix one should sum the products of the first row and the first column. For the square next to that (Fig. 9-6: square AB) one should sum the products of the first row (Fig. 9-6: green) and the second column (Fig. 9-6: red). An example of the latter is given below (Eq. 1).

		Apple	Banana	Cherry	
Apple	[	AA	AB	AC	]
Banana		BA	BB	BC	
Cherry		CA	CB	CC	

Figure 9-6: Theoretical matrix (compare: Faber, C. e.a. 2011)

$$AB_{Sm} = AB_{Rm} \times AA_{Rm} + BB_{Rm} \times AB_{Rm} + CB_{Rm} \times AC_{Rm} = \frac{1}{3} \times 1 + 1 \times \frac{1}{3} + \frac{1}{7} \times 5 = \frac{29}{21}$$

Equation 1: Squaring the reciprocal matrix (Sm stands for squared matrix; Rm stands for reciprocal matrix)

Performing this action for every square will result in the following squared matrix (Fig. 9-7). The rows of the squared matrix can be summed up as these form the Eigenvectors. When these are normalized the Normalized Eigenvectors – or relative weights – can be obtained. These relative weights are considered as being trustworthy enough if they, after an iterative process of squaring of matrixes, differ less than 0,0001 with the previous set of relative weights (Walraven, A.R. 2008). In this example it takes four times of squaring to reach to this point.

		Apple	Banana	Cherry		Eigenvector	Normalized Eigenvector
Apple	[	3	1 8/21	12 1/3	]	16 5/7	0,27721
Banana		7 2/5	3	29		39 2/5	0,65345
Cherry		29/35	37/105	3		4 19/105	0,06934
Sum					60 31/105	1,00000	

Figure 9-7: Squared matrix, Eigenvectors and normalized Eigenvectors; first iteration

		Apple	Banana	Cherry		Eigenvector	Normalized Eigenvector	Difference
Apple	[	29 46/105	12 199/315	114 1/21	]	156 37/315	0,27902	-0,00181
Banana		68 3/7	29 46/105	265 4/15		363 2/15	0,64900	0,00445
Cherry		7 304/525	3 38/147	29 46/105		40 43/156	0,07198	-0,00264
Sum					559 448/851	1,00000		

Figure 9-8: Squared matrix, Eigenvectors and normalized Eigenvectors; second iteration

		Apple	Banana	Cherry		Eigenvector	Normalized Eigenvector	Difference
Apple	[	2595 9/26	1115 1/3	10065 335/712	]	13776 84/559	0,27895	0,00006
Banana		6039 201/712	2595 9/26	23422 4/621		32056 193/304	0,64912	-0,00012
Cherry		669 1/5	287 317/542	2595 9/26		3552 69/526	0,07193	0,00005
Sum					49384 865/944	1,00000		

Figure 9-9: Squared matrix, Eigenvectors and normalized Eigenvectors; third iteration



	Apple	Banana	Cherry	Eigenvector	Normalized Eigenvector	Difference
Apple	20207450 309/334	8684030 289/402	78370111 295/742	107261593 1/24	0,27895	0,00000
Banana	47022066 161/192	20207450 309/334	182364645 13/134	249594162 414/481	0,64912	0,00000
Cherry	5210418 289/670	2239146 23/576	20207450 309/334	27657015 377/951	0,07193	0,00000
Sum				384512771 193/646	1,00000	

Figure 9-10: Squared matrix, Eigenvectors and normalized Eigenvectors; fourth iteration

In this example, finally after the iteration process (Fig 9-7, 9-8, 9-9 and 9-10), the relative weights of the alternatives for the respondent are: 27,90% for Apple, 64,91% for Banana and 7,19% for Cherry. Also, it can be deduced from these relative weights that the respondent likes a banana  $\frac{64,91}{27,90} = 2,33$  times more than an apple for example.

### 9.3 Consistency check

An important aspect when applying the AHP-method is the checking of the consistency of the answers, which can be done by calculating the Consistency Ratio (CR). The reason why this should be done is that the respondent might not have a very clear view on his preferences which could result in untrustworthy data. The first step in calculating the CR is determining the Principal Eigen Value ( $\lambda_{max}$ ) which can be calculated by adding up the products of the sum of the columns of the reciprocal matrix with their corresponding relative weights as they have been calculated with the help of the squared matrix (Eq. 2).

$$\lambda_{max} = \frac{21}{5}(0,28) + \frac{31}{21}(0,65) + 13(0,07) = 3,05$$

Equation 2: Principal Eigen Value

When the Principal Eigen Value has been obtained, the Consistency Index (CI) can be calculated (Eq. 3):

$$CI = \frac{\lambda_{max} - n}{n - 1} = \frac{3,05 - 3}{3 - 1} = 0,025$$

Equation 3: Consistency Index (n stands for the number of used alternatives)

The goal is now to compare this CI with the Random Consistency Index (RI). Professor Thomas, L. Saaty, who introduced the AHP research method in 1980, has defined these RI by investigating numerous AHP experiments. He decided that in order for a dataset of answers on an AHP-experiment to be consistent that the Consistency Ratio (CR) should be 10% or less (Teknomo, K. 2006).

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

Table 9-2: Random Consistency Index (RI) related to the number of used alternatives (n) (Teknomo, K. 2006)

The CR can be calculated by dividing the CI by the RI. The CI has been calculated before and as the experiment consisted of a comparison of three alternatives the RI which can be applied is 0,58 according to the table above (Tab. 9-2).

$$CR = \frac{CI}{RI} = \frac{0,025}{0,58} = 4,3\%$$

Equation 4: Consistency Ratio

The CR is less than 10%, so it can be concluded that the respondent is consistent in his preferences considering the three types of fruit (Eq. 4).

### 9.4 Different levels of criteria

In the previous paragraphs the concepts of the pair wise comparisons, the relative weights and the consistency check are introduced. In this paragraph these concepts are put into the context of an example on the choice of a gadget which contains different levels of criteria (Goepel, K.D. 2010). In this example four groups of criteria are pair wise compared: the main criteria of color, memory and delivery; the sub-criteria on color; the sub-criteria on memory and, finally, the sub-criteria on delivery (Fig. 9-11). The results of these comparisons are in the grey boxes. The final relative weights – in the white boxes – of all sub-criteria are calculated by multiplying the relative weight of the main criteria with that of the sub-criteria itself. The benefit of the alternative models of gadgets can then be calculated by adding up the relative weights of the properties it contains; in this example, model 1 is the most beneficial gadget to choose (Tab. 9-3).

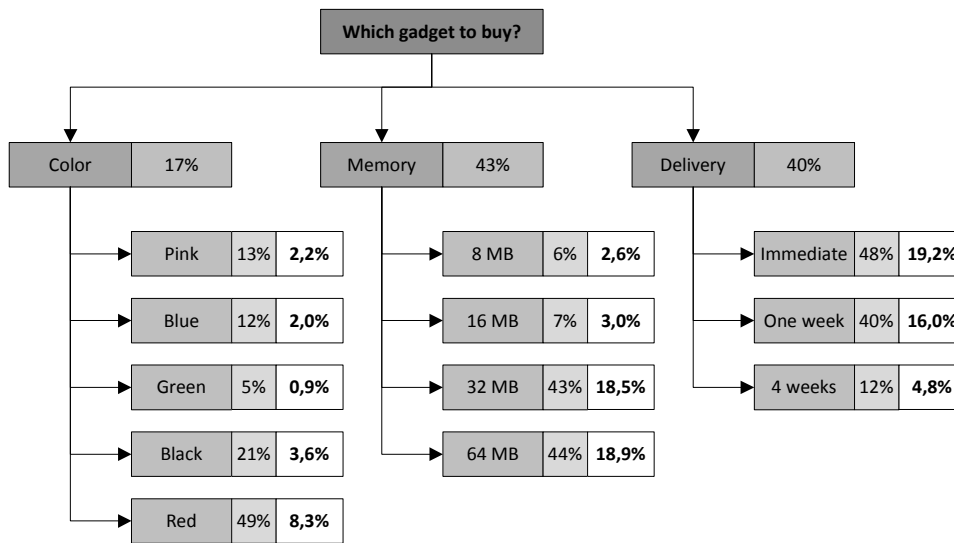


Figure 9-11: Example of AHP applied on the choice of a gadget (Goepel, K.D. 2010)

Alternatives	Benefit
<b>Model 1</b> Pink, 32 MB, immediate	2,2% + 18,5% + 19,2% = 39,9%
<b>Model 2</b> Blue, 16 MB, immediate	2,0% + 3,0% + 19,2% = 24,2%
<b>Model 3</b> Black, 32 MB, 1 week	3,6% + 18,5% + 16,0% = 38,1%
<b>Model 4</b> Red, 64 MB, 4 weeks	8,3% + 18,9% + 4,8% = 32,0%

Table 9-3: Example of AHP applied on the choice of a gadget (Goepel, K.D. 2010)

## 9.5 Comparison with other research methods

Of course AHP is not the only quantitative research method which could be used that is eligible to apply in order to obtain the quantitative values of the influential factors within the System Dynamics model of the financial system. In this paragraph the Analytical Hierarchy Process will be compared to three other methods: the Likert-scale, the Analytical Network Process (ANP) and the Conjoint Analysis (CA).

### 9.5.1 The Analytical Hierarchy Process versus the Likert-scale

In a previous research on the value creation within primary schools the Likert-scale has been used (Walraven, A.R. 2008). Application of this method, in which the respondent is asked to rank every element separately on a 1 to 5 scale in which 1 means very unimportant and 5 very important, results in less questions than AHP. The relative importance of these factors is then obtained with the help of the SPSS software package. Nevertheless the reduction of the amount of questions, and therefore a most likely increase in the number of responses, the author questions the use of the application of the theory since the results ended up in all elements being almost equally important. The pair wise comparisons of the AHP process will force the respondents to make a relative choice and thus create a more differentiated ranking of elements. The disadvantage of the high number of questions by using the AHP-method can be eliminated by regrouping of the value elements from groups of 8-10 to groups of a maximum of 5 elements. This will not only increase the response rate but most likely also increase the consistency of the answers of the respondents as the cognitive abilities of most people are limited to comparing 7 mental elements at the same time (Walraven, A.R. 2008).

### 9.5.2 The Analytical Hierarchy Process versus the Analytical Network Process

The Analytical Hierarchy Process has been further developed into the Analytical Network Process by its creator professor Saaty. When comparing the two methods (Goepel, K.D. 2011) the main difference that is noticeable is that in ANP the matter in which the criteria, which are grouped in clusters, are present in the alternatives can re-influence the weighing factors of these criteria as these are linked in a two-way manner. Also in ANP the criteria within the clusters can influence each other; which explains the network aspect of the title of the method. AHP in contrary is, as the title of the method suggests and as we have seen in the examples on the previous pages, more hierarchical. Relative weights of criteria and sub-criteria are determined independently from each other, as they are not considered to influence each other, and then the alternatives are judged. Since it is recommended to use AHP over ANP whenever possible because of its intuitive simplicity this advice will also be followed in this research. ANP is promoted as a tool to gain deeper insight in a complex problem decision problem, whereas AHP is promoted as a tool to get consolidated results in ranking of criteria from a group of people (Goepel, K.D. 2011). The added value of the network aspect of ANP is neutralized as the network of the financial system including its factors, actors and relationships have already been mapped and described with the use of the System Dynamics methodology. The task at hand is to obtain the relative weighing factors on the elements, of which value creation consists of according to HEVO, out of the market. According to Goepel's definitions; AHP is the right method to choose for this task.

### 9.5.3 The Analytical Hierarchy Process versus the Conjoint Analysis

The main difference with the Conjoint Analysis (CA) research method when comparing it to AHP (Goepel, K.D. 2010) is that instead of comparing isolated variables to each other it is based on comparisons of different alternatives as a whole, which contain several variables that are attributed different values in every comparison. The respondent can either be asked to choose between these different alternatives (Kemperman, A.D.A.M. 2000), rank them (Goepel, K.D. 2010) or perform another action like filling in a Game Theory matrix (Kooij, J. 2009). Like with the Likert-scale, the relative importance of each variable can then be deducted from the gathered data by use of the SPSS software package. CA might seem an ideal way to compare different alternative different schools, containing different values regarding their value elements. However, since HEVO's definition of value consists of 38 value elements in total this would lead to an enormous amount of questions for the respondents to answer. Nevertheless the possibility of reducing this amount of needed comparisons by applying a fractional factorial design (Faber, C. e.a. 2011), and asking only the most essential comparisons and deducting other results from those essential results, AHP still remains the method with the lowest amount of needed comparisons. As an example, comparing the 38 value elements, using a three-level scale of attribution and a full factorial design would result in  $3^{38} = 1.350.817.117.672.992.089$  alternatives that would need to be ranked, whereas AHP would result in  $\frac{38 \times (38-1)}{2} = 703$  comparisons. Even if the value criteria were to be compared one group at a time, a full fractional CA application would still result in  $3^{10} = 59.049$  alternatives as opposed to the somewhat lesser amount of  $\frac{10 \times (10-1)}{2} = 45$  AHP-comparisons. Even with the use of a fractional factorial design application of CA would still result in a larger amount of comparisons than the application of AHP would (Hahn, G.J. e.a. 1966). Since, CA has no outstanding advantage, the Analytical Hierarchy Process is chosen over the Conjoint Analysis.

## 9.6 Conclusion

In this chapter the research methodology called the Analytical Hierarchy Process is introduced. The concepts of pair wise comparisons, relative weights, consistency and different levels of criteria are elaborated upon. Furthermore the choice for AHP is supported and justified by comparing the method to the Likert-scale, ANP and CA. Now that the research methodology for the questionnaire is decided upon, the questionnaire itself can be constructed.



## 10. Questionnaire

Now that we have learned about the possibilities of creating questionnaires with the use of the Analytical Hierarchy Process this chapter will discuss the adaptation of this research method on this research subject as the creation process of the questionnaire is described. Two questionnaires – covering all questions asked – are attached to this report as appendixes.

### 10.1 General approach

In chapter 8 the model has been introduced and the data already present has been discussed. The data that is still needed consists of three groups being the relative importance factors of the variables of which sustainable value creation consists of according to HEVO, the average current evaluation of these variables, and the values of the influential factors on the value creation as a result of the financial system. Since this might end up in pretty extensive questionnaires the main challenge is to limit the questionnaire as much as possible without having it compromising the trustworthiness of the data that it can gather. Next to the limitation of the length of the questionnaire (Walraven, A.R. 2008), the response of the respondents can be heightened by preferring a digital questionnaire over a paper one, sending a reminder email and offering the respondents the results of the research (Faber, C. e.a. 2011). Also actions like sending an announcement mail, calling respondents during the response term, using as simple questions as possible and only using the TU/e logo without the company logo - increasing the image of objectivity – might increase the response rate (Walraven, A.R. 2008). To ensure the trustworthiness of the data which will be gathered, it is important to give a clear explanation of the context (Faber, C. e.a. 2011) and of the methodology (Goepel, K.D. 2011). Next to this it can be enhanced by the use of closed questions to eliminate interpretation issues and by pre-testing the questionnaire (Kloet, T. 2008). Finally, a part on the confidentiality and anonymity of the participation and a word of thanks should be included in the questionnaire.

### 10.2 Finding the relative importance factors

The main data needed is the relative importance factors which are attributed to the different elements of which sustainable value creation consists of according to HEVO. In the previous chapter AHP has been introduced as a right method for finding relative importance factors, since this is the method that can be used which needs the smallest amounts of questions. However, to be able to apply this method on these variables, they need to be regrouped. When using AHP it is recommended to limit the groups of variables to 4-5 each (Goepel, K.D. 2011). Also, taking into account the fact that the amount of needed comparisons rises pretty steeply whenever the number of variables to be compared rises the way sustainable value creation has been defined and ordered needs to be regrouped from clusters of 8-10 to clusters of max 5 variables in order to keep the questionnaire as short as possible. The way in which the variables have been regrouped is displayed in a graphical way on the next pages in which the numbers of needed comparisons per cluster of variables are included (Fig. 10-1 and 10-2).

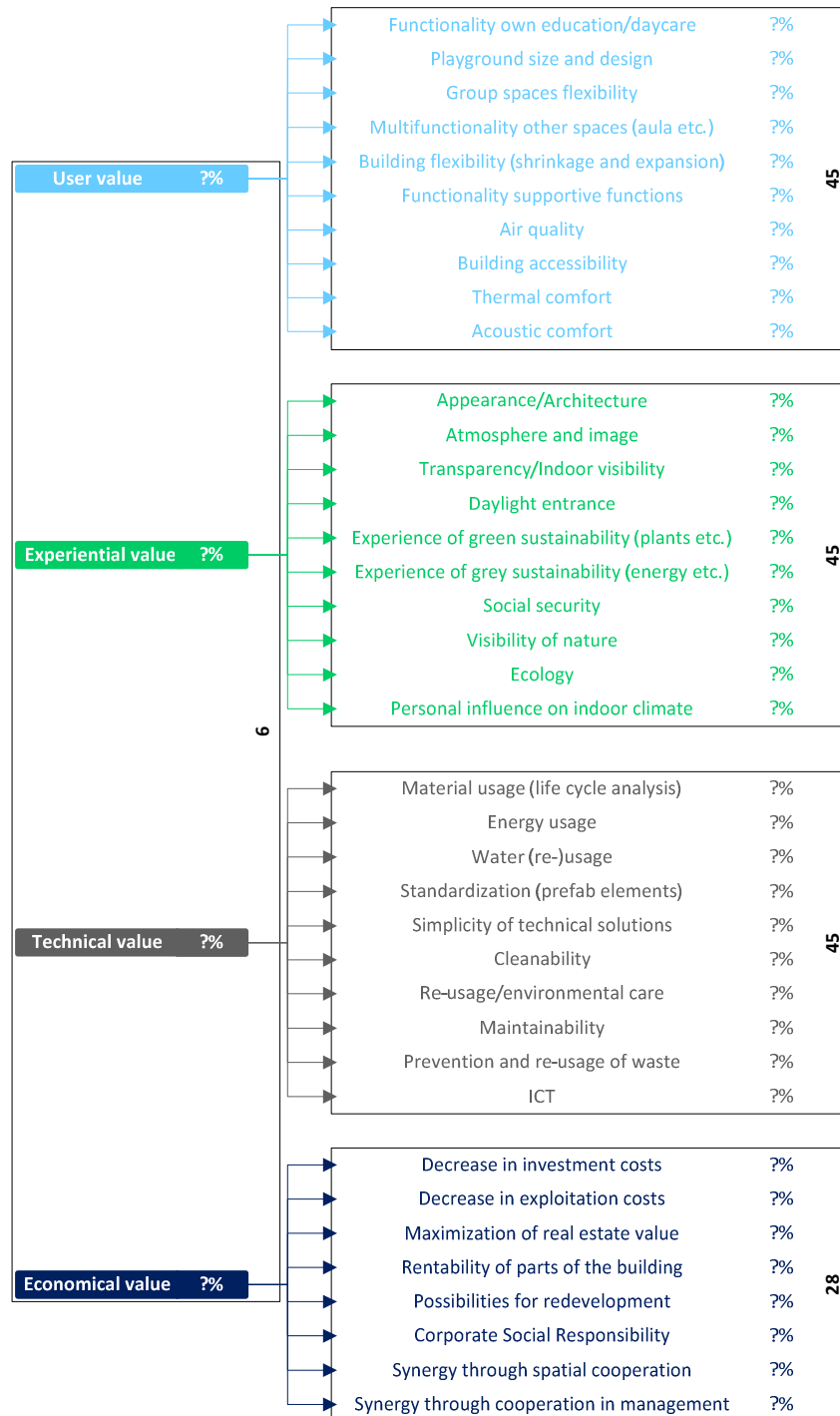


Figure 10-1: Amount of comparisons needed when using HEVO's grouping of variables

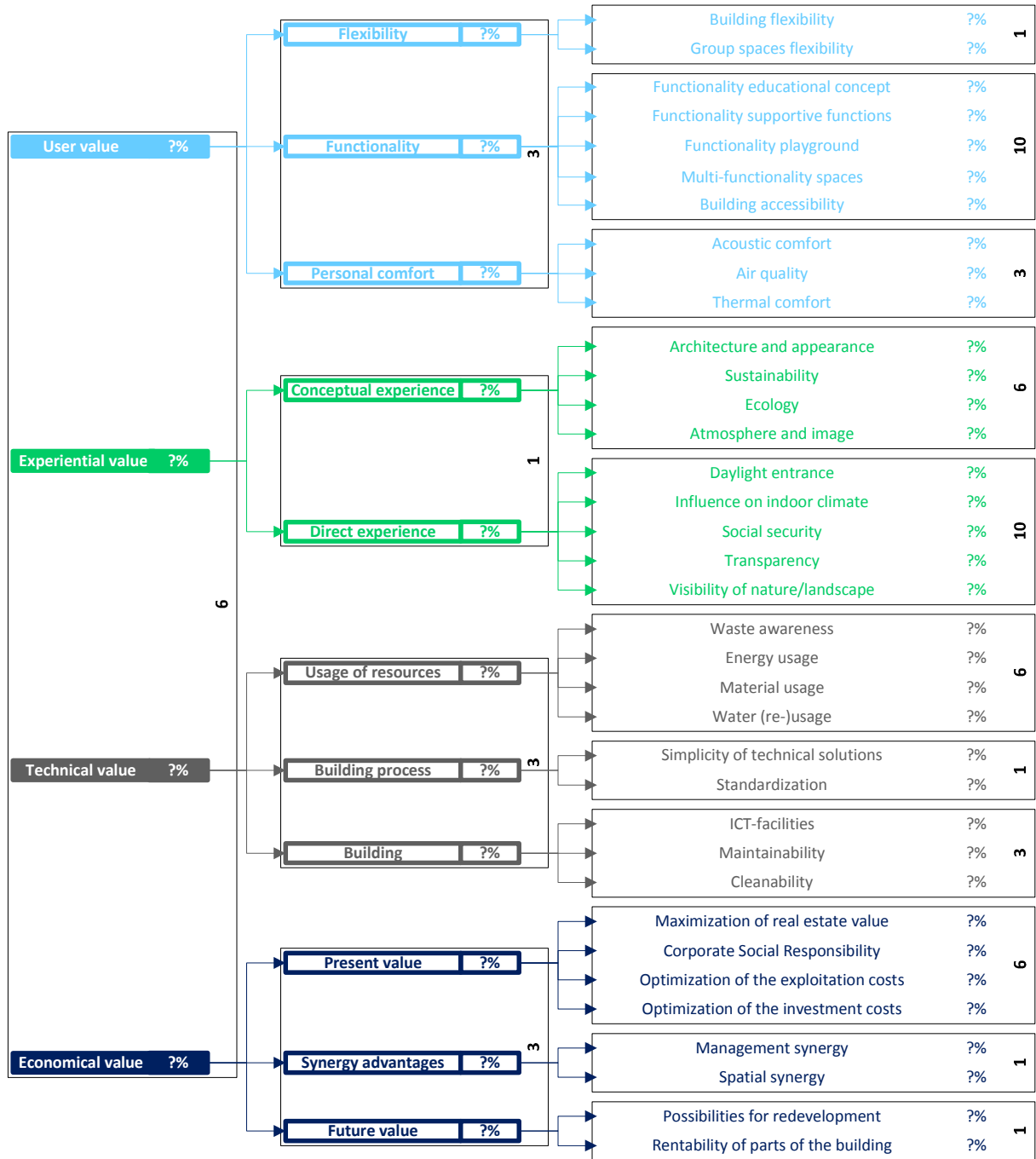


Figure 10-2: Amount of comparisons needed after regrouping the variables



During this regrouping, in cooperation with HEVO, some elements have been merged in order to prevent confusion and lowered response as these elements overlapped too much. This ended up in a reduction from 38 to 36 value elements. When the numbers of comparisons are summarized in a table it becomes even clearer what reduction in the amount of comparisons the regrouping of the variables enables (Tab. 10-1).

Include	General	User value		Experiential value		Technical value		Economical value		Total	
	Before and after	Before	After	Before	After	Before	After	Before	After	Before	After
<b>1 value</b>	6	45	17							51	23
	6			45	17					51	23
	6					45	13			51	19
	6							28	11	34	17
<b>2 values</b>	6	45	17	45	17					96	40
	6	45	17			45	13			96	36
	6	45	17					28	11	79	34
	6			45	17	45	13			96	36
	6			45	17			28	11	79	34
	6					45	13	28	11	79	30
<b>3 values</b>	6			45	17	45	13	28	11	124	47
	6	45	17			45	13	28	11	124	47
	6	45	17	45	17			28	11	124	51
	6	45	17	45	17	45	13			141	53
<b>4 values</b>	6	45	17	45	17	45	13	28	11	169	64

Table 10-1: Total number of comparisons before and after regrouping

Next to that the names and the definitions of the value elements in order to introduce the questions to the respondents have been adjusted and compiled in cooperation with HEVO in order to suit them the most to the respondents' point of view.

### 10.3 Target groups

Since the idea is to approach the complex problem from a wide-angle System Dynamics perspective, it is important to gather data from the most important actors involved, being the users, the school boards, the municipalities and the architects. By including these four groups most perspectives on the sustainable value creation within primary schools have been covered. Users – more specifically the school principals – will be able to assess the sustainable value creation from a practical day-to-day point of view. School boards and municipalities will approach sustainable value creation as a financial trade-of trading money for value. Expected is that both groups will make different trade-offs because of their different responsibilities. Finally, the architects are included as a target group as they can be seen as being an independent actor who wishes to create the best value possible for all actors involved as they represent the general interest; having less focus on the financial side of the matter as the previous two actors. When combining the answers of these target groups a consensus can be modeled by combining and averaging the answers. Also, remarkable differences in attitudes towards sustainable value creation might be identified. A further way of declining the number of questions per respondent is to use the different target groups for defining only that part of sustainable value creation on which their personal focus lies (Tab. 10-2). When they are all asked to also define the general comparisons as well, the results of all four types of the questionnaire can still be combined.

Target group	General	User value	Experiential value	Technical value	Economical value	Total
Users	6	17	17			40
Architects	6	17	17			40
School boards	6			13	11	30
Municipalities	6			13	11	30

Table 10-2: Number of comparisons per questionnaire per target group

### 10.4 Evaluating the variables

Now that the way to determine the relative importance of the variables has been determined; their value needs to be evaluated. In chapters 4 and 6 the research by Onderzoekslab (Bakers, J. e.a. 2010) has been discussed which had also delivered relative importance factors and values of variables of which value creation consists of. However, this research has focused solely on the user experience whereas HEVO's definition of sustainable value creation, unlike Onderzoekslab's definition of value creation and that of many others discussed in chapter 6, also includes the economical value, and a more extensive definition of experiential and technical value (Fig. 10-3).

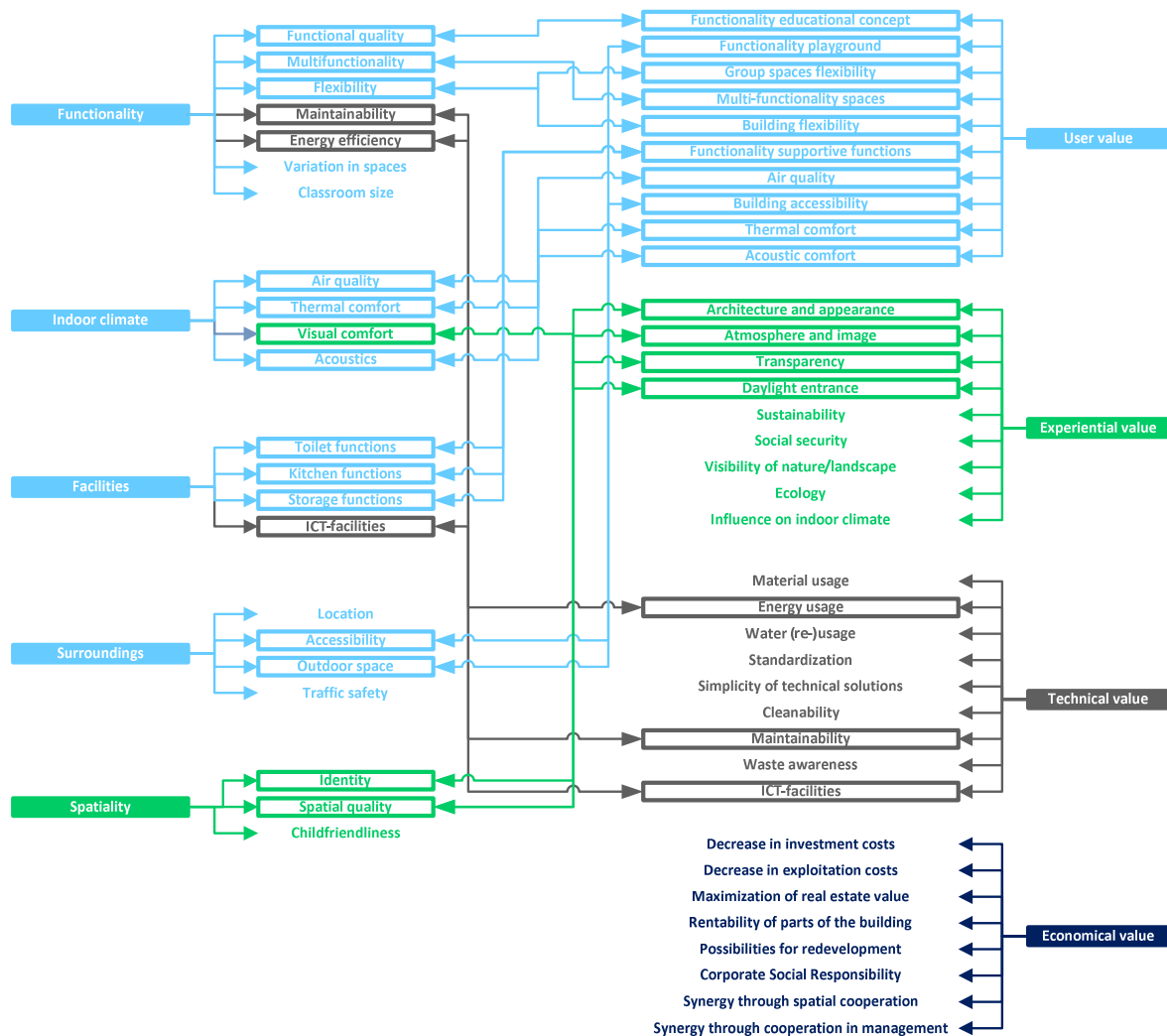


Figure 10-3: Comparison between Onderzoekslab's value creation (left) and HEVO's sustainable value creation (right)

It is for this reason that, next to their relative importance factors, also the values of the variables will be reinvestigated. For doing so, like Onderzoekslab, the same evaluating system of 0-10 will be used; in which 0 is the lowest evaluation and 10 the highest. This grading mechanism is well-known in the field of primary education, and therefore like AHP's pair wise comparisons very intuitive, which lowers the barrier for the respondents to answer the questionnaire. The different target groups will be asked to evaluate the same variables as they were asked to determine the relative importance amongst.

### 10.5 Evaluating the influential factors

In chapter 8 the influential factors on the sustainable value creation in primary schools as a result of the financial system have been identified. Their quantitative value will also be determined by using AHP comparisons to compare the proposed improvement measures within each scenario with each other and with the current situation. In this way relative weighing factors for the measures compared to the current situation can be obtained, which then can be entered in the model. Since the municipalities and the school boards are the actors most closely involved in the governance process, and thus most aware of the possibilities and constraints of the current financial system, this part of the questionnaire will only be included in the questionnaires to these actors. As described in chapter 8, the measures that had to be included in the questionnaire have been verified by HEVO, as were their definitions.

### 10.6 Conclusion

In this chapter the questionnaire which is necessary to obtain the needed quantitative data for the model is discussed. After a description of the general approach towards the questionnaire the target groups have been introduced and the ways in which the three different types of needed data will be gathered are discussed. In the table below an overview is shown in which four questionnaires this has resulted finally (Tab. 10-3).

	USERS	ARCHITECTS	SCHOOL BOARDS	MUNICIPALITIES
<b>PART 1: COMPARING THE ELEMENTS OF A PRIMARY SCHOOL</b>				
Four main values	X	X	X	X
User value	X	X		
Experiential value	X	X		
Technical value			X	X
Economical value			X	X
<b>PART 2: JUDGING THE ELEMENTS OF A PRIMARY SCHOOL</b>				
User value	X	X		
Experiential value	X	X		
Technical value			X	X
Economical value			X	X
<b>PART 3: COMPARING PROPOSED IMPROVEMENT MEASURES</b>				
Scenario 1: Right on full advanced decentralization			X	X
Scenario 2: Increasing the budgets			X	X
Scenario 3: Enhancing the financial management			X	X
Scenario 4: Changing the program of requirements			X	X
Scenario 5: Optimizing the maintenance policy			X	X

Table 10-3: Overview of the build-up of the four questionnaires

Two versions of the questionnaire in which this has resulted by using the GoogleDocs software are included in the appendixes: that to the architects and that to the school boards. These questionnaires combined give an overview of which questions have been asked as, apart from some small textual changes within the questionnaire regarding its target group, the user questionnaire is identical to that that has been send to the architects and the questionnaire to the school boards is the same as the municipalities questionnaire. But finally, the most important question is what results have these questionnaires ended up delivering in the end.



## 11. Results of the research

### 11.1 Gathering of respondents

After the completion of the questionnaires the next step was to gather the email addresses of respondents of the four target groups. Since a previous graduate at HEVO has had problems with the gathering of enough respondents the tactic was to approach as much respondents as possible; within reasonable boundaries that is.

#### 11.1.1 Municipalities

Considering the municipalities, a first search on the internet resulted in the overview of the general municipal contact data of all Dutch municipalities via the Stichting Adviesgroep Bestuursrecht ([www.st-ab.nl](http://www.st-ab.nl)), which resulted in a list of 405 general email addresses. Adding the contact list of municipal educational real estate divisions and personal contacts within the educational real estate divisions of municipalities and districts from the internal HEVO database resulted in a total of 442 general addresses of municipalities and districts and 90 personal addresses, adding up to 532 email addresses in total. A remark that has to be made is that the personal email addresses belong to people who work for municipalities which are also approached on their general email addresses. In this way, the possibility is present that respondents could get the questionnaire both directly and indirectly. Nevertheless, this approach is preferred since it increases the chance that the questionnaires reach the right respondents as much as possible. The addresses covered all Dutch municipalities ranging from the largest, being Amsterdam with 779.808 inhabitants in 2011 ([www.metatopos.org](http://www.metatopos.org)) to the smallest, being Schiermonnikoog having 957 inhabitants in 2011. The average Dutch municipality has 40.329 inhabitants in 2012 ([www.cbs.nl](http://www.cbs.nl)).

#### 11.1.2 Architects

A first list of primary school designing architectural firms has been constructed with the help of the of Architectuur Lokaal's 2008 publication on the Multi-Functional Accommodations (Bergvelt, D. e.a. 2008) and its accompanying website with examples of best practices of this type of building ([www.arch-lokaal.nl/scholenbouw](http://www.arch-lokaal.nl/scholenbouw)). Adding the list of members of the Stichting Architecten Research Onderwijsgebouwen ([www.staro-bna.org](http://www.staro-bna.org)) and the results of a post within the author's personal network of architectural master students of Eindhoven University of Technology on FaceBook resulted in a first overview of 159 email addresses. After verifying HEVO's internal database contact list of architectural firms on whether or not all of these firms have designed primary schools or not, those who did were added to the list resulting in a total list of 283 email addresses of primary school designing architects.

#### 11.1.3 School boards

Regarding the school boards, a first contact list of school boards from HEVO's internal database resulted in a list of 196 general email addresses. Then, this list was extended with the list of contacted school boards and personal contacts because of a HEVO symposium on the Multi-Functional Accommodation, ending up in a list of 265 general email addresses and 162 personal email addresses. The contacted school boards consist of a minimum of 3 to a maximum of 71

schools; averaging around 17 schools per school board. Together these contacted school boards represent 4.446 of the more than 7000 schools in the Netherlands and are geographically spread over the country since HEVO operates on a national scale.

#### 11.1.4 Users

And then finally, concerning the users, for obtaining a geographical spread in the contacted schools three randomly chosen schools per school board have been picked for the questionnaire. The email addresses have been obtained by visiting the websites of the school boards or those of the school themselves and compiled up to a list of 795 email addresses.

### 11.2 Response

To optimize the response as much as possible several recommendations from paragraph 10.2 have been applied. The questionnaire has been made as short as possible by regrouping of the value elements and spreading of questions on the different values amongst the different target groups. A digital questionnaire is used and a reminder is sent after one week. In both emails the logo of HEVO is excluded and the logo of Eindhoven University of Technology is included for making a trustworthy impression. Questions are asked in a closed way and as simple as possible within the boundaries of the research method and the GoogleDocs software package. Next to this, definitions are clearly defined just before each question; as well as the context of the questionnaire and the methodology. Furthermore, the respondents are offered the results of the research and can participate in the raffle for a Staatslot. Also, the questionnaires have been pretested on the time expense. These amounts of time to participate have been included in the email, as well as the notion that results will be processed anonymously. Finally, the respondents have been encouraged to participate by stressing the importance of knowledge development within the primary educational real estate sector and the contribution they can make to this noble cause by participating in the questionnaire. The emails which have been sent to the respondents are included next to the questionnaires in the appendixes.

Unfortunately, in spite of all of these measures not all of the approached respondents have been reached. Reasons for unreachable email addresses that have been identified are: automatic email replies of absent respondents that were already on a holiday, because of a full mailbox, or because of strict anti-spam settings of the respondent's email account. Also municipalities that have been switched from answering emails from a standard email account to answering them by means of a contact form embedded within the municipal website and outdated contact data from the HEVO internal database, as some contact persons have switched jobs in the meantime and some municipalities have been merged into larger municipalities, has negatively influenced the amount of reached email addresses. A lack of direct email addresses of some target groups increased the dependence on the willingness of internal administration for directing the email to the right contact person; it is therefore difficult to estimate how many emails did indeed encounter the right respondent.

Next to unreachable email addresses also some respondents who indeed were reached have replied with reasons why they were not able to participate in the questionnaires. Some would find the way in which the questions were asked too difficult or abstract, which is

understandable since a pretty abstract scientific quantitative research method like AHP has been used for constructing the questionnaire. This disadvantage has been somewhat increased by the limitations of the GoogleDocs software which has its limitations on the possibilities of designing questions. Next to that, some respondents replied not being able to participate in the questionnaire because of the fact that the summer holiday had already begun or almost begun and that, because of increased work pressure as a result of having to finish a lot of projects before this deadline, the questionnaire had been sent at an inconvenient time. Other respondents had a current policy of non-participation in questionnaires as a result of an overload of questionnaires in the past. Finally, some architects had fundamental objections on answering questions on which element of a school building they would find more important as they plead for an integral vision on architecture.

After one of the two weeks in which the respondents could participate in the questionnaire the initial email to the respondents had led to a satisfying number of responding respondents within the municipalities target group. However, the number of reactions from the other target groups had fell behind. This was reason enough to send all of the initially reached respondents of these target groups a reminder. Typically, partially because of reasons that have been mentioned considering the non-reaching of the initial email, also the additional email did not reach all additionally approached email addresses. Below the approached and reached email addresses and the response after the initial and additional approach of all target groups is summarized in a graphical way (Fig. 11-1).

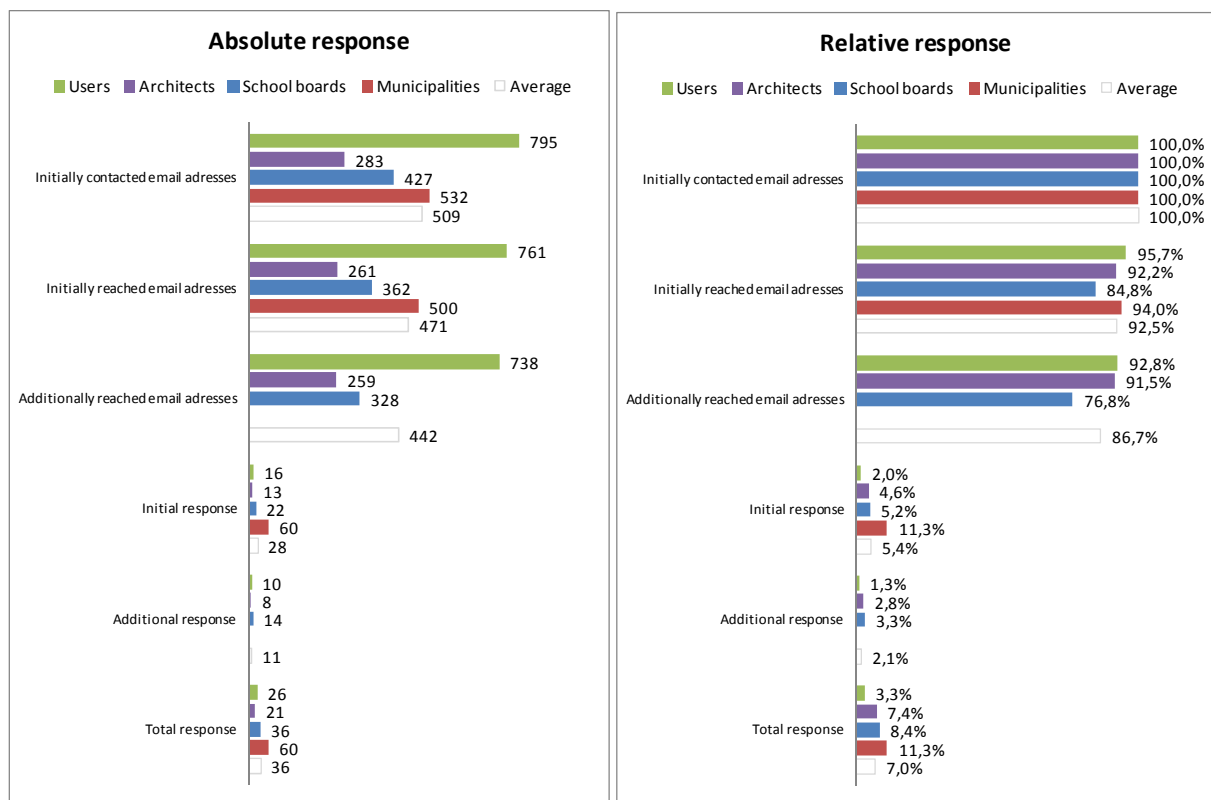


Figure 11-1: Absolute and relative response rates



### 11.3 Consistency analysis

In the previous part we have seen that the average absolute response rate of the questionnaires is 36 respondents and the average relative response rate is 7.0%. This, however, does not mean that all of these responses are useful, as we have seen in chapter 9 on the Analytical Hierarchy Process that the respondent's set of answers should be consistent enough for it to be used in the calculation of the results of the questionnaires. Below the average consistency of the target groups is depicted and the consistency per target group per question is shown (Fig. 11-2 and Tab 11-1). The latter is important since it enables one to put the results of each question in the right context since some results are based on many consistent sets of answers, whereas other results are based on less consistent sets of answers; influencing the validity of the results.

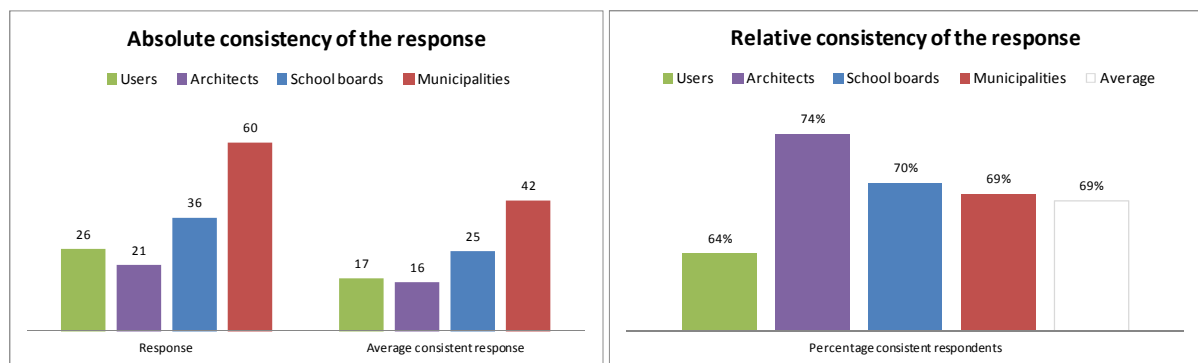


Figure 11-2: Absolute and relative consistency rates

	USERS			ARCHITECTS			SCHOOL BOARDS			MUNICIPALITIES			TOTAL		
	Number of respondents	Number of consistent respondents	Percentage of consistent respondents	Number of respondents	Number of consistent respondents	Percentage of consistent respondents	Number of respondents	Number of consistent respondents	Percentage of consistent respondents	Number of respondents	Number of consistent respondents	Percentage of consistent respondents	Number of respondents	Number of consistent respondents	Percentage of consistent respondents
VALUE	26	16	62%	21	14	67%	36	15	42%	60	31	52%	143	76	53%
<b>EXPERIENTIAL VALUE</b>	26	26	100%	21	21	100%							47	47	100%
Conceptual, architectural experience	26	18	69%	21	15	71%							47	33	70%
Direct, sensual experience	26	14	54%	21	11	52%							47	25	53%
<b>USER VALUE</b>	26	6	23%	21	11	52%							47	17	36%
Flexibility	26	26	100%	21	21	100%							47	47	100%
Functionality	26	13	50%	21	16	76%							47	29	62%
Personal comfort	26	14	54%	21	14	67%							47	28	60%
<b>ECONOMICAL VALUE</b>							36	16	44%	60	27	45%	96	43	45%
Present value							36	22	61%	60	37	62%	96	59	61%
Synergy advantages							36	36	100%	60	60	100%	96	96	100%
Future value							36	36	100%	60	60	100%	96	96	100%
<b>TECHNICAL VALUE</b>							36	21	58%	60	26	43%	96	47	49%
Usage of resources							36	23	64%	60	42	70%	96	65	68%
Technical aspects of the building process							36	36	100%	60	60	100%	96	96	100%
Technical aspects of the building							36	23	64%	60	39	65%	96	62	65%
<b>SCENARIOS</b>							36	18	50%	60	30	50%	96	48	50%
<b>SCENARIO 1: INTRODUCING THE RIGHT ON FULL ADVANCED DECENTRALIZATION</b>							36	36	100%	60	60	100%	96	96	100%
Effect on the lifecycle							36	36	100%	60	60	100%	96	96	100%
Effect on the different values							36	24	67%	60	42	70%	96	66	69%
<b>SCENARIO 2: INCREASING THE BUDGETS</b>							36	21	58%	60	35	58%	96	56	58%
<b>SCENARIO 3: ENHANCING THE FINANCIAL MANAGEMENT</b>															
School boards							36	18	50%	60	35	58%	96	53	55%
Municipalities							36	25	69%	60	28	47%	96	53	55%
<b>SCENARIO 4: CHANGING THE PROGRAM OF REQUIREMENTS</b>							36	18	50%	60	42	70%	96	60	63%
<b>SCENARIO 5: OPTIMIZING THE MAINTENANCE POLICY</b>							36	20	56%	60	23	38%	96	43	45%
<b>AVERAGE</b>	26	17	64%	21	16	74%	36	25	70%	60	42	69%	84	57	69%

Table 11-1: Consistency rates per target group per question

## 11.4 Comparing and evaluating value elements

On the following pages the results of the first two parts of questionnaires on the comparing and evaluating of the value elements will be displayed. These results will be put into context in the next chapter as the conclusions and recommendations will be summed up there. Firstly, in the graph below the different opinions of the different target groups on the comparison of the four values are shown (Fig. 11-3).

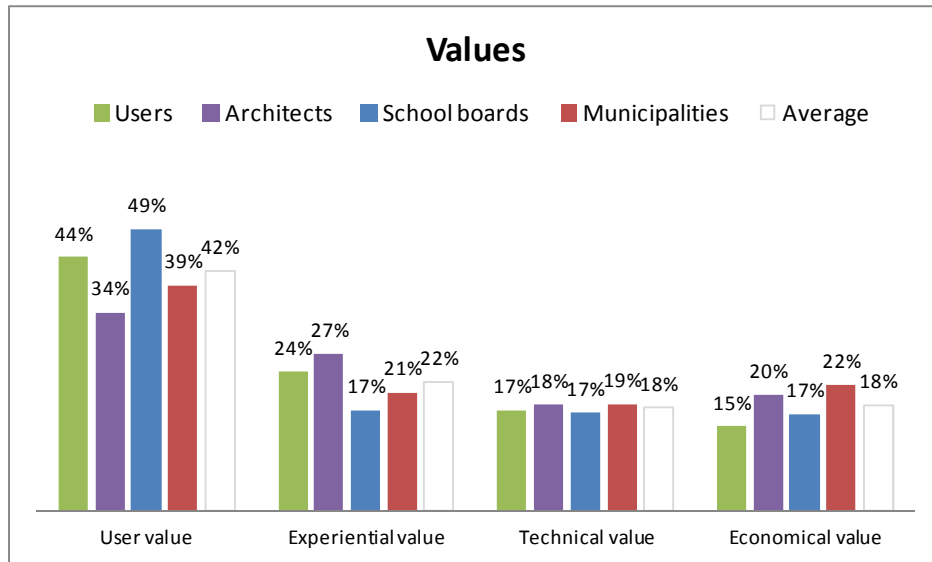


Figure 11-3: Most important values by target group

These values are then dealt with one by one on the following eight pages. For each value on the left page the averaged most important and the averaged best values are shown next to each other; both grouped by cluster (Fig. 11-4, 11-8, 11-12 and 11-16) and ranked from least important and worse scoring to most important and best scoring (Fig. 11-5, 11-9, 11-13 and 11-17). Then on the right page the creation of these averaged results is made clear as the rankings on most important and best elements from both target groups that had answered the questions for that particular value are displayed (Fig. 11-6, 11-7, 11-10, 11-11, 11-14, 11-15, 11-18 and 11-19).

These overviews per value together and the comparison between the values are then summarized within a table in which the different evaluations by the different target groups are being made even more insightful (Tab.11-2). This table provides in a good comparison possibility of the different answers of the different target groups per value, cluster or value element. The table is accompanied by graphical results of the best scoring values (Fig. 11-20) as well as the best scoring clusters; both grouped by value (Fig. 11-21) and ranked from least important and worse scoring to most important and best scoring (Fig. 11-22). Finally, the graphs of the total ranking of most important and best value elements, again ranked from least important and worse scoring to most important and best scoring, are shown (Fig. 11-23 and 11-24). These rankings are then also published containing the elements grouped by value (Fig. 11-25 and 11-26) and grouped by cluster (Fig. 11-27 and 11-28).

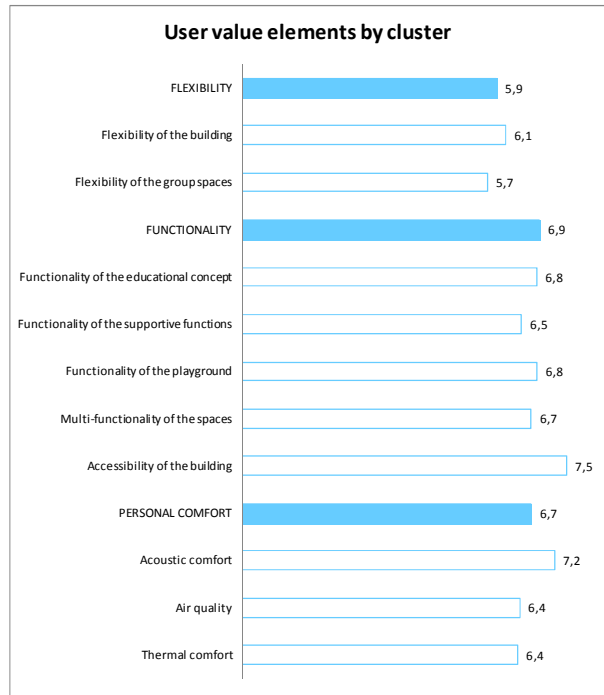
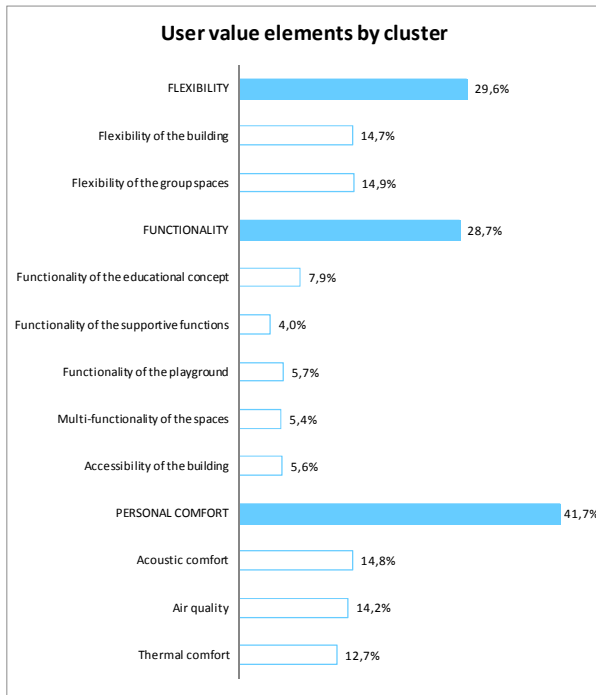


Figure 11-4: Most important and best user value elements by cluster (averaged)

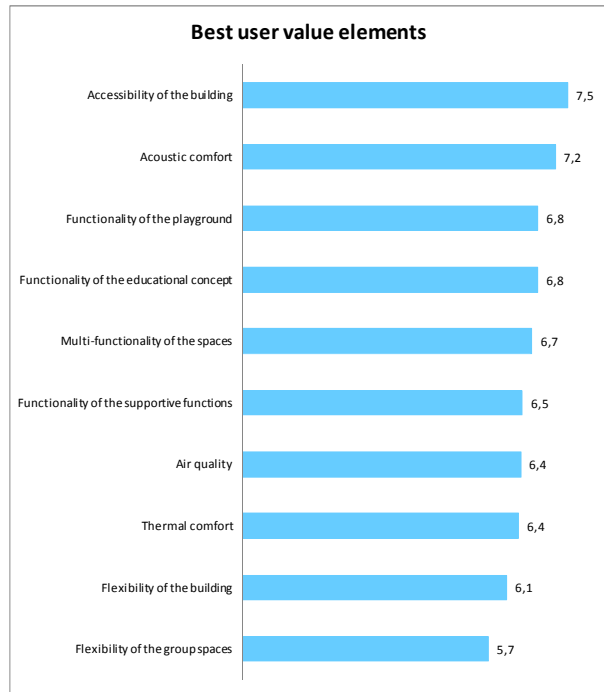
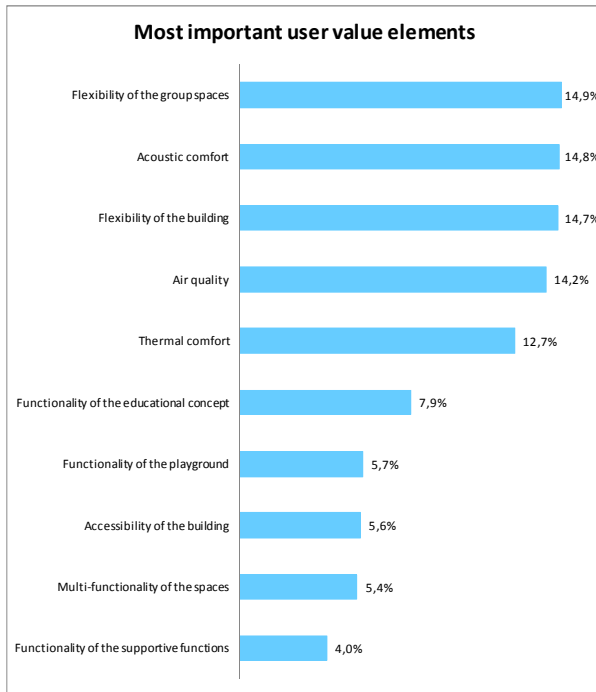


Figure 11-5: Most important and best user value elements (averaged)

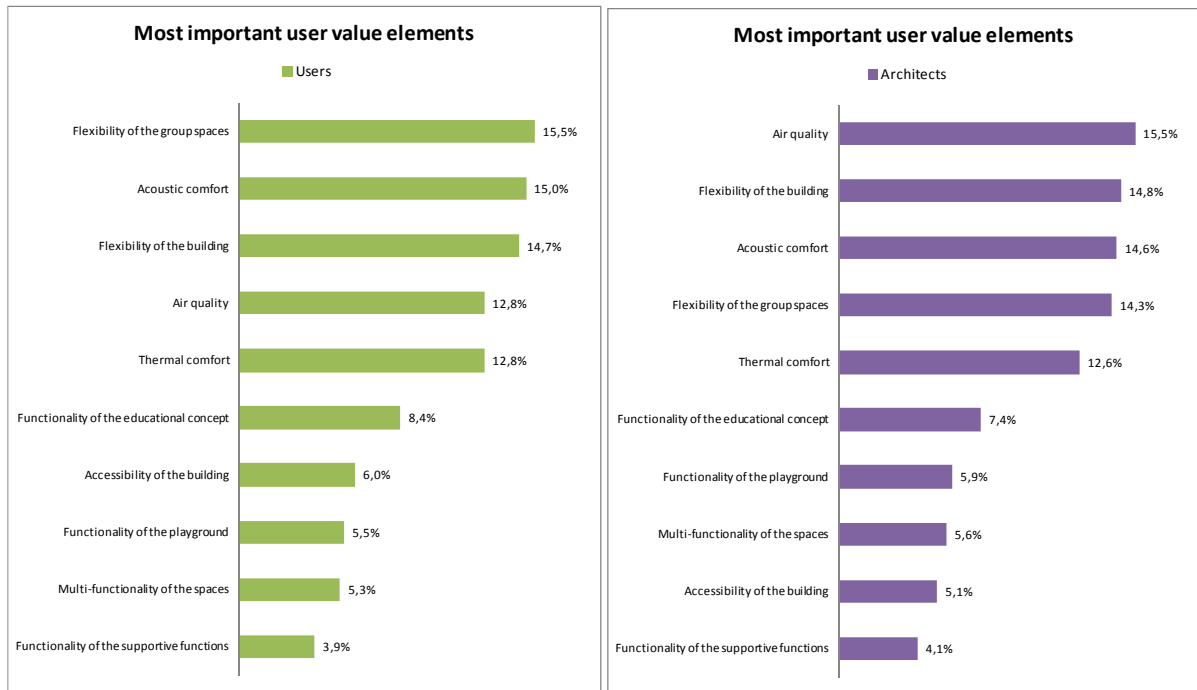


Figure 11-6: Most important user value elements according to users and architects

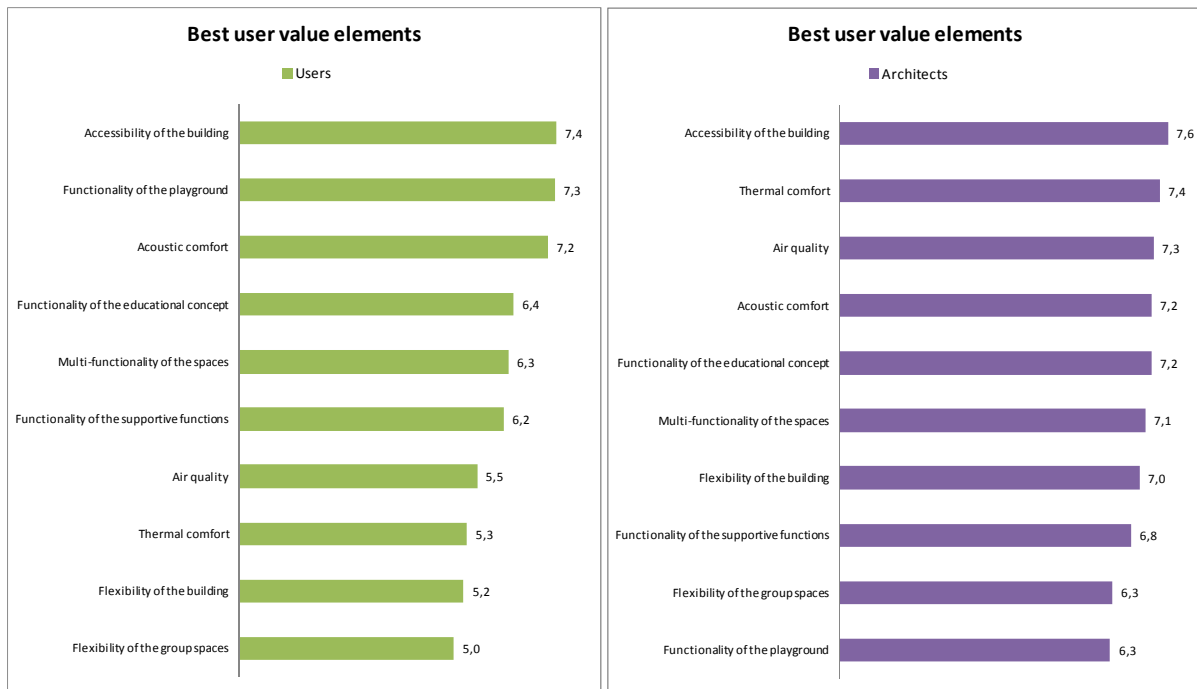


Figure 11-7: Best user value elements according to users and architects

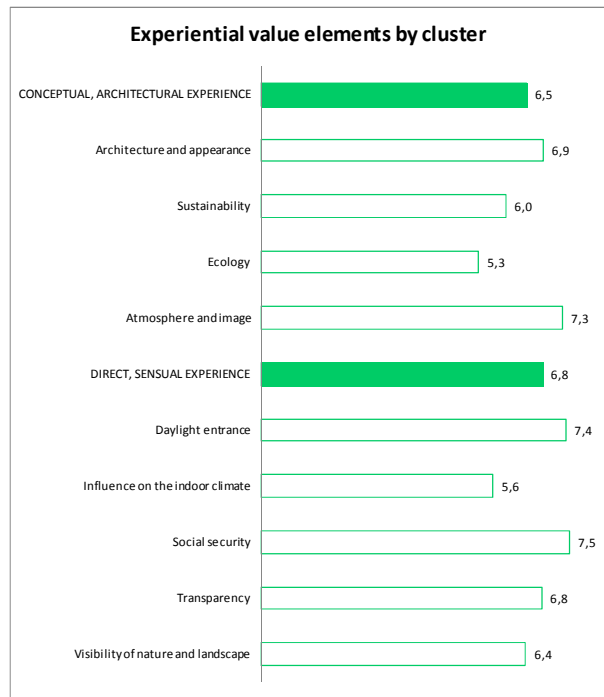
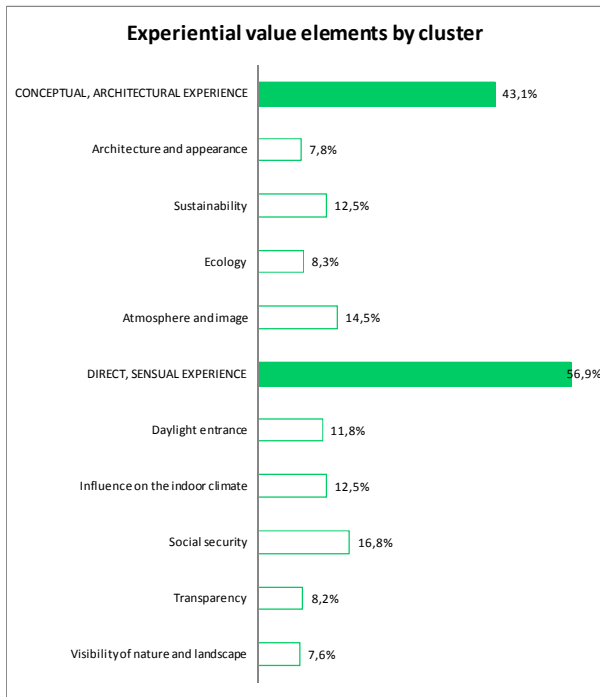


Figure 11-8: Most important and best experiential value elements by cluster (averaged)

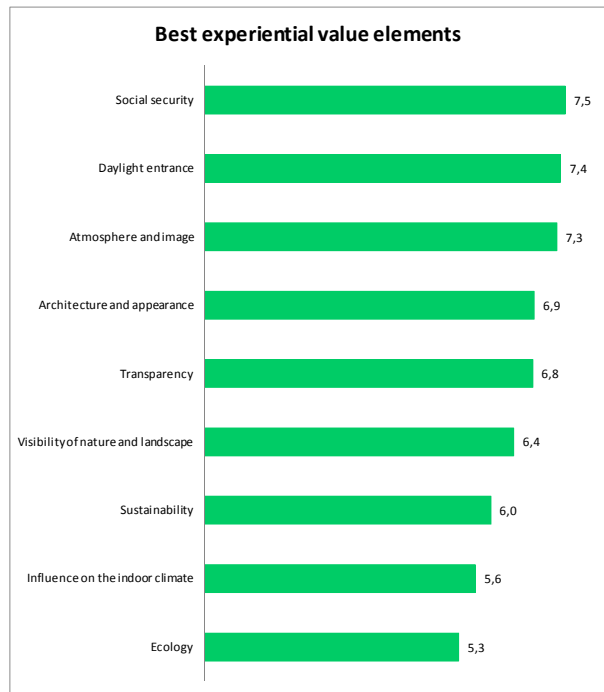
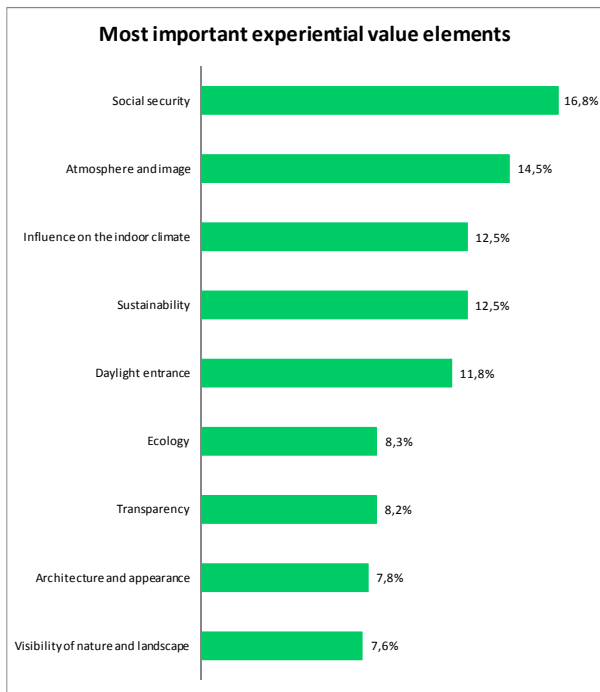


Figure 11-9: Most important and best experiential value elements (averaged)

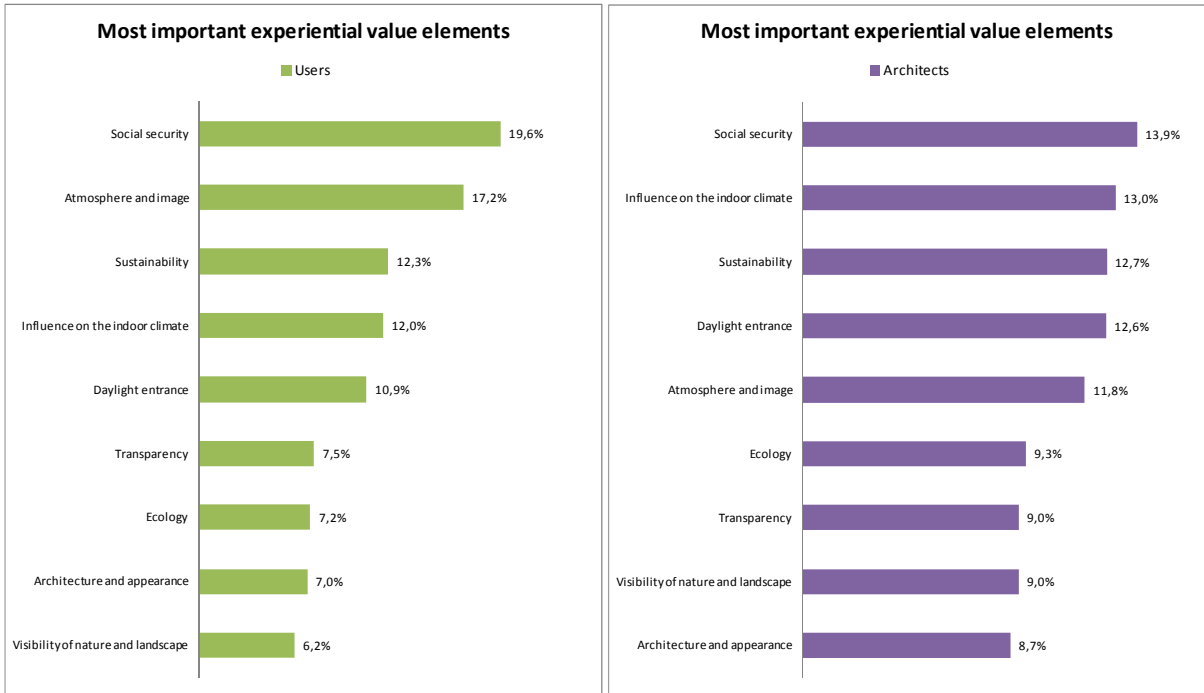


Figure 11-10: Most important experiential value elements according to users and architects

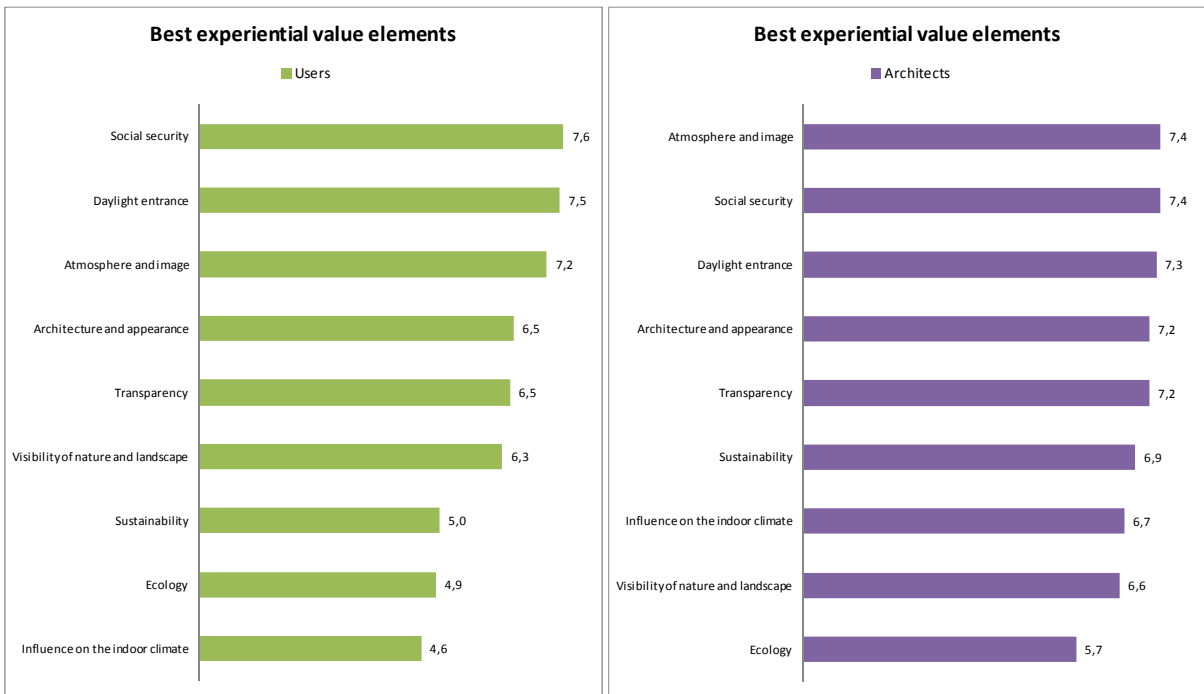


Figure 11-11: Best experiential value elements according to users and architects

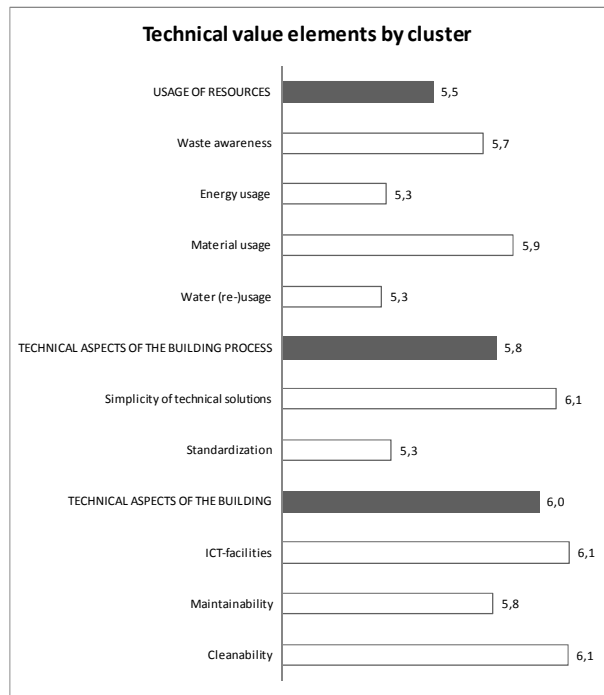
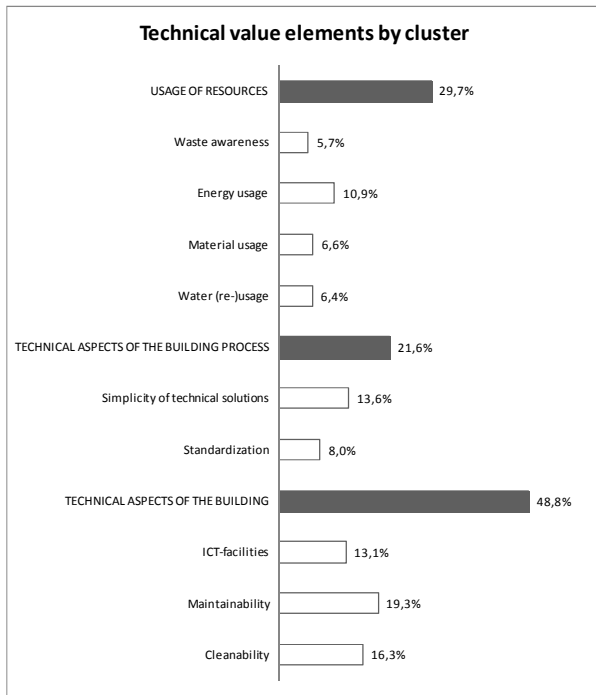


Figure 11-12: Most important and best technical value elements by cluster (averaged)

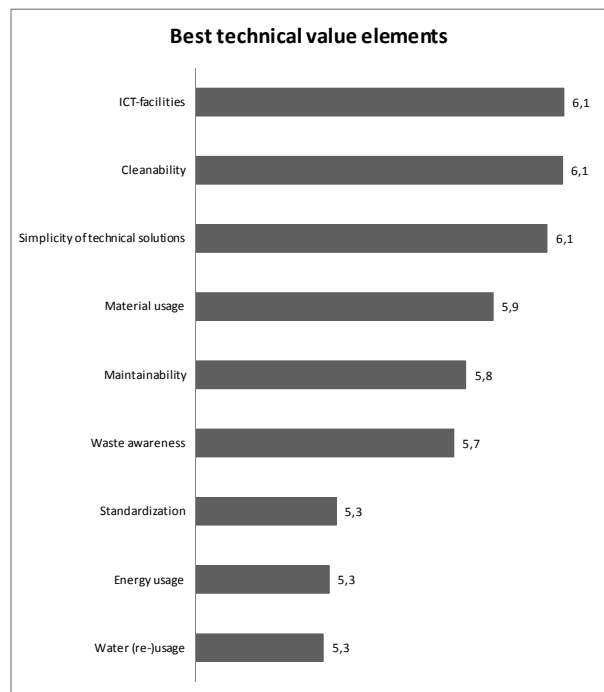
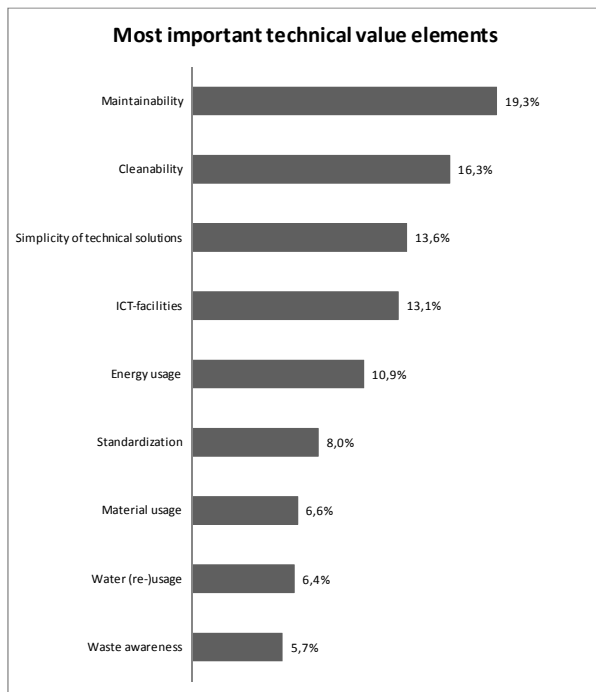


Figure 11-13: Most important and best technical value elements (averaged)

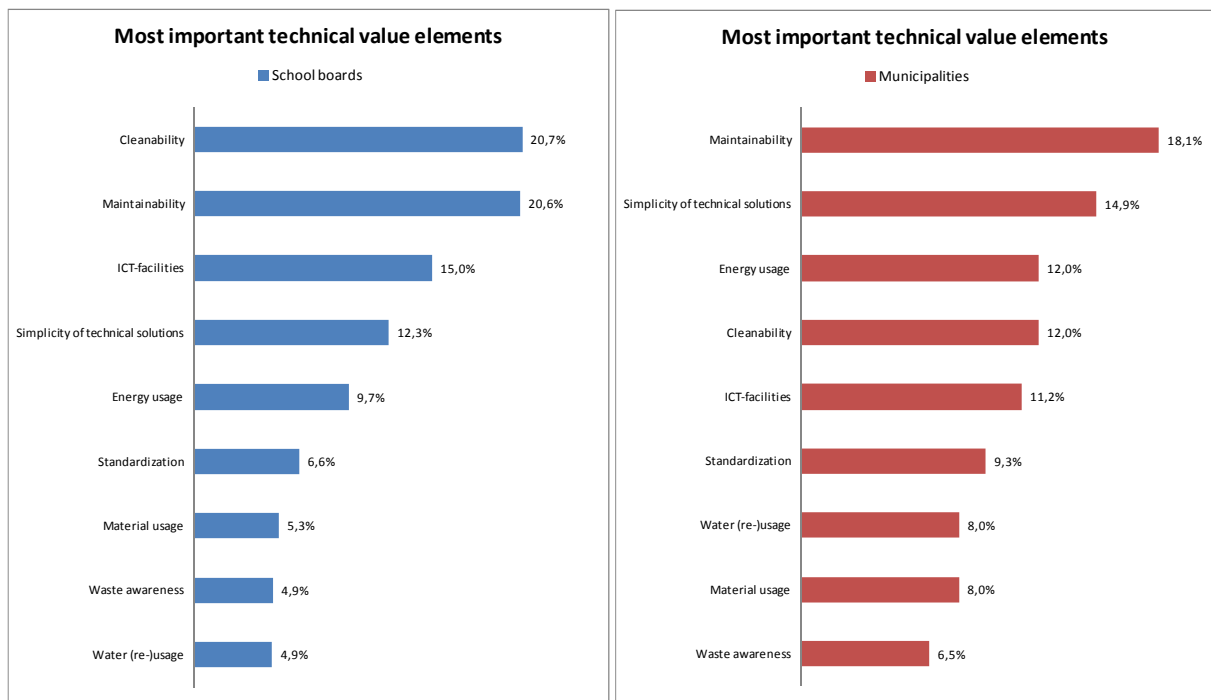


Figure 11-14: Most important technical value elements according to school boards and municipalities

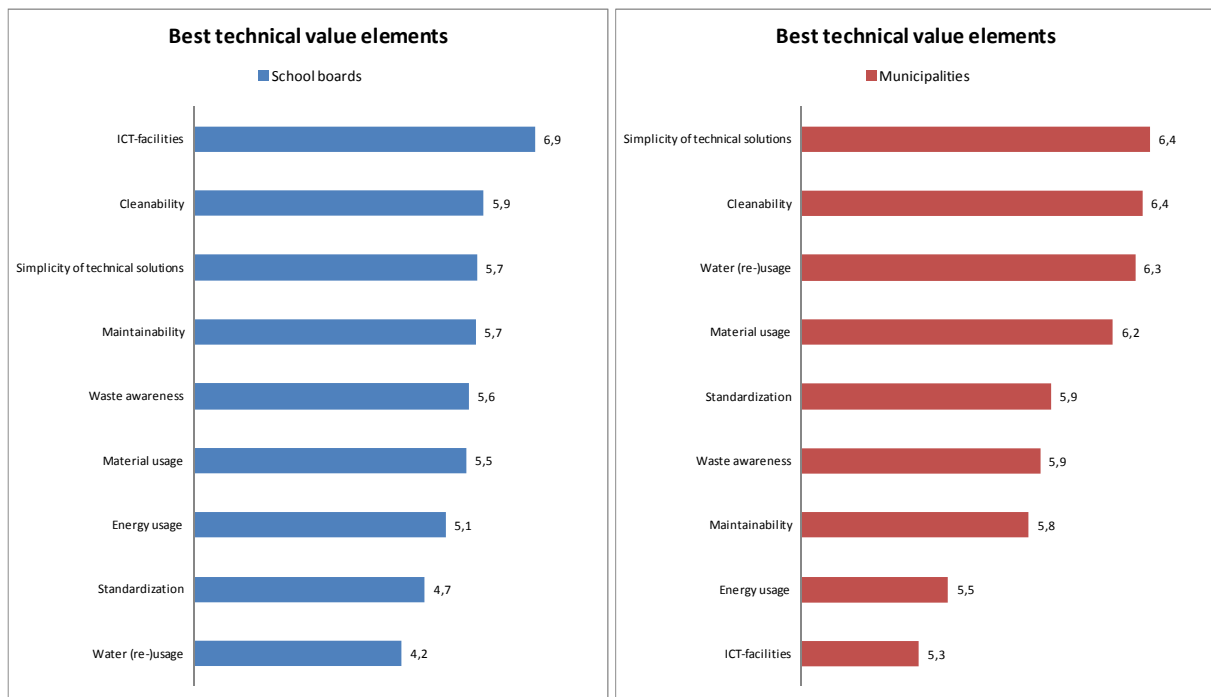


Figure 11-15: Best technical value elements according to school boards and municipalities



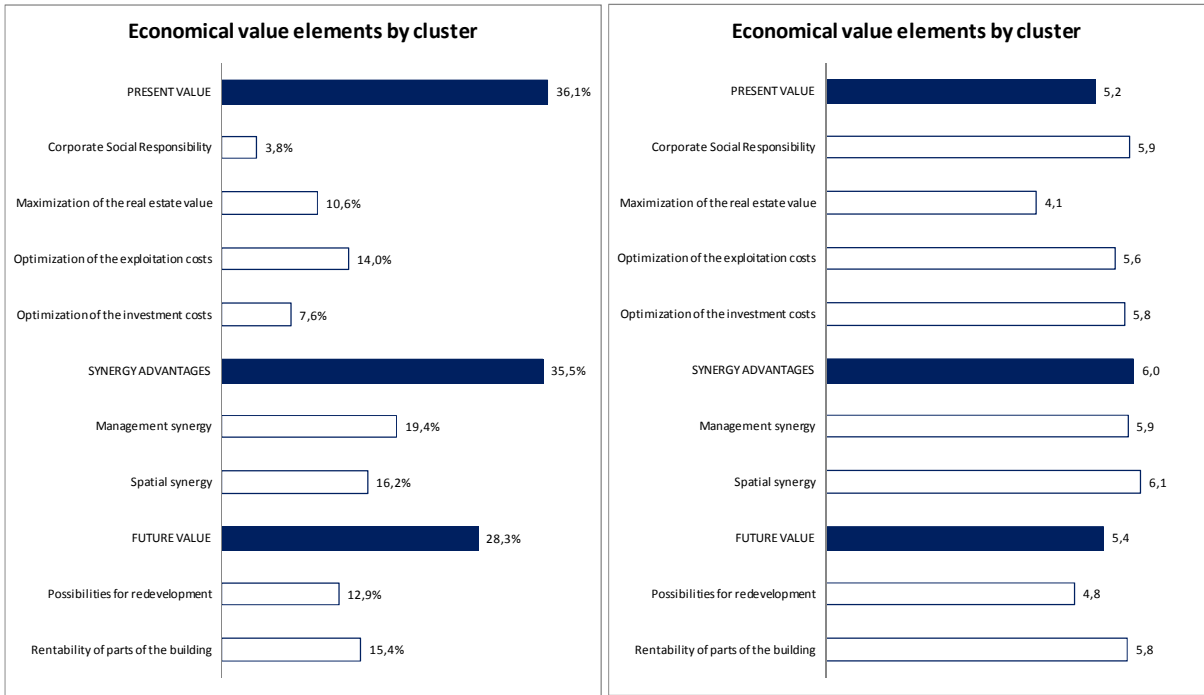


Figure 11-16: Most important and best economical value elements by cluster (averaged)

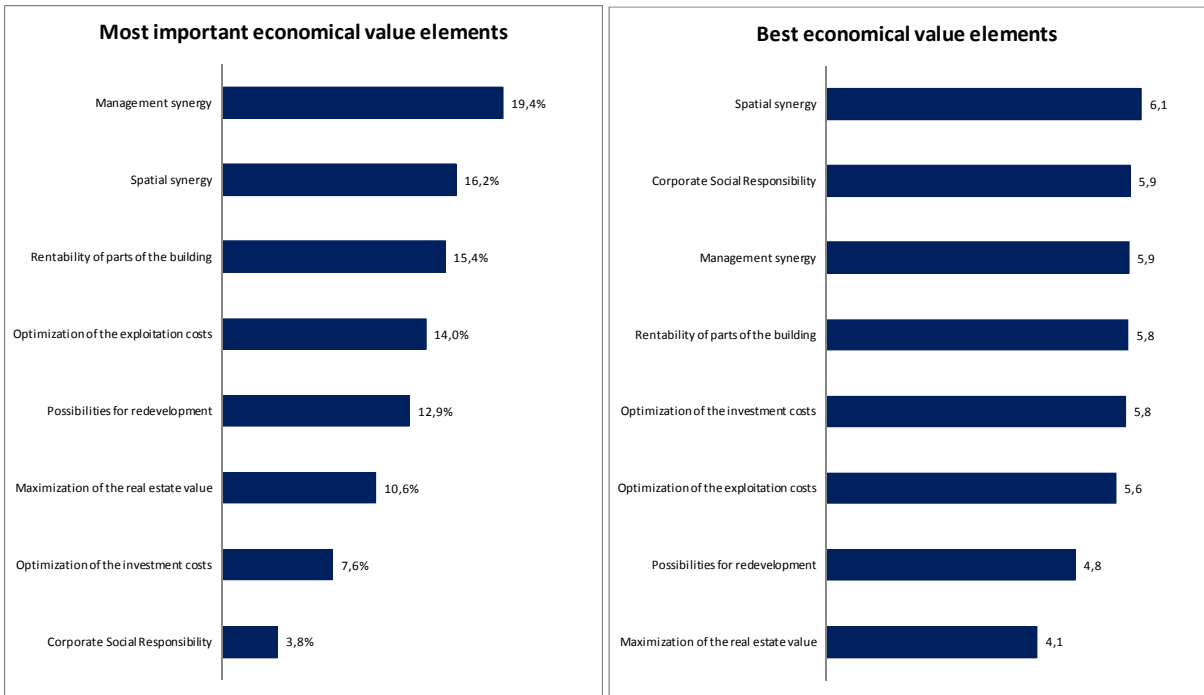


Figure 11-17: Most important and best economical value elements (averaged)

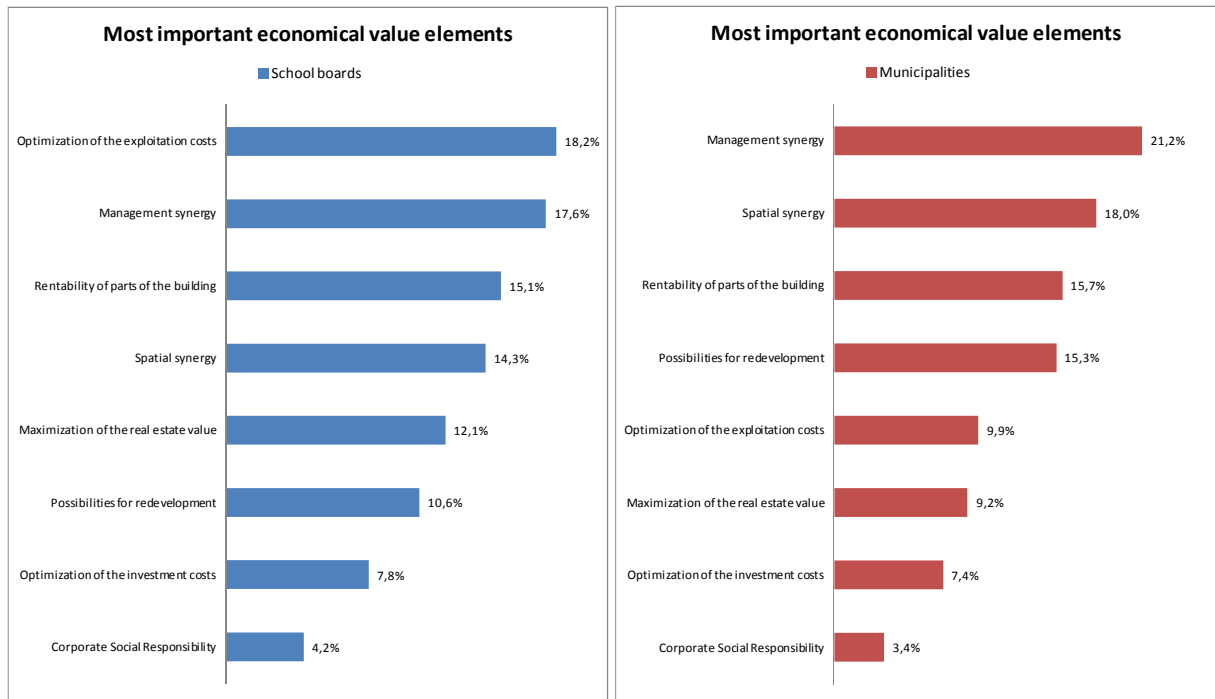


Figure 11-18: Most important economical value elements according to school boards and municipalities

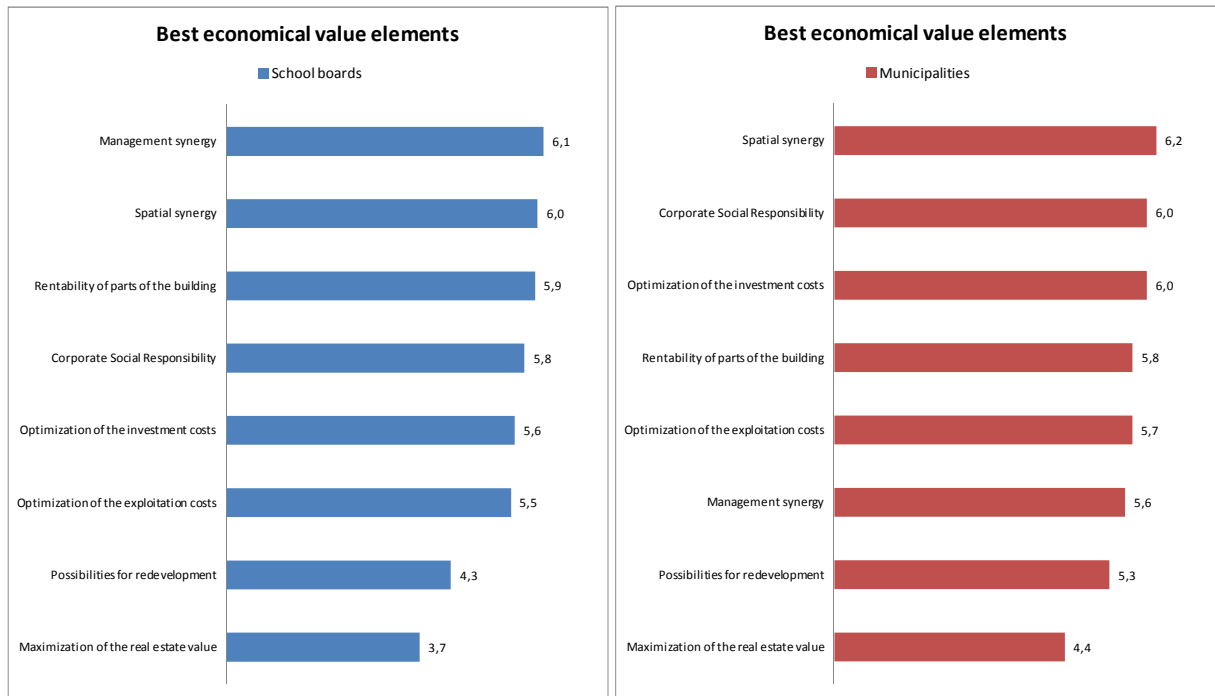


Figure 11-19: Best economical value elements according to school boards and municipalities

	USERS			ARCHITECTS			SCHOOL BOARDS			MUNICIPALITIES			AVERAGE		
	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade
<b>USER VALUE</b>	100%	43,9%	6,0	100%	34,4%	7,0	48,8%			39,1%		100%	38,5%	6,5	
<b>FLEXIBILITY</b>	30%	13,2%	5,1	29%	10,0%	6,6						30%	11,4%	5,9	
Flexibility of the building	15%	6,4%	5,2	15%	5,1%	7,0						15%	5,7%	6,1	
Flexibility of the group spaces	15%	6,8%	5,0	14%	4,9%	6,3						15%	5,8%	5,7	
<b>FUNCTIONALITY</b>	29%	12,8%	6,7	28%	9,7%	7,0						29%	11,1%	6,9	
Functionality of the educational concept	8%	3,7%	6,4	7%	2,6%	7,2						8%	3,1%	6,8	
Functionality of the supportive functions	4%	1,7%	6,2	4%	1,4%	6,8						4%	1,5%	6,5	
Functionality of the playground	5%	2,4%	7,3	6%	2,0%	6,3						6%	2,2%	6,8	
Multi-functionality of the spaces	5%	2,3%	6,3	6%	1,9%	7,1						5%	2,1%	6,7	
Accessibility of the building	6%	2,7%	7,4	5%	1,8%	7,6						6%	2,2%	7,5	
<b>PERSONAL COMFORT</b>	41%	17,9%	6,1	43%	14,7%	7,3						42%	16,0%	6,7	
Acoustic comfort	15%	6,6%	7,2	15%	5,0%	7,2						15%	5,7%	7,2	
Air quality	13%	5,6%	5,5	16%	5,3%	7,3						14%	5,4%	6,4	
Thermal comfort	13%	5,6%	5,3	13%	4,3%	7,4						13%	4,9%	6,4	
<b>EXPERIENTIAL VALUE</b>	100%	24,0%	6,4	100%	27,2%	7,0	17,5%			20,6%		100%	25,1%	6,7	
<b>CONCEPTUAL, ARCHITECTURAL EXPERIENCE</b>	44%	10,5%	6,1	42%	11,5%	6,8						43%	10,8%	6,5	
Architecture and appearance	7%	1,7%	6,5	9%	2,4%	7,2						8%	2,0%	6,9	
Sustainability	12%	3,0%	5,0	13%	3,4%	6,9						12%	3,1%	6,0	
Ecology	7%	1,7%	4,9	9%	2,5%	5,7						8%	2,1%	5,3	
Atmosphere and image	17%	4,1%	7,2	12%	3,2%	7,4						14%	3,6%	7,3	
<b>DIRECT, SENSUAL EXPERIENCE</b>	56%	13,5%	6,6	58%	15,7%	7,1						57%	14,3%	6,8	
Daylight entrance	11%	2,6%	7,5	13%	3,4%	7,3						12%	3,0%	7,4	
Influence on the indoor climate	12%	2,9%	4,6	13%	3,5%	6,7						13%	3,2%	5,6	
Social security	20%	4,7%	7,6	14%	3,8%	7,4						17%	4,2%	7,5	
Transparency	7%	1,8%	6,5	9%	2,4%	7,2						8%	2,1%	6,8	
Visibility of nature and landscape	6%	1,5%	6,3	9%	2,4%	6,6						8%	1,9%	6,4	
<b>TECHNICAL VALUE</b>	17,5%			18,3%			100%	16,9%	5,7	100%	18,5%	6,0	100%	17,4%	5,8
<b>USAGE OF RESOURCES</b>							25%	4,2%	5,1	34%	6,4%	5,9	30%	5,2%	5,5
Waste awareness							5%	0,8%	5,6	6%	1,2%	5,9	6%	1,0%	5,7
Energy usage							10%	1,6%	5,1	12%	2,2%	5,5	11%	1,9%	5,3
Material usage							5%	0,9%	5,5	8%	1,5%	6,2	7%	1,2%	5,9
Water (re-)usage							5%	0,8%	4,2	8%	1,5%	6,3	6%	1,1%	5,3
<b>TECHNICAL ASPECTS OF THE BUILDING PROCESS</b>							19%	3,2%	5,4	24%	4,5%	6,2	22%	3,8%	5,8
Simplicity of technical solutions							12%	2,1%	5,7	15%	2,8%	6,4	14%	2,4%	6,1
Standardization							7%	1,1%	4,7	9%	1,7%	5,9	8%	1,4%	5,3
<b>TECHNICAL ASPECTS OF THE BUILDING</b>							56%	9,5%	6,1	41%	7,6%	5,8	49%	8,4%	6,0
ICT-facilities							15%	2,5%	6,9	11%	2,1%	5,3	13%	2,3%	6,1
Maintainability							21%	3,5%	5,7	18%	3,4%	5,8	19%	3,4%	5,8
Cleanability							21%	3,5%	5,9	12%	2,2%	6,4	16%	2,8%	6,1
<b>ECONOMICAL VALUE</b>	14,6%			20,1%			100%	16,8%	5,4	100%	21,9%	5,6	100%	19,0%	5,5
<b>PRESENT VALUE</b>							42%	7,1%	5,0	30%	6,5%	5,4	36%	6,7%	5,2
Corporate Social Responsibility							4%	0,7%	5,8	3%	0,7%	6,0	4%	0,7%	5,9
Maximization of the real estate value							12%	2,0%	3,7	9%	2,0%	4,4	11%	2,0%	4,1
Optimization of the exploitation costs							18%	3,1%	5,5	10%	2,2%	5,7	14%	2,6%	5,6
Optimization of the investment costs							8%	1,3%	5,6	7%	1,6%	6,0	8%	1,4%	5,8
<b>SYNERGY ADVANTAGES</b>							32%	5,4%	6,1	39%	8,6%	5,9	36%	6,8%	6,0
Management synergy							18%	3,0%	6,1	21%	4,6%	5,6	19%	3,7%	5,9
Spatial synergy							14%	2,4%	6,0	18%	3,9%	6,2	16%	3,1%	6,1
<b>FUTURE VALUE</b>							26%	4,3%	5,3	31%	6,8%	5,5	28%	5,4%	5,4
Possibilities for redevelopment							11%	1,8%	4,3	15%	3,3%	5,3	13%	2,5%	4,8
Rentability of parts of the building							15%	2,5%	5,9	16%	3,4%	5,8	15%	2,9%	5,8

100,0% 6,2

Table 11-2: Overview of the results per target group

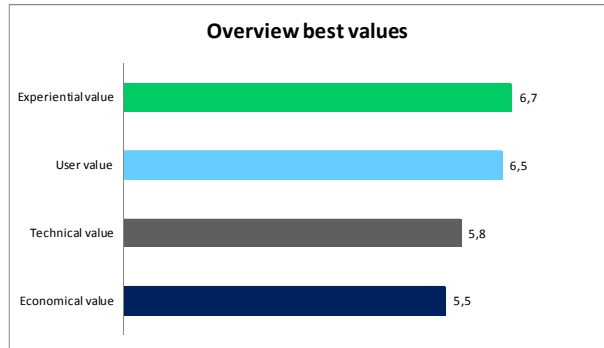
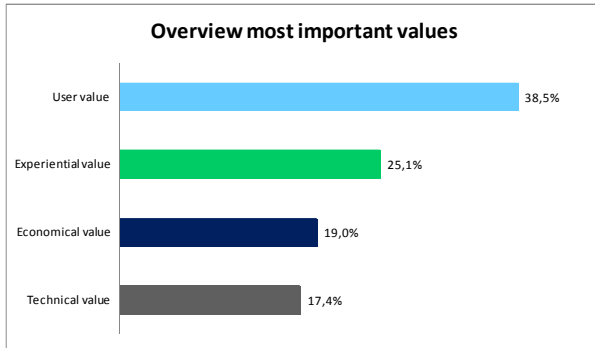


Figure 11-20: Overview of the most important and best scoring values

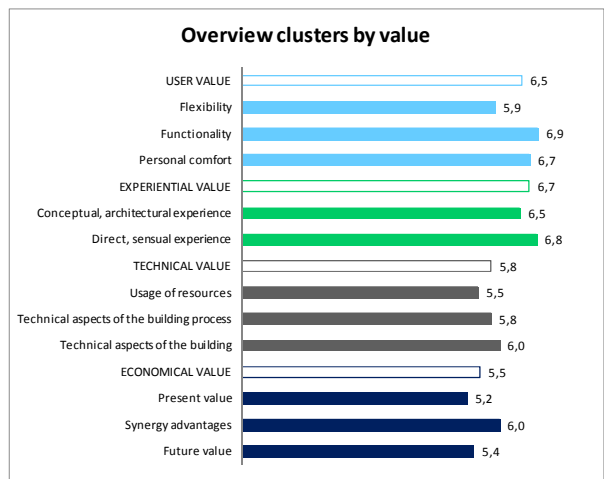
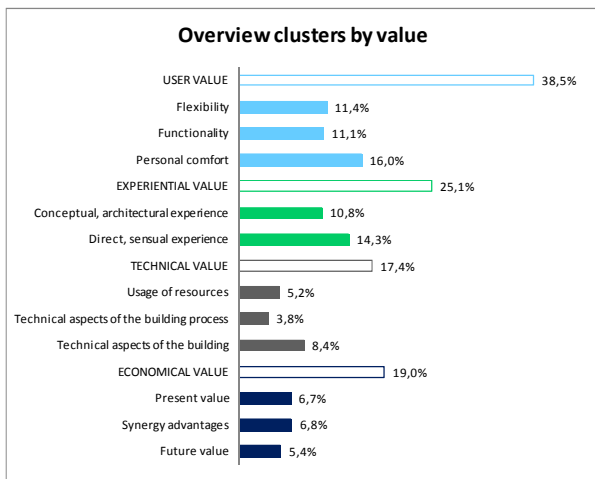


Figure 11-21: Overview of the most important and best scoring clusters by value

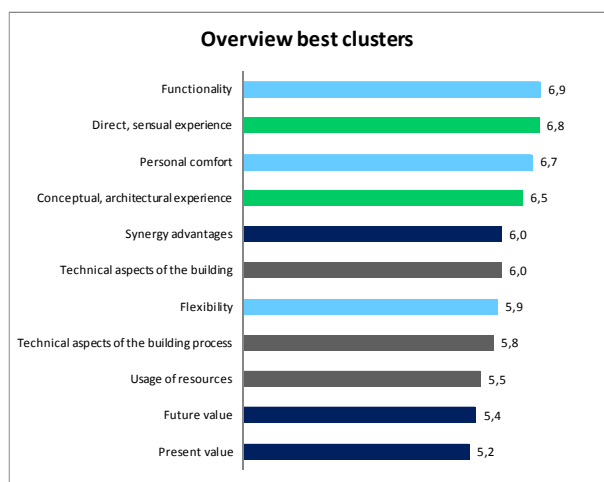
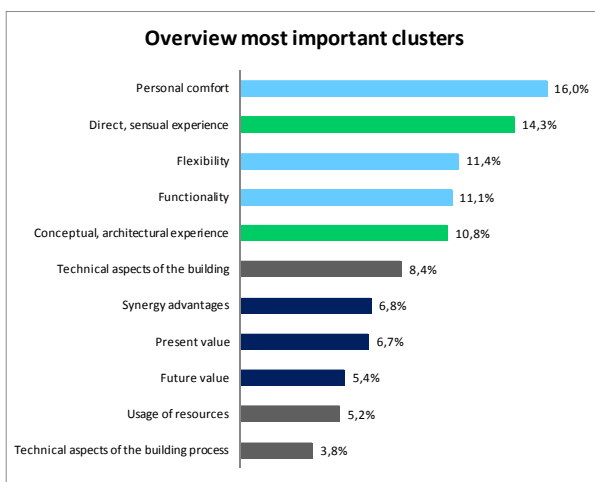


Figure 11-22: Overview of the most important and best scoring clusters

## Overview most important elements

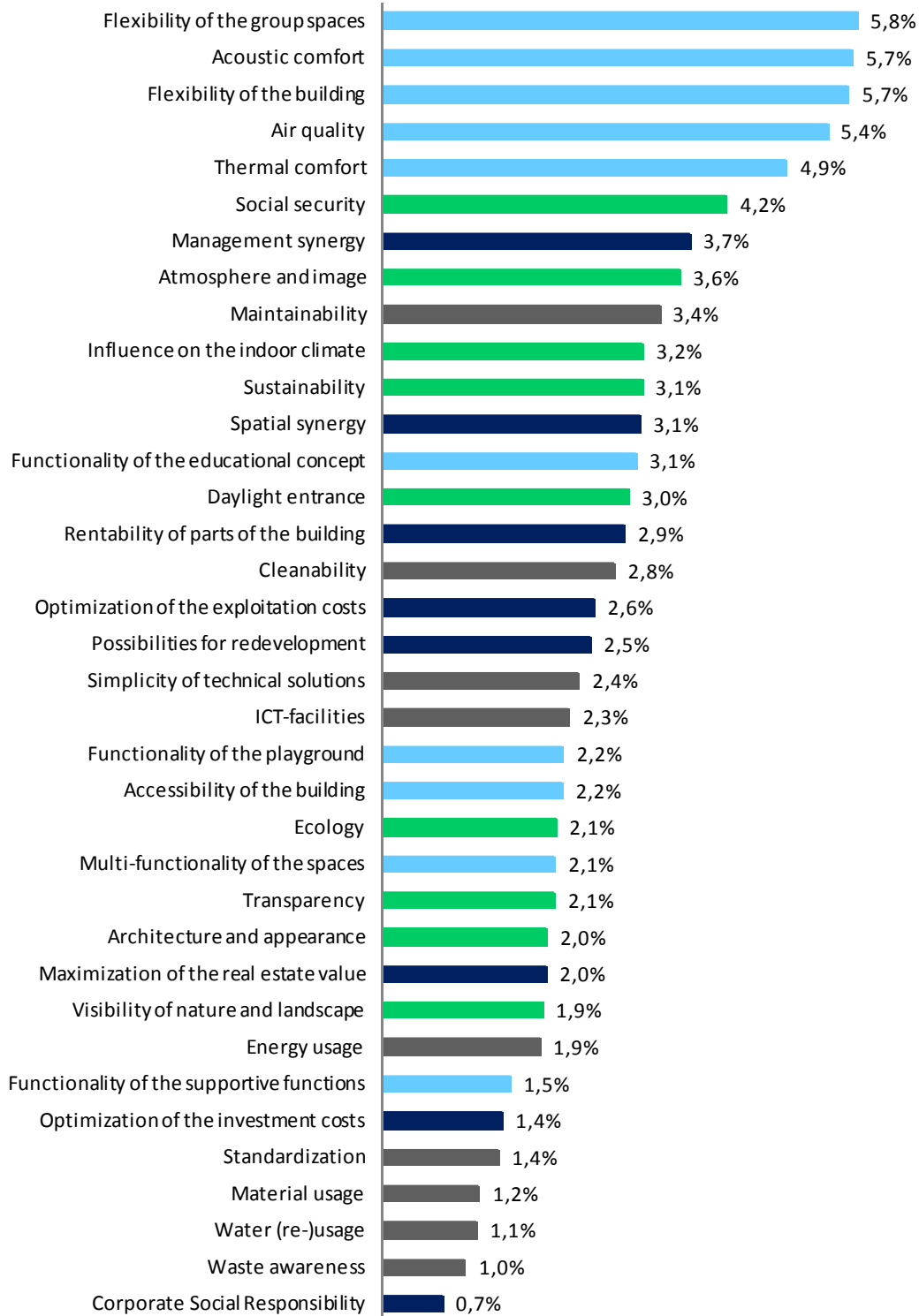


Figure 11-23: Overview of the most important elements within a primary school

## Overview best elements

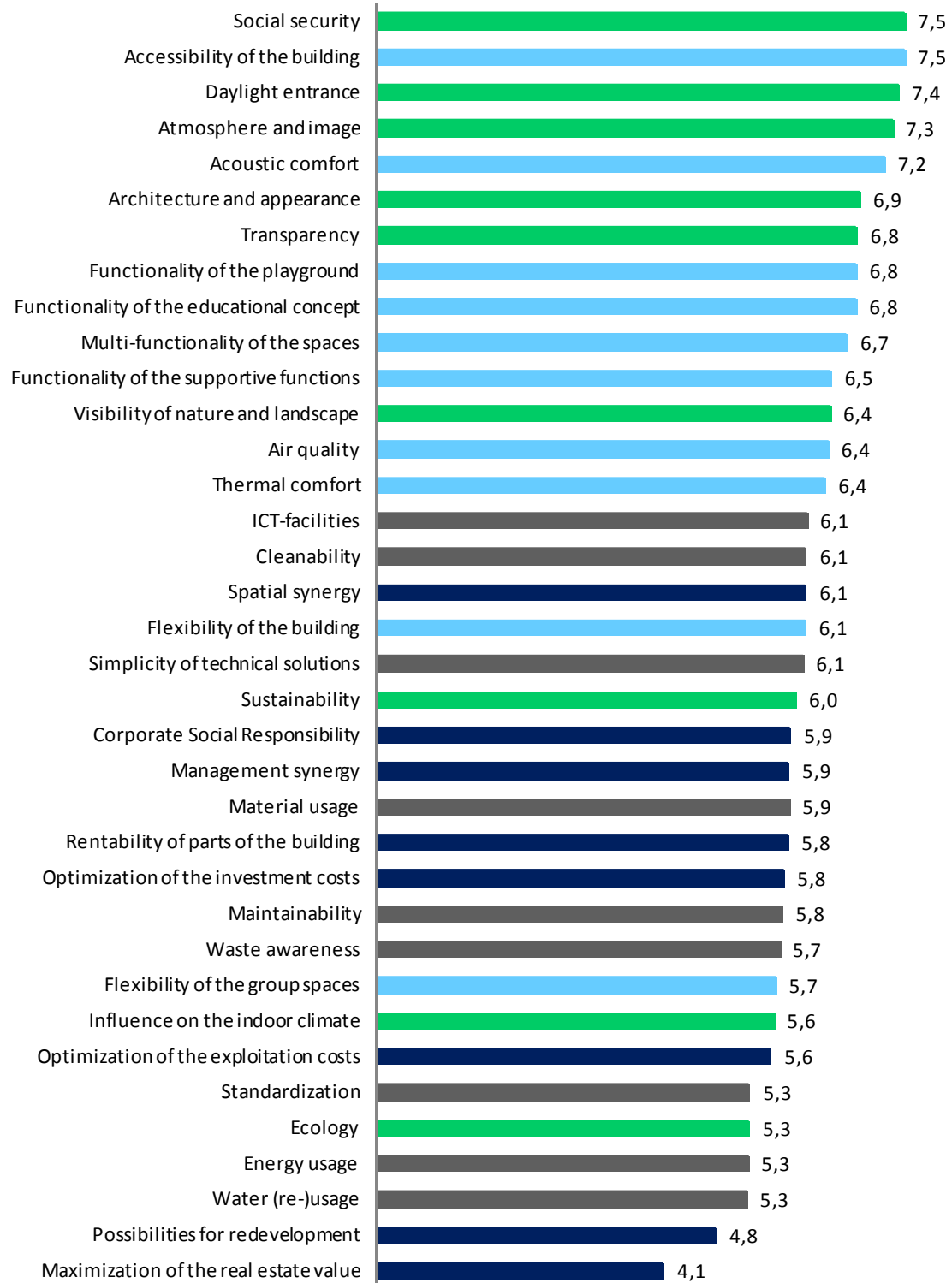


Figure 11-24: Overview of the best scoring elements within current-day primary schools

## Overview elements by value

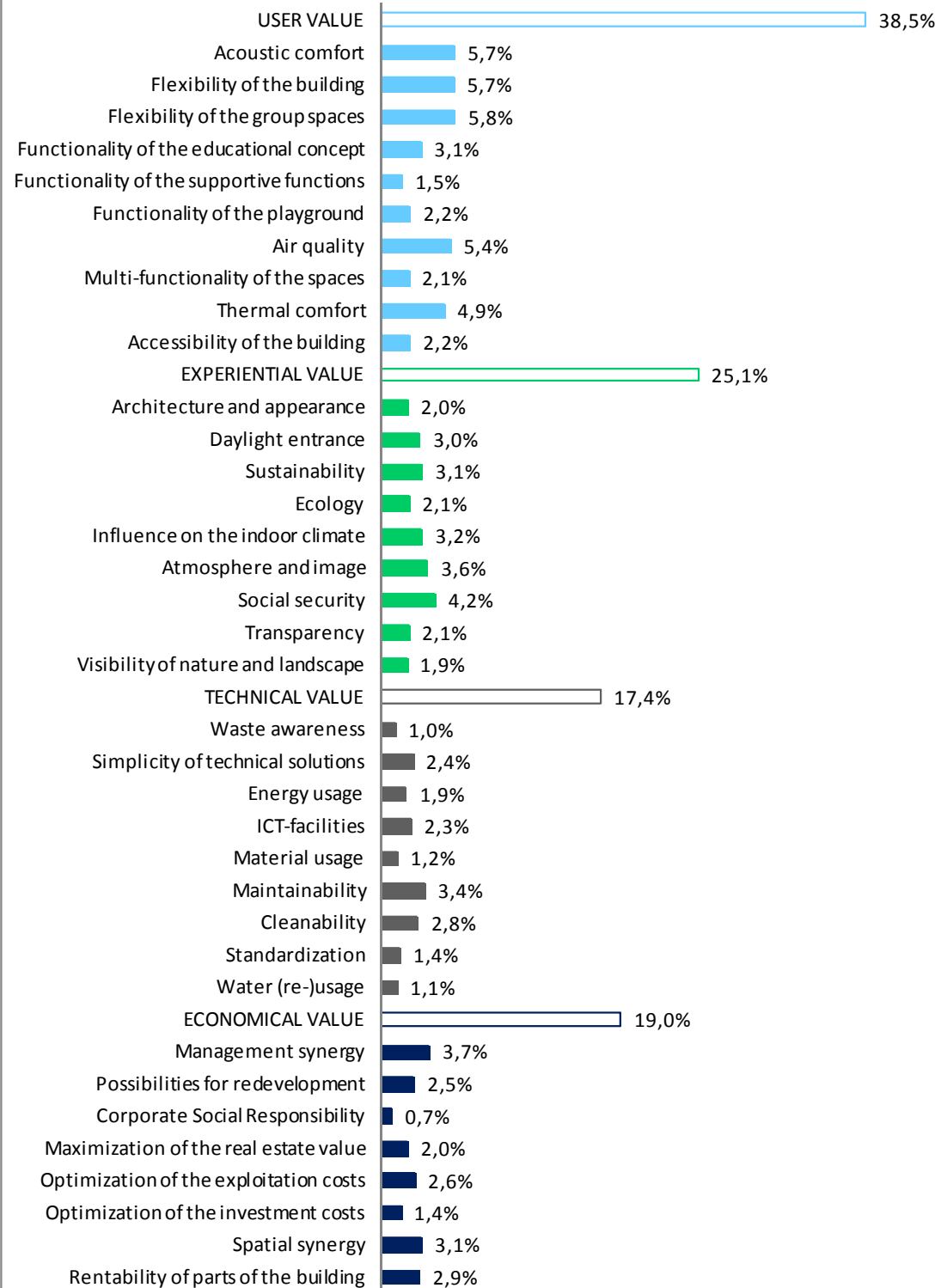


Figure 11-25: Overview of the most important elements within a primary school by value

## Overview elements by value

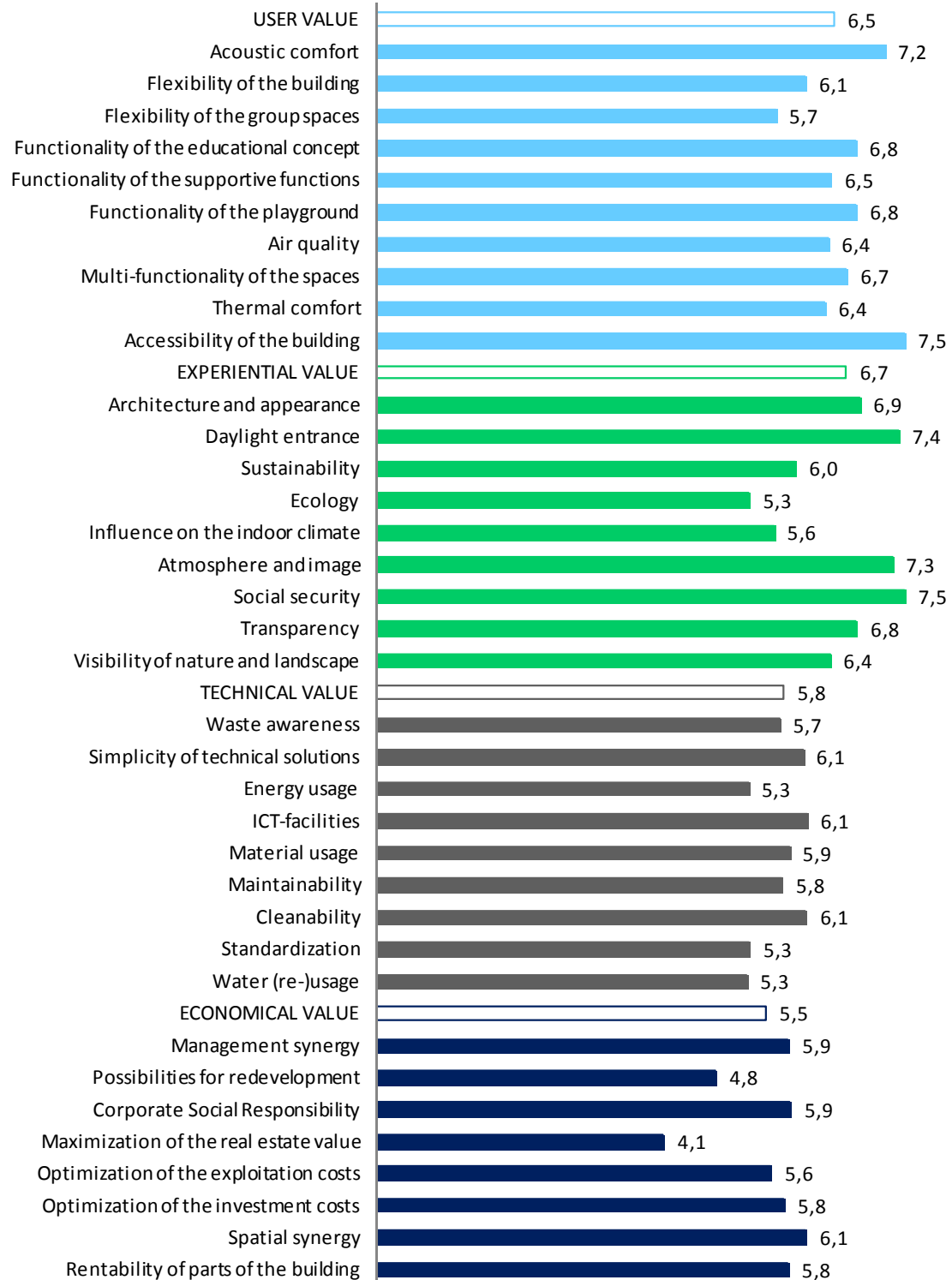


Figure 11-26: Overview of the best scoring elements within current-day primary schools by value



## Overview elements by cluster

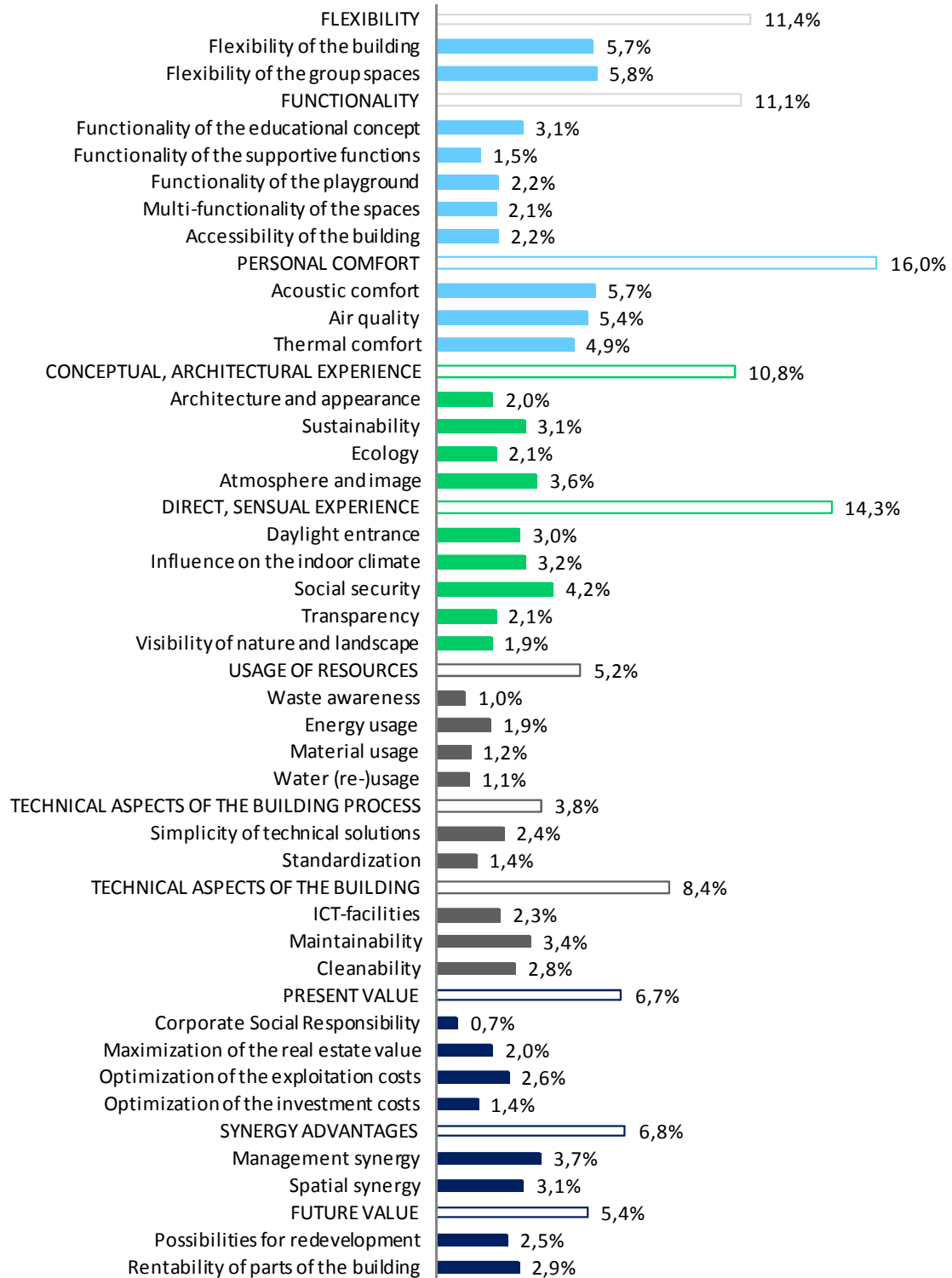


Figure 11-27: Overview of the most important elements within a primary school by cluster

## Overview elements by cluster

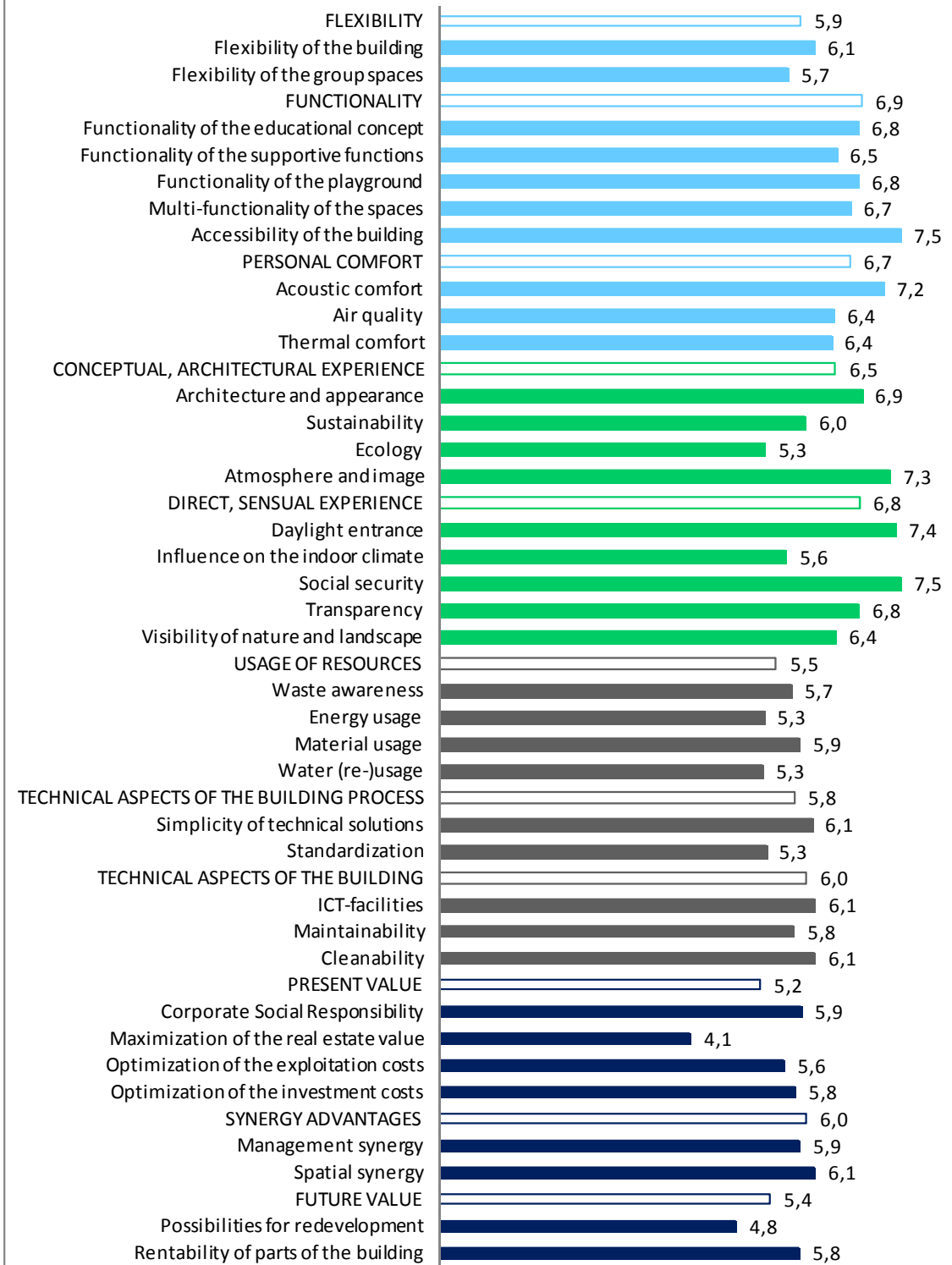


Figure 11-28: Overview of the best scoring elements within current-day primary schools by cluster

## 11.5 The relative importance of improvement measures

The results of the questionnaire on the relative importance of improvement measures for the current financing system as answered upon by both the school boards and the municipalities are depicted on these two pages. Below the relative comparison between scenarios as a whole and calibration of the measures per scenario has been summarized by target group by means of a table (Tab. 11-3). On the right the differences in judgment between the target groups becomes clear as the rankings of most supported measures are shown by means of graphs for the average ranking and those of the school boards and of the municipalities (Fig. 11-29).

	SCHOOL BOARDS		MUNICIPALITIES		AVERAGE	
	Answers questionnaire	Weighing factor per scenario	Answers questionnaire	Weighing factor per scenario	Answers questionnaire	Weighing factor per scenario
<b>SCENARIO 1: INTRODUCING THE RIGHT ON FULL ADVANCED DECENTRALIZATION</b>	<b>22%</b>		<b>15%</b>		<b>18%</b>	
Current situation	0,30	<b>1,00</b>	0,39	<b>1,00</b>	0,35	<b>1,00</b>
Introducing the right on full advanced decentralization	0,70	<b>2,34</b>	0,61	<b>1,54</b>	0,65	<b>1,94</b>
<b>EFFECT ON DIFFERENT ELEMENTS</b>	<b>1,38</b>		<b>1,13</b>		<b>1,25</b>	
Effect on initial total value	0,61		0,55		0,58	
Effect on value decay during the life-cycle	0,39		0,45		0,42	
Effect on the experiential value	0,28		0,29		0,28	
Effect on the economical value	0,22		0,21		0,22	
Effect on the user value	0,27		0,29		0,28	
Effect on the technical value	0,22		0,22		0,22	
<b>EFFECT FULL ADVANCED DECENTRALIZATION</b>						
Effect on the initial experiential value		<b>1,52</b>		<b>1,16</b>		<b>1,34</b>
Effect on the initial economical value		<b>1,41</b>		<b>1,12</b>		<b>1,27</b>
Effect on the initial user value		<b>1,50</b>		<b>1,17</b>		<b>1,33</b>
Effect on the initial technical value		<b>1,41</b>		<b>1,12</b>		<b>1,27</b>
Effect on the experiential value decay		<b>1,33</b>		<b>1,13</b>		<b>1,23</b>
Effect on the economical value decay		<b>1,27</b>		<b>1,10</b>		<b>1,18</b>
Effect on the user value decay		<b>1,33</b>		<b>1,13</b>		<b>1,23</b>
Effect on the technical value decay		<b>1,26</b>		<b>1,10</b>		<b>1,18</b>
<b>SCENARIO 2: INCREASING THE BUDGETS</b>	<b>27%</b>		<b>24%</b>		<b>26%</b>	
Current situation	0,14	<b>1,00</b>	0,19	<b>1,00</b>	0,17	<b>1,00</b>
Involving private parties	0,14	<b>0,97</b>	0,22	<b>1,15</b>	0,18	<b>1,06</b>
Updating the standard allowances to current price and quality levels	0,46	<b>3,23</b>	0,37	<b>1,94</b>	0,42	<b>2,58</b>
Earmarking of the municipal educational real estate budgets	0,26	<b>1,84</b>	0,21	<b>1,09</b>	0,24	<b>1,47</b>
<b>SCENARIO 3: ENHANCING THE FINANCIAL MANAGEMENT</b>	<b>13%</b>		<b>16%</b>		<b>15%</b>	
<b>FINANCIAL MANAGEMENT OF SCHOOL BOARDS</b>						
Current situation	0,24	<b>1,00</b>	0,23	<b>1,00</b>	0,24	<b>1,00</b>
Benchmarking	0,35	<b>1,46</b>	0,35	<b>1,54</b>	0,35	<b>1,50</b>
Increasing financial expertise	0,40	<b>1,66</b>	0,42	<b>1,86</b>	0,41	<b>1,76</b>
<b>FINANCIAL MANAGEMENT OF MUNICIPALITIES</b>						
Current situation	0,24	<b>1,00</b>	0,26	<b>1,00</b>	0,25	<b>1,00</b>
Benchmarking	0,38	<b>1,59</b>	0,37	<b>1,39</b>	0,37	<b>1,49</b>
Increasing financial expertise	0,38	<b>1,61</b>	0,37	<b>1,40</b>	0,38	<b>1,50</b>
<b>SCENARIO 4: CHANGING THE PROGRAM OF REQUIREMENTS</b>	<b>18%</b>		<b>21%</b>		<b>19%</b>	
Current situation	0,17	<b>1,00</b>	0,20	<b>1,00</b>	0,18	<b>1,00</b>
Using quality demands	0,43	<b>2,53</b>	0,45	<b>2,25</b>	0,44	<b>2,39</b>
Using performance documents	0,40	<b>2,36</b>	0,35	<b>1,78</b>	0,38	<b>2,07</b>
<b>SCENARIO 5: OPTIMIZING THE MAINTENANCE POLICY</b>	<b>20%</b>		<b>24%</b>		<b>22%</b>	
Current situation	0,17	<b>1,00</b>	0,27	<b>1,00</b>	0,22	<b>1,00</b>
Introducing the right on renovation	0,37	<b>2,16</b>	0,35	<b>1,31</b>	0,36	<b>1,73</b>
Advanced decentralization of the external maintenance	0,46	<b>2,70</b>	0,38	<b>1,42</b>	0,42	<b>2,06</b>

Table 11-3: Overview of the different proposed improvement measures; normalized by scenario



Figure 11-29: Overview of the relative support for different proposed improvement measures

## 11.6 Calibration of the model

Now that the necessary quantitative data on the relative importance and evaluation of the value elements and the relative importance of the improvement measures has been gathered the impact of the different proposed measures on the sustainable value creation of primary schools can be modeled. But first for being able to do this the model needs to be calibrated. Since the current average Dutch primary school has been appointed a 6.2 the impact of the different improvement measures can range from 6.2 to a 10 since the evaluation of the separate value elements as well as the sustainable value creation will be done on a report card inspired grading scale, ranging from 1 to 10. This means that the multiplication factors that have been attributed to the different improvement measures need to be normalized. The normalization has been performed in such a way that the highest attributed multiplication factor will end up in a sustainable value creation of 10. These normalized multiplication factors are summarized in the table below (Tab 11-4).

	SCHOOL BOARDS		MUNICIPALITIES		AVERAGE	
	Weighing factors from questionnaire	Calibrated weighing factors	Weighing factors from questionnaire	Calibrated weighing factors	Weighing factors from questionnaire	Calibrated weighing factors
<b>SCENARIO 1: INTRODUCING THE RIGHT ON FULL ADVANCED DECENTRALIZATION</b>						
Introducing the right on full advanced decentralization	2,34	<b>1,36</b>	1,54	<b>1,15</b>	1,94	<b>1,25</b>
<b>SCENARIO 2: INCREASING THE BUDGETS</b>						
Involving private parties	0,97	<b>0,99</b>	1,15	<b>1,04</b>	1,06	<b>1,02</b>
Updating the standard allowances to current price and quality levels	3,23	<b>1,60</b>	1,94	<b>1,25</b>	2,58	<b>1,43</b>
Earmarking of the municipal educational real estate budgets	1,84	<b>1,23</b>	1,09	<b>1,02</b>	1,47	<b>1,13</b>
<b>SCENARIO 3: ENHANCING THE FINANCIAL MANAGEMENT</b>						
Benchmarking of school boards	1,46	<b>1,12</b>	1,54	<b>1,14</b>	1,50	<b>1,13</b>
Increasing financial expertise of school boards	1,66	<b>1,18</b>	1,86	<b>1,23</b>	1,76	<b>1,20</b>
Benchmarking of municipalities	1,59	<b>1,16</b>	1,39	<b>1,10</b>	1,49	<b>1,13</b>
Increasing financial expertise of municipalities	1,61	<b>1,16</b>	1,40	<b>1,11</b>	1,50	<b>1,14</b>
<b>SCENARIO 4: CHANGING THE PROGRAM OF REQUIREMENTS</b>						
Using quality demands	2,53	<b>1,41</b>	2,25	<b>1,34</b>	2,39	<b>1,37</b>
Using performance documents	2,36	<b>1,37</b>	1,78	<b>1,21</b>	2,07	<b>1,29</b>
<b>SCENARIO 5: OPTIMIZING THE MAINTENANCE POLICY</b>						
Introducing the right on renovation	2,16	<b>1,31</b>	1,31	<b>1,08</b>	1,73	<b>1,20</b>
Advanced decentralization of the external maintenance	2,70	<b>1,46</b>	1,42	<b>1,11</b>	2,06	<b>1,28</b>

Table 11-4: Overview of the different proposed improvement measures; normalized as a result of calibration

## 11.7 Modeling

On the next pages the results of the modeling of the impact of the proposed measures on the sustainable value creation over the lifetime of an average Dutch primary school are depicted. On the next page, the averaged results are shown per scenario (Fig. 11-30). Then two pages are filled with graphical comparisons between the answers of the school boards and the municipalities as the twelve proposed improvement measures are dealt with one by one (Fig. 11-31). Finally, the averaged results on all improvement measures are summarized within one graph (Fig. 11-32). These results will be put into context in the next chapter as the conclusions will be drawn and recommendations will be formulated there.

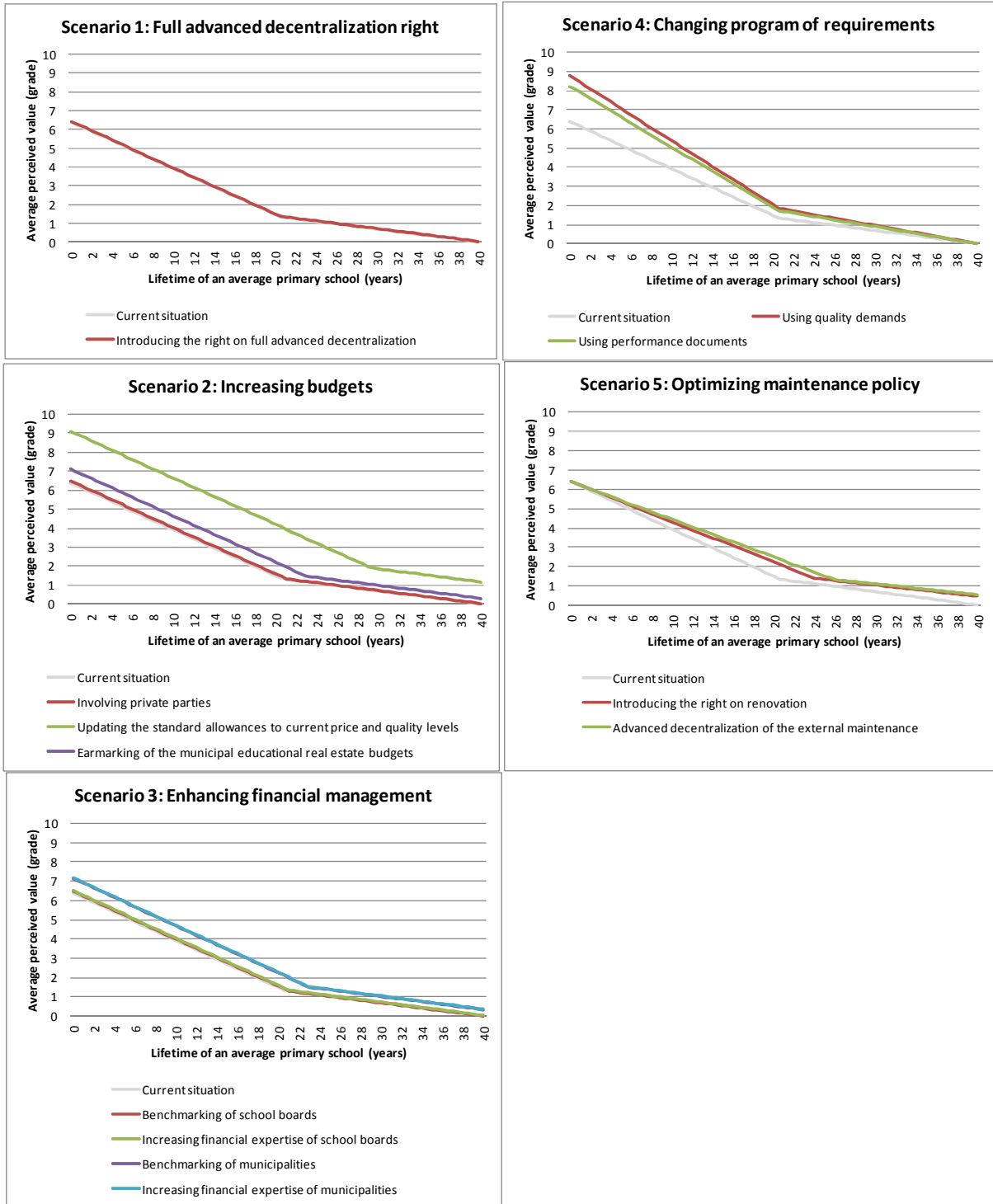


Figure 11-30: Comparisons between the proposed improvement measures by scenario

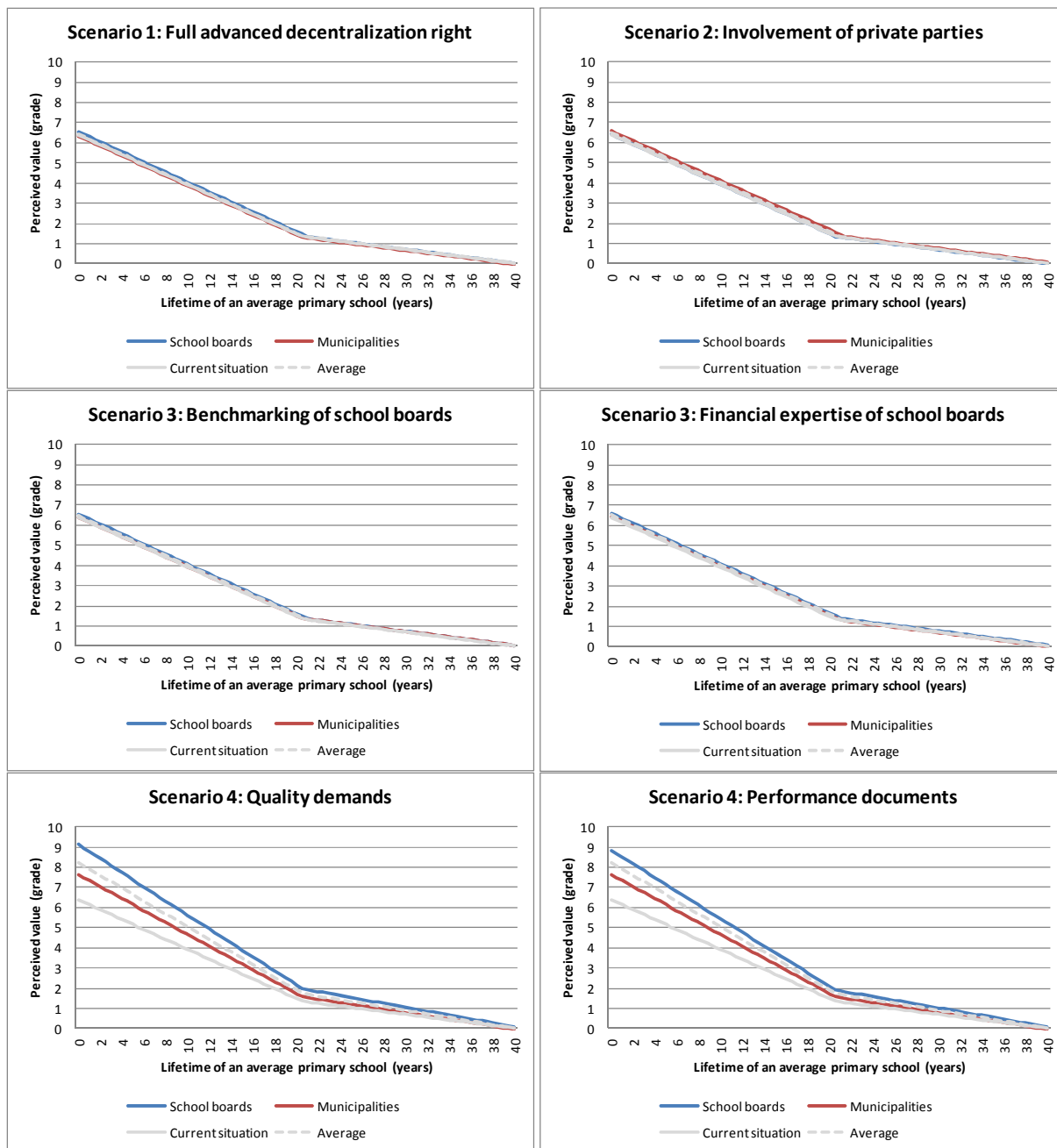
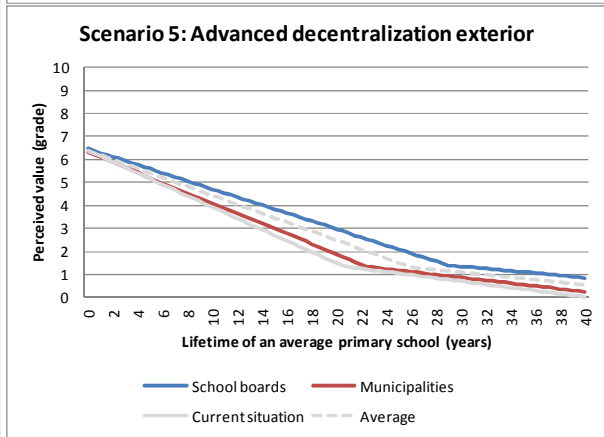
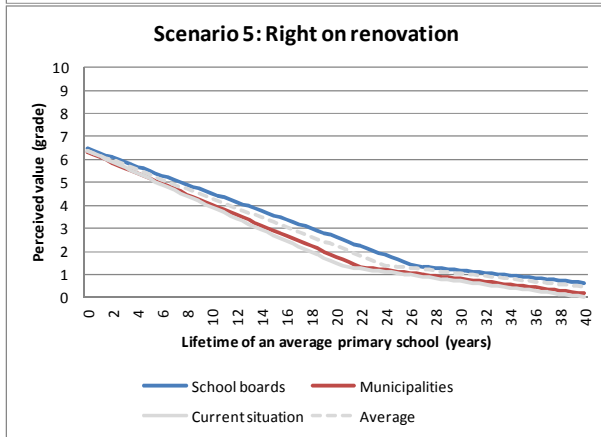
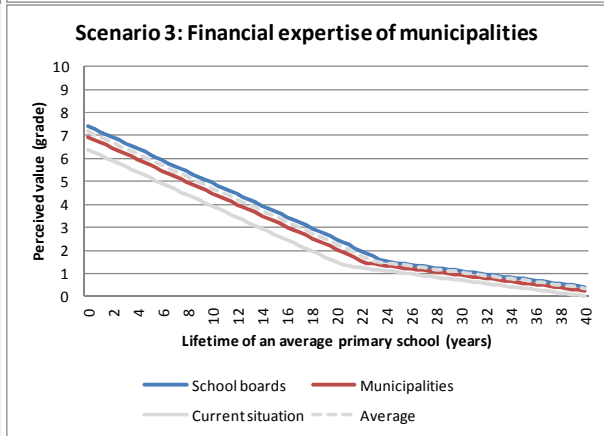
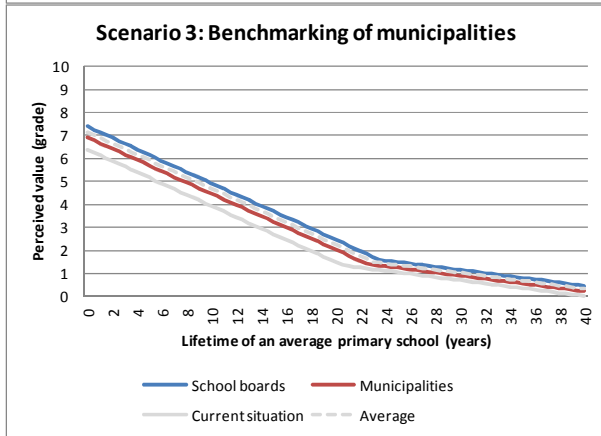
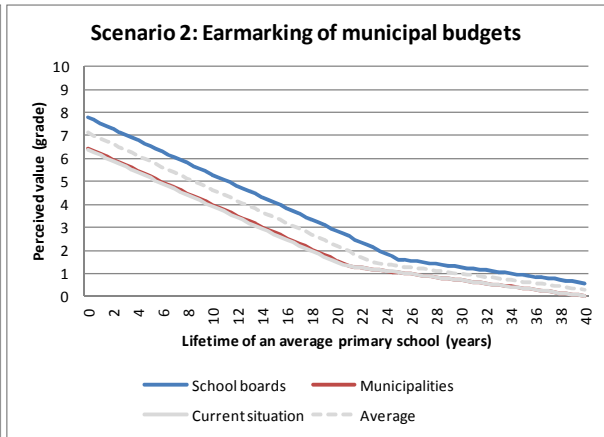
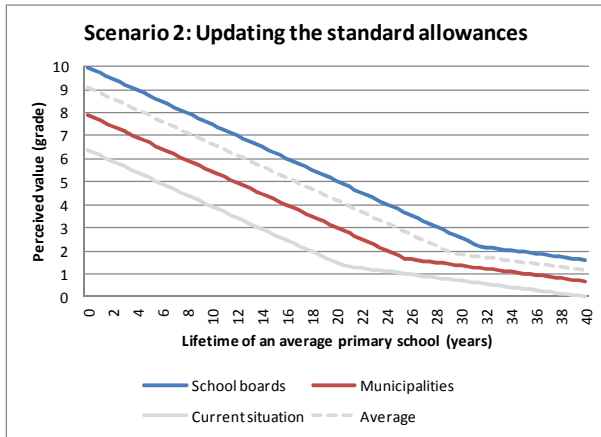


Figure 11-31: Comparisons between the proposed improvement measures by target group





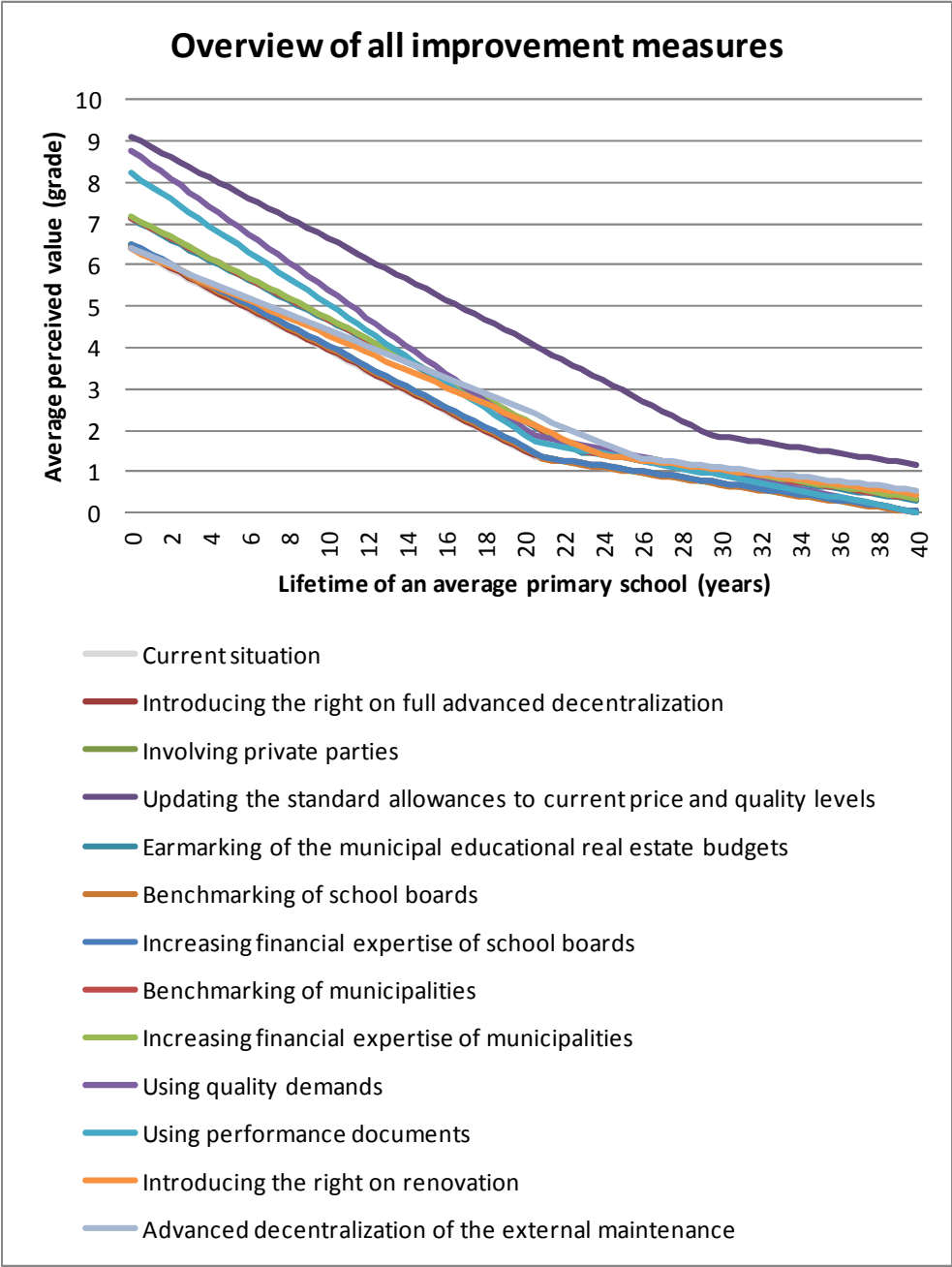


Figure 11-32: Average perceived value of all improvement measures

## 12. Conclusions and recommendations

After all the steps described earlier on in this report it is finally possible to answer the primary research questions. By summarizing the answers on the secondary research questions that have been gathered along the way in this report these primary research questions will be answered in the next paragraph. Following this, these answers will be put into context as the research and research process will be reflected upon in the discussions paragraph. Finally, the results of this research will be put further into context as the practical relevance of the research results for the actors involved and the recommendations for further research will be discussed.

### 12.1 Conclusions

In chapter 2, the design and research questions of this research have been introduced. During the course of this report the several secondary research questions have been answered:

I	<i>How is the current financing of educational real estate organized?</i>
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The current financing of primary educational real estate can be divided in two scenarios. The first can be characterized as the regular way of financing in which the municipality is responsible for the creation and larger – and primarily external – maintenance for the schools and the school boards are responsible for the exploitation and smaller – and primarily internal – maintenance. The other scenario of advanced decentralization consists of a transfer of the responsibilities and accompanying budgets from the municipalities to the school boards; enabling an integral housing policy at the side of the school boards.

II	<i>What problems are currently present within the educational real estate sector?</i>
----	---

The division of responsibilities as described in the regular financing scenario above creates a conflict of interest as the municipalities wish to optimize the investment side and the school boards wish to optimize the exploitation side of the life-cycle costs. In this way, the regular way of financing results in schools of suboptimal quality as no integrally responsible actor is present who could advocate for larger initial investments who might ask for larger initial investments, but that could recover their initial investments over the life-cycle of a building. Examples of these kinds of investments are investments in the realms of sustainability or indoor climate installations. More general, currently the sector encounters problems within the realms of the program of requirements; laws and regulations; budgets and cash flows; quality assurance and monitoring; clientship; cooperation and research agenda. However the main problem is that, because of the fragmentation within the financing system, there is a lack of a clear problem owner.

III	<i>What solutions are possible for creating more value in the educational real estate sector?</i>
-----	---

Next to optimization of the cooperation and the building process, most solutions consider alternative proposals for the financing system or optimization measures for the current

financing system. Since the optimization of the current financing system can count on more support than the implementation of alternative ways of financing, solutions within this research direction will be investigated.

IV	<i>How can sustainable value creation be defined?</i>
----	---

Sustainable value creation can be defined as a combination of optimization of the total initial value creation and the optimization of the total value decay over the entire life-cycle of the building. Value is within this context subdivided in user value, experiential value, technical value and economical value; further subdivided in a total of 36 value elements as they have been defined within the context of HEVO's Sustainable Performance 2.0 philosophy.

V	<i>Which factors are most influential on sustainable value creation?</i>
---	--

After verification by experts of HEVO of the influential factors on sustainable value creation, that have been gathered by means of literature research, twelve influential factors within the context of five scenarios have been selected for further research. These scenarios focus on introducing the right on full advanced decentralization; increasing the budgets; enhancing the financial management; changing the program of requirements and optimizing the maintenance policy.

VI	<i>How can these factors be quantified?</i>
----	---

After a comparison with other quantitative research methods, the Analytical Hierarchy Process has been selected for quantifying the influential factors by using the method within the context of a questionnaire amongst school boards and municipalities. The effect of the factors on the sustainable value creation within primary schools has been determined by finding out the currently perceived value of the average Dutch primary school – by means of a questionnaire amongst users, architects, school boards and municipalities – and modeling the impact of the improvement measures on this currently perceived value by using the System Dynamics methodology.

By combining these answers on the secondary research questions, the primary research questions can now be answered:

1.	<i>Does the current way of financing of educational real estate influence the value creation within primary schools in a negative way?</i>
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By performing literature research in the previous chapters enough evidence is gathered to confirm the first primary research question of this research; the current way of financing of educational real estate does influence the value creation within primary schools in a negative way, as it is described in chapter 4 (Pol, L. van der e.a. 2009; Barendregt, E. e.a. 2010; Uhlenbusch, M. e.a. 2011 and others).

2. Which changes in the way of financing of educational real estate could enable a higher and more sustainable value creation within primary schools?

Considering the answering of the second primary research question, the answers from the questionnaire and the graphs created by the model have resulted in enough data for drawing some conclusions. First of all some differences in the support for different improvement measures between school boards and municipalities, which were encountered during the literature research part, have been confirmed (Fig. 12-1). School boards are for example more in favor of the advanced decentralization of the external maintenance than municipalities are, whereas municipalities see more need in the enhancement of the financial management of school boards than they themselves do. Also, the need for updating of the standard allowances is indicated by both groups, as is the preference for the use of quality demands and performance documents instead of the currently used programs of requirements. Next to this it is remarkable that school boards expect overall a larger effect from the improvement measures as the municipalities do.

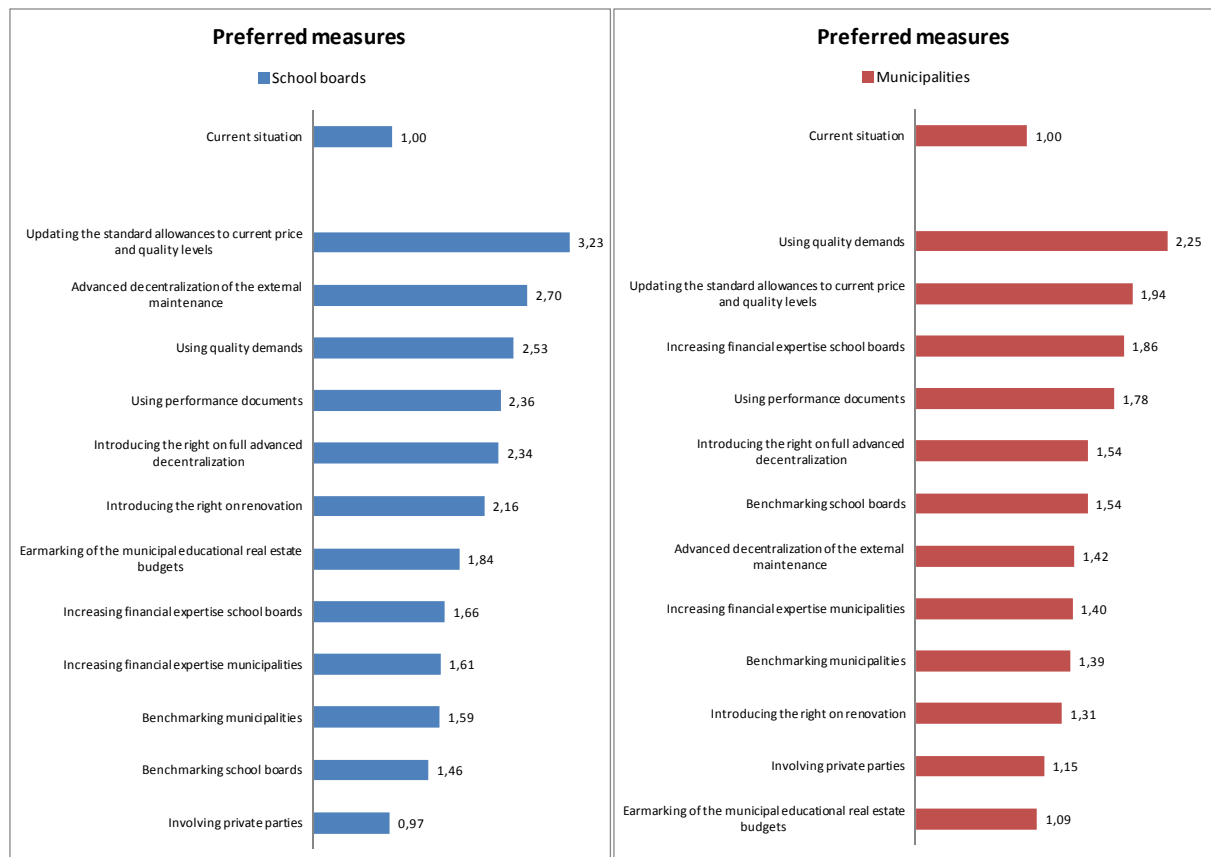


Figure 12-1: Preferred improvement measures by both school boards and municipalities

When combining these answers, one can say that improvement measures within the scenario of the change of the program of requirements, as well as the updating of the standard allowances and measures directed to advanced decentralization can count on the most general support of both actors involved. If one looks at the modeled effects one can say that of these

measures, the updating of the standard allowances will have the highest effect on optimization of the sustainable value creation as it influences both the creation and maintenance of primary schools (Fig. 12-2). This influence is different and higher compared to that of the measures on the program of requirements, which primarily influence the initial value creation, as not so much the value decay.

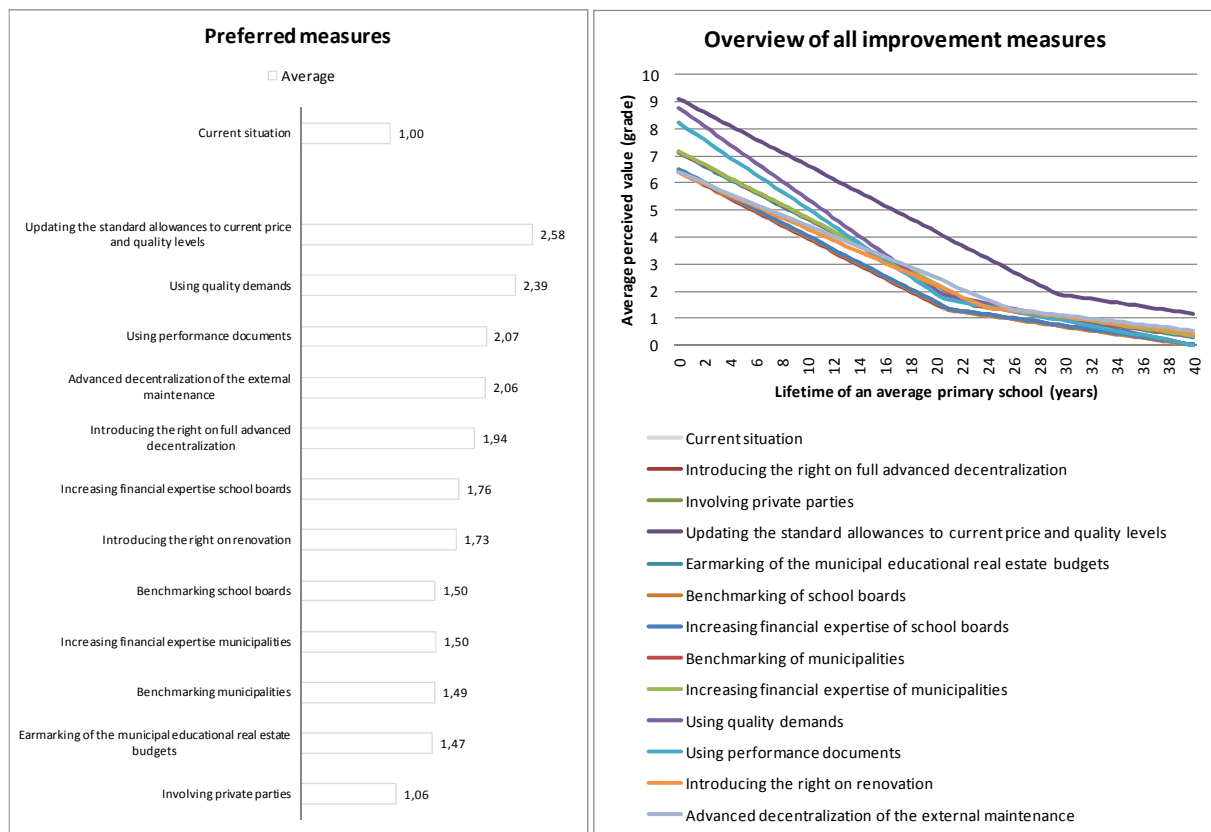


Figure 12-2: Overview of the average preferred measures and their impact on the sustainable value creation

## 12.2 Discussions

### 12.2.1 Discussion on the quantitative dynamic system approach

During the literature research phase on the Dutch primary education sector it became clear that primarily qualitative research on problems and value creation within the (financial system of the) primary educational real estate is performed as opposed to quantitative research (Tab. 12-1), something which is confirmed by the Rijksbouwmeester report which pleads for more quantitative scientific research on the primary educational real estate sector (Pol, L. van der e.a. 2009). However, the quantitative researches that do have been performed tend to focus on one subject or on one relationship. The user experience and user wishes of primary school users have been investigated (Adriaansen, W.J.A. e.a. 2011; Bakers, J. e.a. 2010 and Walraven, A.R. 2008) or a benchmark on the financial management is performed (Adriaansen, W.J.A. e.a. 2011 and Don, H. e.a. 2009). The budgets and cash flows regarding the creation of new schools are investigated (Arkesteijn, M. e.a. 2009; Swart, M.A. 2009 and Vermeer, D.M.M. 2006) or the support for one particular improvement measure like the advanced decentralization of the

external maintenance is investigated (Berndsen, F.E.M. e.a. 2012 and Diepeveen, M. e.a. 2004). Or the effect of the application of Public Private Partnerships on the quality of schools has been investigated (Wolff, R. 2011). All of these researches tend to be rather static and specific. The integral approach of this research, looking at the matter from a dynamic complex eco-system point of view, will hopefully encourage other researchers to follow up on this line of research as more dynamic system quantitative research might help the primary educational real estate sector become more efficient and sustainable. This method of researching might be applied on determining the influence of other influential factors on the sustainable value creation within primary schools or could be used in a similar way in other real estate sectors.

Qualitative researches	Quantitative researches
(Adriaansen, W.J.A. e.a. 09-01-12; Andersson Elfers Felix 2005; Appel, P. e.a. 07-03-12; Barendregt E. e.a. 2010; Basari, K. (red.) 2011; Beek, H. e.a. 2006; Bergvelt, C. e.a. (red.) 2010; Bloois, R. van e.a. 03-04-12; Bosch, S. van den 2007; Frijns, W.M.M. 2007; Fuite, M. e.a. 2011; Giebbels, E. 2002; Gramberg, P. e.a 2010; Leun, A. van der (red.) 2009; Midden, G.J. van 07-03-12; Migchielsen, H. 07-03-12; Pol, L. van der e.a. 2009; Proosdij, E. van 2007; Roemaat, W.J.J. 2011; Rutjes, F.e.a. (red.) 2007; Sande, L. E. van de 2009; Schraven, J.W. e.a. 1997; Steltenpool, R. 2007; Uhlenbusch, M. e.a. 2011; Uhlenbusch, M. e.a. 2011; Vermeer, D.M.M. 2009; Vries, T.A.J. de 2008; Zandwijk, M. van e.a. 2011)	(Adriaansen, W.J.A. e.a. 2011; Adriaansen, W.J.A. e.a. 2011; Arkesteijn, M. e.a. 2009; Bakers, J. e.a. 2010; Berndsen, F.E.M. e.a. 2012; Diepeveen, M. e.a. 2004; Don, H. e.a. 2009; Swart, M.A. 2009; Vermeer, D.M.M. 2006; Walraven, A.R. 2008; Wolff, R. 2011)

Table 12-1: Classification of qualitative and quantitative Dutch researches on the primary educational real estate sector

Apart from the Dutch literature on the primary educational real estate sector, it also became clear that the way to approach value creation that has been used in this report is pretty unique in the scientific world, which could lead to a publication possibility for the university. This presumption should however be verified, which could be done by performing more research on already published papers or by sending a concept version of a paper to the magazines earlier mentioned in this report to get feedback in this regard.

### 12.2.2 Discussion on the Analytical Hierarchy Process

The choice for AHP over other quantitative research methods has been elaborated upon in chapter 9. AHP has been chosen over the Likert-scale there as AHP can provide in a relative ranking based on comparative judgments of value elements, instead of a ranking of separate judgments, ranking one value element at a time. This can be seen as beneficial for the results to be gathered; however this choice also had an unintended side-effect. Some respondents have indicated that they found the comparisons too abstract or too difficult, which finally resulted in some loss of response.

Also the principle and core of AHP, which is gathering insight into a complex problem by unraveling it into elements which can be compared to each other, is discussed as some target groups find it inappropriate and plead for an integral approach to the design of primary schools in which the total is more than the sum of its parts. Other find it sometimes hard to compare two specific value elements as these sometimes do not have to do too much with each other, but are however still part of the some value which is a result of the grouping of value elements as it has been done by HEVO. Next to that, some respondents have found it hard to make distinctions between two value elements as they found a lot of elements equally important.

Nevertheless differentiated results can be obtained from the results of this questionnaire as, luckily, not all respondents have had this view on the matter.

Also the categorization of the elements, which was necessary for reducing the amount of comparisons, has been questioned. Most categorizations have been chosen pretty well, however the consistent sets of responses regarding the user value clusters have been relatively low, making this user value part of the results a little less valid, since the relative importance factors of the clusters heavily influences the relative importance of the value elements of which they are composed.

Next to this, AHP has been chosen primarily while focusing on finding the relative importance of the value elements. It has been also applied on finding the relative importance of the improvement measures. This do has resulted in restrictions for the possibilities considering the amount of improvement measures to be compared per scenario as the total number of comparisons and questions of the questionnaires needed to be reduced as much as possible in order to optimize the possible response. Another restriction of AHP is the fact that it allows only for comparisons of two measures at a time, which limits the interpretation possibilities of the results. Conjoint Analysis could be interesting for finding reactions of school boards and municipalities on combinations of measures.

### **12.2.3 Discussion on the questionnaire**

A lot of substantive remarks on advanced decentralization from the daily practice have been made by both the school boards and municipalities which mostly support the graphic results. Remarkably, some respondents confirm the conflict of interests between school boards and municipalities, whilst others deny it. Apart from this the possibly too high abstraction level of the questionnaire and the fact that the respondents were investigated upon scenarios which they do not encounter on a day to day base forced the respondents to spend more time on the questionnaire than expected: sometimes 20 instead of 10 minutes and 30 instead of 15. The long time span of the questionnaire has been linked by some respondents to a decreasing concentration level and thus a possibly decreasing trustworthiness of the gathered data. Also some respondents found it annoying that the definitions of the value elements were clustered at the top of each questionnaire section as opposed to placed separately at every comparison. Next to this some definitions of the value elements and the improvement measures were not always perceived as being totally clear. Finally, more examples to clarify the questions and a possibility to pause the questionnaires would have been appreciated.

Apart from these remarks some enthusiastic comments were received from respondents which were very interested in the results as they could use them for example for guiding a program of requirements workshop or creating a new program of requirements themselves.

Next to the remarks of the respondents, the time planning of the questionnaire has not been ideal. The creation of the model, the questionnaire and the determination on the method for obtaining the improvement measures multiplication factors did take that much time that the questionnaire has been sent not earlier than a week before the first region would go on

summer holiday. This possibly reduced the overall response in general and the geographical spread of the response in particular as the South region was the first to go on a holiday and a lot of respondents were too busy there with finalizing their school year to participate in questionnaires.

The GoogleDocs software package that has been used in the creation of the questionnaires has had a tremendous advantage in the fact that it automatically combines all answers on the digital questionnaires within easy downloadable Excel sheets. However, the program has its limitations regarding the way of asking questions. It has proven to be unable to put the two value elements or improvement measures at two sides of the answering scale, which resulted in more abstract and difficult questions which possibly reduced the response rate.

Eventually, the absolute response can be considered as satisfactory. The relative response rate can be considered as somewhat low, but this can be explained by the vast amount of possible respondents that have been approached.

Furthermore, regarding the grading of the value elements it should be noticed that the averaged results that have been used as input for the model are the combined results of one questionnaire to the users and the architects and another to the school boards and municipalities. This should be taken into mind when interpreting these results, as at the moment it is not clear if the technical and economical value is really worse than the user and experiential value, since these are assessed by the different target groups. Another explanation could be that generally speaking municipalities and school boards tend to assess criteria in a more critical way than users and architects do.

Finally, during the modeling it became clear that the way in which the perceived influence of improvement measures on the advanced decentralization ratio had been questioned should have been differently, as this leverage point functions differently within the model than the others. This however will be further elaborated upon in the discussion section on the System Dynamics model.

#### **12.2.4 Discussion on System Dynamics**

The choice for this research method has been based primarily upon personal experience and not on a market scan of different dynamic research methods. However, because of this during the process valuable time has been saved in creation of the model and the running of the scenarios, as no time was lost on the search for other dynamic system methods. Furthermore this method has been proven in the past to be a decent method for quantitatively estimating the influence of different scenarios within the context of a complex system; like it has been in this research. However, also the limitations of the method should be stressed. The complex system which is modeled in System Dynamics models can only be as big as its boundaries allow it to be. The choice on determining the boundaries of the system, as to which influential factors are included and which not, heavily influences the results. Too less included factors will end up in too simplified conclusions, whereas too much factors involved will make the model less easy to interpret. Despite the possibilities of a System Dynamics model to map a complex system



one should realize that a model is and always will be a simplified resemblance of reality. This should be kept in mind during the interpretations of the results of any System Dynamics research.

#### 12.2.5 Discussion on the model

The main subject of discussion is that the model calculates one average value for all Dutch schools, regardless of age and moment of renovation or maintenance. This makes the model very abstract and it is important to keep this in mind whilst interpreting the results. Furthermore the discussion on the model primarily focuses on to subjects: its boundaries and which other factors could possibly be included and investigated; and the sensitivity analysis of the factors that are currently included.

Regarding the boundaries and the current amount of influential factors included; these are primarily decided upon as a result of limitations of the questionnaires and the research method which it is based upon. The Analytical Hierarchy Process quickly ends up in a lot of to be judged comparisons if too much variables are included within one cluster. Since the most of the quantitative input for the model had to come from a questionnaire, this heavily influenced the amount of influential factors which could be investigated; as too many questions might radically reduce the response of the questionnaire.

Nevertheless, the influence of several other factors on the sustainable value creation within primary schools might be interesting to investigate and possibly add to the created model:

- Splitting the total possible value creation in the value creation within advanced decentralized schools and that within non-advanced decentralization schools; being able to compare both.
- Include and more specifically quantify the dynamic influence of different types of maintenance and renovation; being able to more realistically model the perceived value of a school building over the lifetime.
- Include the financial management influence of municipalities within the advanced decentralization scenario and the financial management influence of school boards within the regular scenario. Although these influences are expected to be limited, they make the model more realistic.
- Include possible measures from alternatively proposed financing structures like the Fresh Alternative; which might complicate the model but also enable a wider overview on the proposed solutions.
- Include possible proposed measures from the realms of governance, cooperation, project management and Total Engineering. Although these more abstract influential factors are hard to quantify one might try to by using combinations of methodologies like Game Theory teamed up with Conjoint Analysis. The results of such a research could be added to the model, making it more realistic.
- Include influence of the size of scale of the school boards and municipalities as several respondents indicate and suspect a relationship between larger organizations and better financial management.

- Include effects of shrinkage regions on the average value creation, as this problem will become more evident in the future.
- Like the effect of the possible advanced decentralization synergy gain, also the expected effect of other measures can be included by value to approximate their effect more closely.
- The possible synergy effect on the total possible value creation of several measures might be included, as several respondents advocated for a more integral approach regarding the questionnaire

Regarding the sensitivity analysis of the influential factors that do have been included, two types stand out in being different: the advanced decentralization ratio and the depreciation periods of the different values. All other factors have an equal influence, since in the standard situation these by multiplications and divisions interrelated factors are all attributed a value of 1. In this way, one could say that the entire research can be seen as one big sensitivity analysis of the complex financing system of primary educational real estate as the effect of each proposed improvement measure is modeled one measure at a time.

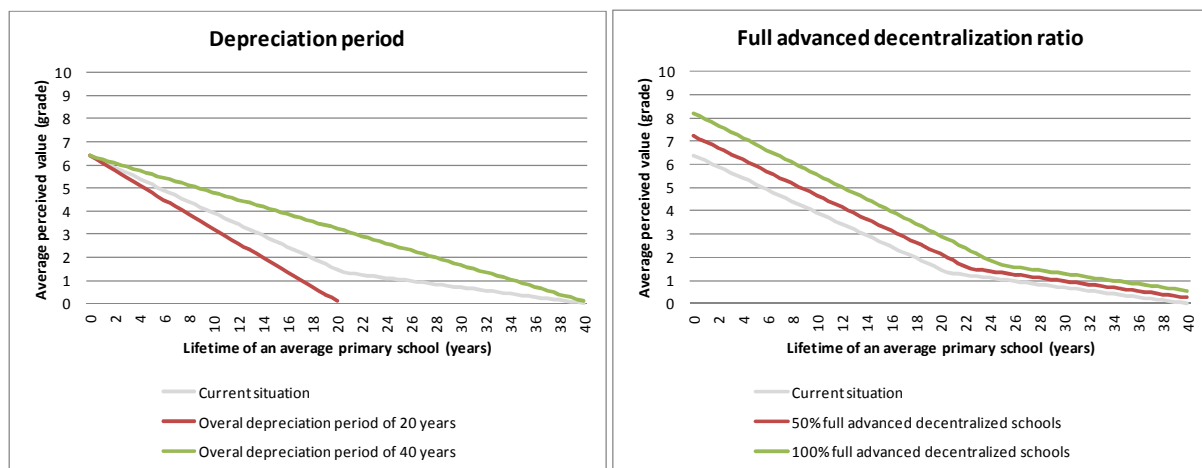


Figure 12-3: Leverage points within the model

The depreciation periods have a large influence on the results as it can be seen in the left graph (Fig. 12-3). More research on these how to more exactly define these depreciation periods and how to find better arguments for their values is desired, as the current values are a result of mere estimations.

The full advanced decentralization ratio is another leverage point within the model. Since the current level of advanced decentralization, and which is also include in the model, is estimated on 7.5% (Berndsen, F.E.M. e.a. 2012) it would be interesting to see what increase both school boards and municipalities would expect if for example the right on full advanced decentralization would be introduced. However, since this factor has a different standard value than the others, a different way of questioning should have been included in the questionnaire for obtaining the correct multiplication factors, as opposed to applying AHP. A way of questioning which would be more related to how the synergy effect of advanced

decentralization has been asked would have been more suitable. Nevertheless, the effect of several possible answers can be seen in the right graph, enabling to compare the possible influence of this measure to that of the others.

Another more implicit way of sensitivity analysis is comparing ways to calibrate the model. In the previous parts the relative importance factors that have been attributed to the different proposed improvement measures have been normalized, as to which the largest attributed value would ensure the graph to visualize a 10. Another way to calibrate the model is by deciding that the total possible value creation can only be a 10 if all improvement measures are applied at the same time. The latter method might seem more realistic as it is quite arbitrary to state that the value creation within a school might skyrocket from a 6.2 to a 10 because of the introduction of one improvement measure; as is the case in the former method. However, when the model is being interpreted in the right way, as being a visual companion to the obtained relative comparisons of proposed improvement measures – and nothing more than that – one would most likely opt for the first method as it enable the spectator to more closely study the differences in effect over the lifecycle of the different measures. Some measures influence the initial value creation, some the value decay whereas others influence both. Furthermore, the differences in visualization might influence the amount of impact of the research results as one could suspect that the neutral unknowledgeable spectator might be more impressed by the results visualized in the former way as in the latter way. On these pages the different ways of calibration are visualized by ways of graphs and a table (Fig. 12-4 and Tab 12-2). Also the effect of both ways of calibration on the research results is depicted (Fig. 12-5).

	Calibrated weighing factors	Normalized weighing factors
<b>SCENARIO 1: INTRODUCING THE RIGHT ON FULL ADVANCED DECENTRALIZATION</b>		
Introducing the right on full advanced decentralization	1,25	<b>1,08</b>
<b>SCENARIO 2: INCREASING THE BUDGETS</b>		
Involving private parties	1,02	<b>1,00</b>
Updating the standard allowances to current price and quality levels	1,43	<b>1,13</b>
Earmarking of the municipal educational real estate budgets	1,13	<b>1,04</b>
<b>SCENARIO 3: ENHANCING THE FINANCIAL MANAGEMENT</b>		
Benchmarking of school boards	1,13	<b>1,04</b>
Increasing financial expertise of school boards	1,20	<b>1,06</b>
Benchmarking of municipalities	1,13	<b>1,04</b>
Increasing financial expertise of municipalities	1,14	<b>1,04</b>
<b>SCENARIO 4: CHANGING THE PROGRAM OF REQUIREMENTS</b>		
Using quality demands	1,37	<b>1,12</b>
Using performance documents	1,29	<b>1,09</b>
<b>SCENARIO 5: OPTIMIZING THE MAINTENANCE POLICY</b>		
Introducing the right on renovation	1,20	<b>1,06</b>
Advanced decentralization of the external maintenance	1,28	<b>1,09</b>

Table 12-2: Normalization of multiplication factors from the current to the alternative way of calibration

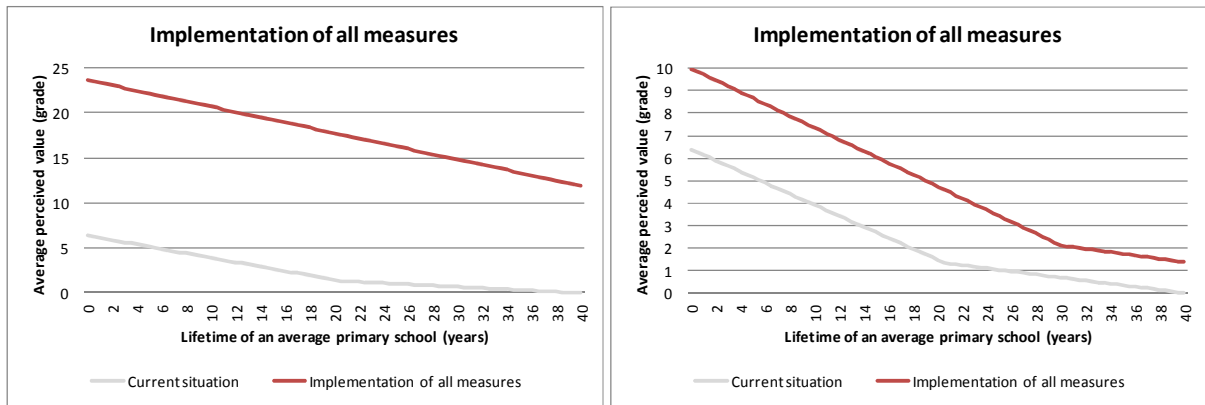


Figure 12-4: The current (left) and alternative (right) way of calibration

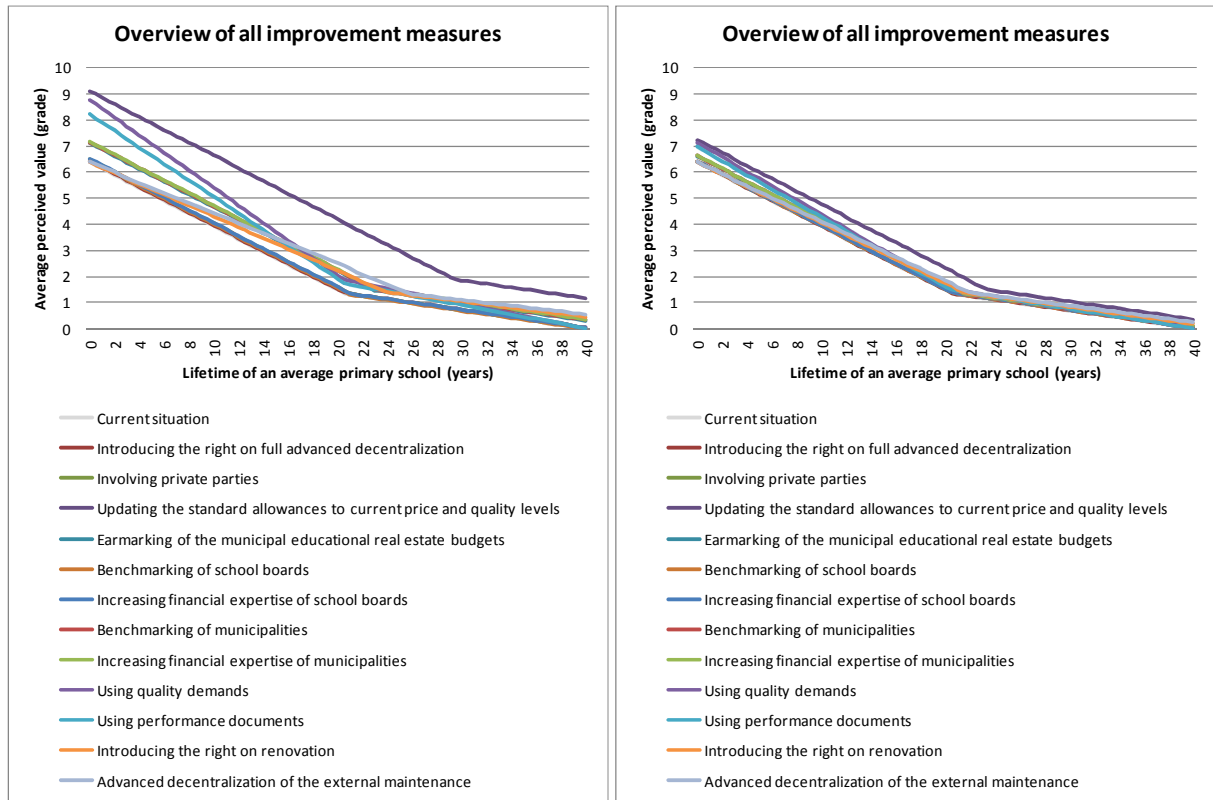


Figure 12-5: Different results using the current (left) and the alternative (right) way of calibration

## 12.3 Recommendations

Now that the conclusions have been drawn and put into context in the discussions section it is time to discuss how in what way which actors can profit from the gathered knowledge. Furthermore recommendations for further research will be done.

### 12.3.1 Recommendations for HEVO

Since the fact that HEVO is a project management housing advice agency in – amongst others – the primary educational real estate sector the company could use the results of this research in

many ways. First of all the company gets more insight in how different key actors with which it communicates on a day to day base look at the value of primary schools. Having learned this knowledge the company might approach and deal with these actors more effectively in the future. Next to that, the company is the first one to have this knowledge which gives it the advantage to publish the results or present the results on a symposium. In this way the company could get a lot of publicity and possible future acquisition, as the gathered knowledge can most probably also count on attention from the company's target groups, which will be further discussed in the following paragraph. Furthermore, this thesis might provide in some more practical changes within the company. The gathered results on the value elements could be an ideal kick-off in a discussion with a client on determining the right program of requirements for the school. In further establishing the exact wishes of the client, HEVO could apply AHP-based questionnaires similar to the one that has been used in this research. If the client wishes to do so these investigations could be extended by simulating the effect on the value creation of transferring of budgets from value to value within the context of a System Dynamics model.

### **12.3.2 Recommendations for the involved target groups**

All involved target groups in the questionnaire can benefit from the gathered knowledge as well. Like HEVO, it can help them in the process of the determination of the program of requirements; whichever role they play. Also, several actors might use AHP-questionnaires to obtain a general overview of the wishes for a new building and create support for the new building in this way. Furthermore, architects and users could learn from and reflect on their differences in the evaluation of the user and the experiential value. Likewise, school boards and municipalities can do the same considering the technical and the economical value. Next to that architect and users might get more insight in the goals of both the school boards and the municipalities regarding the technical and economical value of primary schools. Also, they might get a better understanding of the dynamics between these two main actors within the context of the financing system. In their turn, school boards and municipalities might learn from the attitudes and evaluations of users and architects towards functional and experiential quality. Also, they could learn from and try to take away prejudices of the other negotiation partner within the financing system as they can compare the different results on the relative importance of the proposed improvement measures.

### **12.3.3 Recommendations for the national government**

The national government gets insight in the evaluation of current-day schools compiled by all main actors involved, as well as insight in the support for possible improvement measures of the current financing system from both the school boards and municipalities that are involved. Since the topic of primary educational real estate is a hot one momentarily within the debate agenda of the parliament, considering the decision on the advanced decentralization of the external maintenance in March 2012 and the postponing of the right on full advanced decentralization in June 2012, the members of parliament might be interested in a research on the support of possible other improvement measures of the current financing system.

#### **12.3.4 Recommendations for further research**

Other influential factors on the value creation within the primary educational real estate sector could be investigated or the influence of some factors could be investigated more thoroughly. These options have been elaborated upon earlier in the discussions sector. Next to that the dynamic system quantitative research approach could be applied on other real estate sectors, like it has been proposed there.



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## Reactions on research reports

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## Symposium

7<sup>th</sup> of March symposium at Eindhoven University of Technology on Educational real estate: “*Het spel en de knikkers*”. Key speakers:

Name	Function	Organization
Frans Rutjes	Former advisor	VNG
Gert-Jan van Midden	Advisor	PO-raad
Boris van der Ham	Representative on education	D'66 political party
Hans Mighielsen	Chair department of Youth and Education	Municipality of Den Bosch
Paul van Appel	Chairman Board of Directors	Markant Onderwijs Breda
Frank van Esch	Chairman Board of Directors	INOS, Stichting Katholiek Onderwijs Breda
Rob Hoogzaad	Senior employee educational real estate development	Municipality of Breda
Mary-Ann Schreurs	Alderman	Municipality of Eindhoven
Harry Vedder	Chairman	Platform educational real estate
Jeroen Vrolijk	Sectorspecialist education & Charitas	Rabobank



## System Dynamic model equations

Variable	Equation	Initial value (in case of stock)
<b>Possible total value</b>	Possible economical value * Weighing factor economical value + Possible experiential value * Weighing factor experiential value + Possible technical value * Weighing factor technical value + Possible user value * Weighing factor user value	
<b>Possible user value</b>	INTEG(-Possible user value decay)	Possible initial user value
<b>Possible initial user value</b>	Experienced user value * Optimization initial user value by governance process	
<b>Experienced user value</b>	1. * Acoustic comfort + 2. * Building flexibility + 3. * Group spaces flexibility + 4. * Functionality educational concept + 5. * Functionality supportive functions + 6. * Functionality playground + 7. * Air quality + 8. * Multifunctionality spaces + 9. * Thermal comfort + 10. * Building accessibility	
<b>Possible user value decay</b>	IF THEN ELSE(Possible user value > 0, (Possible initial user value * (1 / Depreciation period user value)), 0 )	
<b>Depreciation period user value</b>	20 * Minimization user value decay by governance process	
<b>Possible experiential value</b>	INTEG(-Possible experiential value decay)	Possible initial experiential value
<b>Possible initial experiential value</b>	Experienced experiential value * Optimization initial experiential value by governance process	
<b>Experienced experiential value</b>	11. * Architecture and appearance + 12. * Daylight entrance + 13. * Sustainability + 14. * Ecology + 15. * Influence on indoor climate + 16. * Atmosphere and image + 17. * Social security + 18. * Transparency + 19. * Visibility of nature/landscape	
<b>Possible experiential value decay</b>	IF THEN ELSE(Possible experiential value > 0, (Possible initial experiential value * (1 / Depreciation period experiential value)), 0)	
<b>Depreciation period experiential value</b>	40 * Minimization experiential value decay by governance process	
<b>Possible technical value</b>	INTEG(-Possible technical value decay)	Possible initial technical value
<b>Possible initial technical value</b>	Experienced technical value * Optimization initial technical value by governance process	
<b>Experienced technical value</b>	20. * Waste awareness + 21. * Simplicity of technical solutions + 22. * Energy usage + 23. * ICT-facilities + 24. * Material usage + 25. * Maintainability + 26. * Cleanability + 27. * Standardization + 28. * Water (re-)usage	
<b>Possible technical value decay</b>	IF THEN ELSE(Possible technical value > 0, (Possible initial technical value * (1 / Depreciation period technical value)), 0 )	
<b>Depreciation period technical value</b>	20 * Minimization technical value decay by governance process	
<b>Possible economical value</b>	INTEG(-Possible economical value decay)	Possible initial economical value
<b>Possible initial economical value</b>	Experienced economical value * Optimization initial economical value by governance process	
<b>Experienced economical value</b>	29. * Management synergy + 30. * Possibilities for redevelopment + 31. * Corporate Social Responsibility + 32. * Maximization of real estate value + 33. * Optimization of exploitation costs + 34. * Optimization of investment costs + 35. * Spatial synergy + 36. * Rentability of parts of the building	
<b>Possible economical value decay</b>	IF THEN ELSE( Possible economical value > 0, (Possible initial economical value * (1 / Depreciation period economical value)),0 )	
<b>Depreciation period economical value</b>	40 * Minimization economical value decay by governance process	

Table 0-1: Equations of the sustainable value creation model

Variable	Equation
<b>Minimization user value decay by governance process</b>	1 * (Efficiency in the maintenance of advanced decentralized schools * Advanced decentralization synergy gain on user value decay + Efficiency in the maintenance of non-advanced decentralized schools)
<b>Optimization initial user value by governance process</b>	1 * (Efficiency in the creation of advanced decentralized schools * Advanced decentralization synergy gain on initial user value + Efficiency in the creation of non-advanced decentralized schools)
<b>Minimization experiential value decay by governance process</b>	1 * (Efficiency in the maintenance of advanced decentralized schools * Advanced decentralization synergy gain on experiential value decay + Efficiency in the maintenance of non-advanced decentralized schools)
<b>Optimization initial experiential value by governance process</b>	1 * (Efficiency in the creation of advanced decentralized schools * Advanced decentralization synergy gain on initial experiential value + Efficiency in the creation of non-advanced decentralized schools)
<b>Minimization technical value decay by governance process</b>	1 * (Efficiency in the maintenance of advanced decentralized schools * Advanced decentralization synergy gain on technical value decay + Efficiency in the maintenance of non-advanced decentralized schools)
<b>Optimization initial technical value by governance process</b>	1 * (Efficiency in the creation of advanced decentralized schools * Advanced decentralization synergy gain on initial technical + Efficiency in the creation of non-advanced decentralized schools)
<b>Minimization economical value decay by governance process</b>	1 * (Efficiency in the maintenance of advanced decentralized schools * Advanced decentralization synergy gain on economical value decay + Efficiency in the maintenance of non-advanced decentralized schools)
<b>Optimization initial economical value by governance process</b>	1 * (Efficiency in the creation of advanced decentralized schools * Advanced decentralization synergy gain on initial economical value + Efficiency in the creation of non-advanced decentralized schools)
<b>Efficiency in the maintenance of advanced decentralized schools</b>	(Number of advanced decentralized schools / 7000) * Financial management school boards * Educational real estate budget school boards
<b>Efficiency in the maintenance of non-advanced decentralized schools</b>	(Number of non-advanced decentralized schools / 7000) * Educational real estate budget municipalities * Financial management municipalities * Advanced decentralization of the external maintenance * Introducing the right on renovation
<b>Efficiency in the creation of advanced decentralized schools</b>	(Number of advanced decentralized schools / 7000) * Financial management school boards * Educational real estate budget school boards * Using performance documents * Using quality demands
<b>Efficiency in the creation of non-advanced decentralized schools</b>	(Number of non-advanced decentralized schools / 7000) * Educational real estate budget municipalities * Financial management municipalities * Using performance documents * Using quality demands
<b>Number of advanced decentralized schools</b>	7000 * Advanced decentralization ratio
<b>Number of non-advanced decentralized schools</b>	7000 * (1 - Advanced decentralization ratio)
<b>Advanced decentralization ratio</b>	0.075 * Introducing the right on full advanced decentralization
<b>Financial management school boards</b>	1 * Benchmarking of school boards * Increasing financial expertise of school boards
<b>Financial management municipalities</b>	1 * Benchmarking of municipalities * Increasing financial expertise of municipalities
<b>Educational real estate budget school boards</b>	1 * Involving private parties * Standard allowances
<b>Educational real estate budget municipalities</b>	1 * Earmarking * Involving private parties * Standard allowances
<b>Standard allowances</b>	1 * Updating to current price and quality levels

**Table 0-2: Equations of the influential factors on sustainable value creation model**

## Emails and questionnaire to architectural firms

Beste lezer,

de kwaliteit van de onderwijshuisvesting van het primair onderwijs en het bijbehorende financieringsstelsel is al enkele jaren onderwerp van discussie. Om de kwaliteit van basisscholen te kunnen verbeteren is er inzicht nodig in wat nu precies scholen **tot** goede scholen maakt en is er meer zicht nodig op welke verbeteringen in het financieringsstelsel op het meeste draagvlak kunnen rekenen.

### **Hier kunt u bij helpen!**

Voor mijn afstudeerproject voor de masteropleiding Construction Management & Engineering aan de Technische Universiteit Eindhoven heb ik een enquête ontworpen met als doel bij architecten, schooldirecteuren, gemeenten en bovenschoolse schoolbesturen hun mening te achterhalen aangaande de kwaliteit van de huidige schoolgebouwen en de steun voor mogelijke verbeteringsmaatregelen voor het huidige financieringsstelsel; en daarmee uiteindelijk ook voor de schoolgebouwen.

Ik hoop dat u –als medewerker van een architectenbureau dat ook basisscholen ontworpen heeft – mij persoonlijk en de kennisontwikkeling in de onderwijshuisvestingssector in het algemeen wilt helpen door het invullen van deze enquête. Dit zal u **slechts 10 minuten** kosten. Daarnaast heeft u de mogelijkheid om **de resultaten van dit onderzoek te ontvangen** en kunt u **kans maken op een staatslot** door het achterlaten van uw e-mailadres in het enquêteformulier. Los hiervan zullen de resultaten van de enquête anoniem worden verwerkt.

De enquête kunt u vinden door op onderstaande link te klikken:

<https://docs.google.com/spreadsheet/viewform?pli=1&formkey=dEJGaExfcmtlWDdaTU10cjc3QUdBWF E6MQ#gid=0>

Wanneer u besluit mee te doen zou ik uw antwoorden graag binnen twee weken ontvangen.

Met vriendelijke groet,

**Ruud van Giels** | Afstudeerder

Construction Management and Engineering | [www.tue.nl/cme](http://www.tue.nl/cme)  
Eindhoven University of Technology (TU/e) | [www.tue.nl](http://www.tue.nl)







## Onderzoek naar het optimaliseren van de waarde van basisscholen door optimalisatie van het financieringssysteem

Deze enquête is onderdeel van een onderzoek naar welke elementen van schoolgebouwen belangrijk worden gevonden en een schoolgebouw meerwaarde geven. Daarnaast wordt het draagvlak voor mogelijke aanpassingen in het huidige financieringssysteem onderzocht.

Bij het maken van deze enquête is getracht deze zo kort mogelijk te houden; deze zal dan ook naar verwachting slechts 10 minuten in beslag nemen. Graag zou ik de enquête binnen twee weken van u terug ontvangen.

Deze enquête bestaat voor u uit twee onderdelen:

DEEL I: Paarsgewijze vergelijkingen elementen schoolgebouw

DEEL II: Beoordeling elementen schoolgebouw op een tienpuntsschaal

De resultaten van deze enquête zullen anoniem verwerkt worden. Mocht u desondanks geïnteresseerd zijn in de resultaten van het onderzoek dan kunt u hieronder uw e-mailadres achterlaten. Daarnaast zal onder de respondenten een staatslot verloot worden. Wilt u kans maken op dit staatslot, vul dan ook in dat vakje hieronder uw e-mailadres in.

Mede namens de Technische Universiteit Eindhoven wil ik u alvast hartelijk danken voor de medewerking.

Ruud van Giels

Afstudeerder masteropleiding Construction Management & Engineering

Technische Universiteit Eindhoven

**Laat hieronder uw emailadres achter als u op de hoogte gebracht wilt worden van de resultaten van het onderzoek**

**Laat hieronder uw emailadres achter als u kans wilt maken op het staatslot**

## DEEL I

Hierna zullen u een aantal paarsgewijze vergelijkingen worden voorgelegd waarbij u gevraagd wordt een voorkeur uit te spreken voor één van beiden op een schaal van 1 tot 5, waarbij:

- 1 staat voor veel onbelangrijker
- 2 staat voor een beetje onbelangrijker
- 3 staat voor even belangrijk
- 4 staat voor een beetje belangrijker
- 5 staat voor veel belangrijker

Voorbeeld:

Wanneer u gevraagd wordt in hoeverre u de KLEUR van een auto belangrijker vindt dan de PRIJS en u vinkt een 1 aan; dan vindt u de KLEUR VEEL ONBELANGRIJKER DAN DE PRIJS.

Voor de duidelijkheid worden de begrippen waartussen u moet kiezen steeds aan het begin van de vraag toegelicht.

## TOTALE WAARDE

De totale waarde van een basisschool kan grofweg in vier deelaspecten worden onderverdeeld:

BELEVINGSWAARDE = Som van conceptuele, architectonische beleving en directe, zintuiglijke beleving

ECONOMISCHE WAARDE = Creatie van huidige en toekomstige waarde; alsook benutting van synergievoordelen

GEBRUIKERSWAARDE = Functionaliteit, flexibiliteit en het persoonlijk comfort (lucht, warmte, akoestiek)

TECHNISCHE WAARDE = Combinatie van grondstoffengebruik en bouwproces; wat resulteert in een gebouw

Kunt u aangeven in hoeverre u de:

**BELEVINGSWAARDE belangrijker vindt dan de ECONOMISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**BELEVINGSWAARDE belangrijker vindt dan de GEBRUIKERSWAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**BELEVINGSWAARDE belangrijker vindt dan de TECHNISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ECONOMISCHE WAARDE belangrijker vindt dan de GEBRUIKERSWAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ECONOMISCHE WAARDE belangrijker vindt dan de TECHNISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**GEBRUIKERSWAARDE belangrijker vindt dan de TECHNISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Belevings- en gebruikerswaarde

Daar u bij een architectenbureau werkt zal hierna de focus van de enquête liggen op de belevings- en de gebruikerswaarde.

### BELEVINGSWAARDE

De belevingswaarde kan grofweg in twee deelaspecten worden onderverdeeld:

CONCEPTUELE, ARCHITECTONISCHE BELEVING = Beleving van zaken als architectuur, sfeer, imago, duurzaamheid en ecologie  
DIRECTE, ZINTUIGLIJKE BELEVING = Beleving van zaken als transparantie, daglicht, landschap en sociale veiligheid

Kunt u aangeven in hoeverre u de:

**CONCEPTUELE, ARCHITECTONISCHE BELEVING belangrijker vindt dan de DIRECTE, ZINTUIGLIJKE BELEVING? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

### Conceptuele, architectonische beleving

De conceptuele, architectonische beleving kan grofweg in vier deelaspecten verder worden onderverdeeld:

ARCHITECTUUR EN UITSTRALING = Het beeld dat het gebouw uitstraalt aan de buitenkant  
DUURZAAMHEID = Mate waarin het gebouw uitstraalt energie te besparen  
ECOLOGIE = Mate waarin het gebouw een relatie met de natuur aangaat  
SFEER EN IMAGO = Het gevoel dat het gebouw geeft aan de binnenkant

Kunt u aangeven in hoeverre u de:

**ARCHITECTUUR EN UITSTRALING belangrijker vindt dan de DUURZAAMHEID? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ARCHITECTUUR EN UITSTRALING belangrijker vindt dan de ECOLOGIE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ARCHITECTUUR EN UITSTRALING belangrijker vindt dan de SFEER EN HET IMAGO? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**DUURZAAMHEID belangrijker vindt dan de ECOLOGIE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**DUURZAAMHEID belangrijker vindt dan de SFEER EN HET IMAGO? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ECOLOGIE belangrijker vindt dan de SFEER EN HET IMAGO? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Directe, zintuiglijke beleving

De directe, zintuiglijke beleving kan grofweg in vijf deelaspecten verder worden onderverdeeld:

DAGLICHTTOETREDING = Mate waarin daglicht ongehinderd het gebouw kan betreden

INVLOED OP HET BINNENKLIMAAT = Mate waarin gebruikers het binnenklimaat naar eigen wens kunnen beïnvloeden

SOCIALE VEILIGHEID = Gevoel van geborgenheid

TRANSPARANTIE = Mate waarin zicht op andere binnenruimten ondersteund wordt

ZICHTBAARHEID NATUUR/LANDSCHAP = Mate waarin zicht op natuurlijke buitenruimte ondersteund wordt

Kunt u aangeven in hoeverre u de:

**DAGLICHTTOETREDING belangrijker vindt dan de INVLOED OP HET BINNENKLIMAAT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**DAGLICHTTOETREDING belangrijker vindt dan de SOCIALE VEILIGHEID? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**DAGLICHTTOETREDING belangrijker vindt dan de TRANSPARANTIE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**DAGLICHTTOETREDING belangrijker vindt dan de ZICHTBAARHEID VAN NATUUR EN LANDSCHAP? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**INVLOED OP HET BINNENKLIMAAT belangrijker vindt dan de SOCIALE VEILIGHEID? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**INVLOED OP BINNENKLIMAAT belangrijker vindt dan de TRANSPARANTIE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**INVLOED OP BINNENKLIMAAT belangrijker vindt dan de ZICHTBAARHEID VAN NATUUR EN LANDSCHAP? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**SOCIALE VEILIGHEID belangrijker vindt dan de TRANSPARANTIE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**SOCIALE VEILIGHEID belangrijker vindt dan de ZICHTBAARHEID VAN NATUUR EN LANDSCHAP? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**TRANSPARANTIE belangrijker vindt dan de ZICHTBAARHEID VAN NATUUR EN LANDSCHAP? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## GEBRUIKERSWAARDE

De gebruikerswaarde kan grofweg in drie deelaspecten worden onderverdeeld:

FLEXIBILITEIT = Flexibiliteit van de groepsruimtes en van het gebouw als geheel

FUNCTIONALITEIT = (Multi-)functionaliteit van primaire en ondersteunende functies

PERSOONLIJK COMFORT = Luchtkwaliteit, thermisch comfort en akoestisch comfort

Kunt u aangeven in hoeverre u:

**de FLEXIBILITEIT belangrijker vindt dan de FUNCTIONALITEIT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**de FLEXIBILITEIT belangrijker vindt dan het PERSOONLIJK COMFORT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**de FUNCTIONALITEIT belangrijker vindt dan het PERSOONLIJK COMFORT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Flexibiliteit

De flexibiliteit kan grofweg in twee deelaspecten verder worden onderverdeeld:

FLEXIBILITEIT VAN HET GEBOUW ALS GEHEEL = Mate waarin het gebouw veranderingen als krimp en uitbreiding op kan vangen

FLEXIBILITEIT VAN DE GROEPSRUIMTEN = Mate waarin een groepsruimte verschillende vormen van gebruik aan kan

Kunt u aangeven in hoeverre u de:

**FLEXIBILITEIT VAN HET GEBOUW ALS GEHEEL belangrijker vindt dan de FLEXIBILITEIT VAN DE GROEPSRUIMTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Functionaliteit

De functionaliteit kan grofweg in vijf deelaspecten verder worden onderverdeeld:

FUNCTIONALITEIT VAN HET ONDERWIJSCONCEPT = Mate waarin het gebouw aansluit op het onderwijsconcept

FUNCTIONALITEIT VAN DE ONDERSTEUNENDE FUNCTIES = Functionaliteit van toilet-, keuken-, bergingsfuncties etc.

FUNCTIONALITEIT VAN HET SPEELTERREIN = Omvang en inrichting van het speelterrein

MULTIFUNCTIONALITEIT VAN DE RUIMTEN = Multifunctionaliteit van ruimten zoals de aula en het speellokaal

TOEGANKELIJKHEID EN BEREIKBAARHEID VAN HET GEBOUW = Mate van toegankelijkheid en bereikbaarheid van het gebouw

Kunt u aangeven in hoeverre u de:

**FUNCTIONALITEIT VAN HET ONDERWIJSCONCEPT belangrijker vindt dan de FUNCTIONALITEIT VAN DE ONDERSTEUNENDE FUNCTIES? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN HET ONDERWIJSCONCEPT belangrijker vindt dan de FUNCTIONALITEIT VAN HET SPEELTERREIN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN HET ONDERWIJSCONCEPT belangrijker vindt dan de MULTIFUNCTIONALITEIT VAN DE RUIMTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN HET ONDERWIJSCONCEPT belangrijker vindt dan de TOEGANKELIJKHEID EN BEREIKBAARHEID VAN HET GEBOUW? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN DE ONDERSTEUNENDE FUNCTIES belangrijker vindt dan de FUNCTIONALITEIT VAN HET SPEELTERREIN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN DE ONDERSTEUNENDE FUNCTIES belangrijker vindt dan de MULTIFUNCTIONALITEIT VAN DE RUIMTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN DE ONDERSTEUNENDE FUNCTIES belangrijker vindt dan de TOEGANKELIJKHEID EN BEREIKBAARHEID VAN HET GEBOUW? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN HET SPEELTERREIN belangrijker vindt dan de MULTIFUNCTIONALITEIT VAN DE RUIMTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**FUNCTIONALITEIT VAN HET SPEELTERREIN belangrijker vindt dan de TOEGANKELIJKHEID EN BEREIKBAARHEID VAN HET GEBOUW? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**MULTIFUNCTIONALITEIT VAN DE RUIMTEN belangrijker vindt dan de TOEGANKELIJKHEID EN BEREIKBAARHEID VAN HET GEBOUW? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Persoonlijk comfort

Het persoonlijk comfort kan grofweg in drie deelaspecten verder worden onderverdeeld:

AKOESTISCH COMFORT = Mate van verstaanbaarheid en afwezigheid van galm, echo of lawaai

LUCHTKWALITEIT = Mate van CO<sub>2</sub>-verzadiging

THERMISCH COMFORT = Behaaglijkheid van de luchttemperatuur en afwezigheid van tocht

Kunt u aangeven in hoeverre u:

**het AKOESTISCH COMFORT belangrijker vindt dan de LUCHTKWALITEIT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**het AKOESTISCH COMFORT belangrijker vindt dan het THERMISCH COMFORT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**de LUCHTKWALITEIT belangrijker vindt dan het THERMISCH COMFORT? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## DEEL II

Naast het feit welke elementen in een schoolgebouw het belangrijkste zijn, ben ik ook nieuwsgierig naar hoe deze elementen gewaardeerd worden in de huidige basisscholen. Voor deze beoordeling mag u gebruik maken van de traditionele beoordelingswijze zoals die ook op basisscholen gebruikt wordt:

- 1 = zeer slecht
- 2 = slecht
- 3 = ruim onvoldoende
- 4 = onvoldoende
- 5 = twijfelachtig
- 6 = voldoende
- 7 = ruim voldoende
- 8 = goed
- 9 = zeer goed
- 10 = uitstekend



Daar u bij een architectenbureau werkt wil ik u vragen de school of scholen waaraan u gewerkt heeft in gedachten te houden bij deze vragen.

De definities van de elementen zullen bij de vraag vermeld worden.

## BELEVINGSWAARDE

Welk rapportcijfer op een schaal van 1 tot 10 geeft u de scho(o)l(en) die u in gedachten heeft op het gebied van:

### ARCHITECTUUR EN UITSTRALING? \*

Het beeld dat het gebouw uitstraalt aan de buitenkant

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### DAGLICHTTOETREDING? \*

Mate waarin daglicht ongehinderd het gebouw kan betreden

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### DUURZAAMHEID? \*

Mate waarin het gebouw uitstraalt energie te besparen

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### ECOLOGIE? \*

Mate waarin het gebouw een relatie met de natuur aangaat

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### INVLOED OP HET BINNENKLIMAAT? \*

Mate waarin gebruikers het binnenklimaat naar eigen wens kunnen beïnvloeden

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### SFEER EN IMAGO? \*

Het gevoel dat het gebouw geeft aan de binnenkant

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**SOCIALE VEILIGHEID? \***

Gevoel van geborgenheid

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend**TRANSPARANTIE? \***

Mate waarin zicht op andere binnenruimten ondersteund wordt

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend**ZICHT OP NATUUR/LANDSCHAP? \***

Mate waarin zicht op natuurlijke buitenruimte ondersteund wordt

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend**GEBRUIKERSWAARDE**

Welk rapportcijfer op een schaal van 1 tot 10 geeft u de scho(o)(l)en die u in gedachten heeft op het gebied van:

**AKOESTISCH COMFORT? \***

Mate van verstaanbaarheid en afwezigheid van galm, echo of lawaai

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend**FLEXIBILITEIT VAN HET GEBOUW ALS GEHEEL? \***

Mate waarin het gebouw veranderingen als krimp en groei op kan vangen

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend**FLEXIBILITEIT VAN DE GROEPSRUIMTEN? \***

Mate waarin een groepsruimte verschillende vormen van gebruik aan kan

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend**FUNCTIONALITEIT VAN HET ONDERWIJSCONCEPT? \***

Mate waarin het gebouw aansluit op het onderwijsconcept

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

**FUNCTIONALITEIT VAN DE ONDERSTEUNENDE FUNCTIES? \***

Functionaliteit van toilet-, keuken-, bergingsfuncties etc.

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

**FUNCTIONALITEIT VAN HET SPEELTERREIN? \***

Omvang en inrichting van het speelterrein

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

**LUCHTKWALITEIT? \***

De mate van CO2-verzadiging

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

**MULTIFUNCTIONALITEIT VAN DE RUIMTEN? \***

Multifunctionaliteit van ruimten als de aula

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

**THERMISCH COMFORT? \***

Behaaglijkheid van de luchttemperatuur en afwezigheid van tocht

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

**TOEGANKELIJKHEID EN BEREIKBAARHEID VAN HET GEBOUW? \***

Mate van toegankelijkheid en bereikbaarheid van het gebouw

1 2 3 4 5 6 7 8 9 10

Zeer slecht            Uitstekend

## Einde van de enquête

Dit was de laatste vraag. U kunt de enquête opsturen door op de knop onderaan de pagina te klikken. Ik wil u hierbij nogmaals hartelijk bedanken voor het invullen van de enquête. Mocht u nog op- of aanmerkingen hebben op de enquête dan kunt u die hieronder kwijt.

**Ruimte voor opmerkingen**

Beste lezer,

een week geleden heb ik u benaderd met onderstaand verzoek, waar ik u graag aan zou willen herinneren. Mocht u de enquête al hebben ingevuld dan mag u deze mail als niet verzonden beschouwen.

De kwaliteit van de onderwijshuisvesting van het primair onderwijs en het bijbehorende financieringsstelsel is al enkele jaren onderwerp van discussie. Om de kwaliteit van basisscholen te kunnen verbeteren is er inzicht nodig in wat nu precies scholen tot goede scholen maakt en is er meer zicht nodig op welke verbeteringen in het financieringsstelsel op het meeste draagvlak kunnen rekenen. **Hier kunt u bij helpen!**

Voor mijn afstudeerproject voor de masteropleiding Construction Management & Engineering aan de Technische Universiteit Eindhoven heb ik een enquête ontworpen met als doel bij architecten, schooldirecteuren, gemeenten en bovenschoolse schoolbesturen hun mening te achterhalen aangaande de kwaliteit van de huidige schoolgebouwen en de steun voor mogelijke verbeteringsmaatregelen voor het huidige financieringsstelsel; en daarmee uiteindelijk ook voor de schoolgebouwen.

Ik hoop dat u –als medewerker van een architectenbureau dat ook basisscholen ontworpen heeft – mij persoonlijk en de kennisontwikkeling in de onderwijshuisvestingssector in het algemeen wilt helpen door het invullen van deze enquête. Dit zal u **slechts 10 minuten** kosten. Daarnaast heeft u de mogelijkheid om **de resultaten van dit onderzoek te ontvangen** en kunt u **kans maken op een staatslot** door het achterlaten van uw e-mailadres in het enquêteformulier. Los hiervan zullen de resultaten van de enquête anoniem worden verwerkt.

De enquête kunt u vinden door op onderstaande link te klikken:

<https://docs.google.com/spreadsheet/viewform?pli=1&formkey=dEJGaExfcmtIWDdaTU10cjc3QUdBWF E6MQ#gid=0>

Wanneer u besluit mee te doen zou ik uw antwoorden graag binnen één week ontvangen.

Met vriendelijke groet,

**Ruud van Giels** | Afstudeerder

Construction Management and Engineering | [www.tue.nl/cme](http://www.tue.nl/cme)  
Eindhoven University of Technology (TU/e) | [www.tue.nl](http://www.tue.nl)





## Emails and questionnaire to school boards

Beste lezer,

de kwaliteit van de onderwijshuisvesting van het primair onderwijs en het bijbehorende financieringsstelsel is al enkele jaren onderwerp van discussie. Om de kwaliteit van basisscholen te kunnen verbeteren is er inzicht nodig in wat nu precies scholen **tot** goede scholen maakt en is er meer zicht nodig op welke verbeteringen in het financieringsstelsel op het meeste draagvlak kunnen rekenen.

**Hier kunt u bij helpen!**

Voor mijn afstudeerproject voor de masteropleiding Construction Management & Engineering aan de Technische Universiteit Eindhoven heb ik een enquête ontworpen met als doel bij architecten, schooldirecteuren, gemeenten en bovenschoolse schoolbesturen hun mening te achterhalen aangaande de kwaliteit van de huidige schoolgebouwen en de steun voor mogelijke verbeteringsmaatregelen voor het huidige financieringsstelsel; en daarmee uiteindelijk ook voor de schoolgebouwen.

Ik hoop dat u –als persoon die vanuit een bovenschools schoolbestuur bezig is met de onderwijshuisvesting – mij persoonlijk en de kennisontwikkeling in de onderwijshuisvestingssector in het algemeen wilt helpen door het invullen van deze enquête. Dit zal u **slechts 15 minuten** kosten. Daarnaast heeft u de mogelijkheid om **de resultaten van dit onderzoek te ontvangen** en kunt u **kans maken op een staatslot** door het achterlaten van uw e-mailadres in het enquêteformulier. Los hiervan zullen de resultaten van de enquête anoniem worden verwerkt.

De enquête kunt u vinden door op onderstaande link te klikken:

<https://docs.google.com/spreadsheet/viewform?formkey=dHRKWnJKN25qQTEweXNzNjNUeG5KcEE6MQ#gid=0>

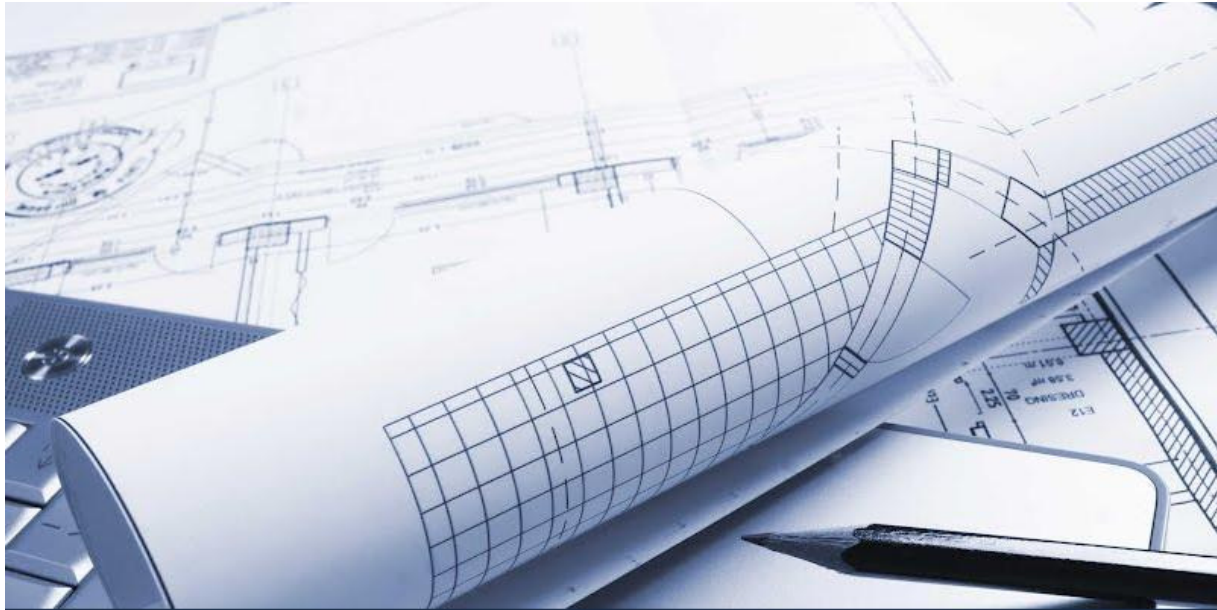
Wanneer u besluit mee te doen zou ik uw antwoorden graag binnen twee weken ontvangen.

Met vriendelijke groet,

**Ruud van Giels** | Afstudeerder

Construction Management and Engineering | [www.tue.nl/cme](http://www.tue.nl/cme)  
Eindhoven University of Technology (TU/e) | [www.tue.nl](http://www.tue.nl)





## Onderzoek naar het optimaliseren van de waarde van basisscholen door optimalisatie van het financieringssysteem

Deze enquête is onderdeel van een onderzoek naar welke elementen van schoolgebouwen belangrijk worden gevonden en een schoolgebouw meerwaarde geven. Daarnaast wordt het draagvlak voor mogelijke aanpassingen in het huidige financieringssysteem onderzocht.

Bij het maken van deze enquête is getracht deze zo kort mogelijk te houden; deze zal dan ook naar verwachting slechts 15 minuten in beslag nemen. Graag zou ik de enquête binnen twee weken van u terug ontvangen.

Deze enquête bestaat voor u uit drie onderdelen:

DEEL I: Paarsgewijze vergelijkingen elementen schoolgebouw

DEEL II: Beoordeling elementen schoolgebouw op een tienpuntsschaal

DEEL III: Beoordeling invloedsfactoren op het gebied van beleid en financiering

De resultaten van deze enquête zullen anoniem verwerkt worden. Mocht u desondanks geïnteresseerd zijn in de resultaten van het onderzoek dan kunt u hieronder uw e-mailadres achterlaten. Daarnaast zal onder de respondenten een staatslot verloot worden. Wilt u kans maken op dit staatslot, vul dan ook in dat vakje hieronder uw e-mailadres in.

Mede namens de Technische Universiteit Eindhoven wil ik u alvast hartelijk danken voor de medewerking.

Ruud van Giels  
Afstudeerder masteropleiding Construction Management & Engineering  
Technische Universiteit Eindhoven

**Laat hieronder uw emailadres achter als u op de hoogte gebracht wilt worden van de resultaten van het onderzoek**

**Laat hieronder uw emailadres achter als u kans wilt maken op het staatslot**

## DEEL I

Hierna zullen u een aantal paarsgewijze vergelijkingen worden voorgelegd waarbij u gevraagd wordt een voorkeur uit te spreken voor één van beiden op een schaal van 1 tot 5, waarbij:

- 1 staat voor veel onbelangrijker
- 2 staat voor een beetje onbelangrijker
- 3 staat voor even belangrijk
- 4 staat voor een beetje belangrijker
- 5 staat voor veel belangrijker

Voorbeeld:

Wanneer u gevraagd wordt in hoeverre u de KLEUR van een auto belangrijker vindt dan de PRIJS en u vinkt een 1 aan; dan vindt u de KLEUR VEEL ONBELANGRIJKER DAN DE PRIJS.

Voor de duidelijkheid worden de begrippen waartussen u moet kiezen steeds aan het begin van de vraag toegelicht.

## TOTALE WAARDE

De totale waarde van een basisschool kan grofweg in vier deelaspecten worden onderverdeeld:

BELEVINGSWAARDE = Som van conceptuele, architectonische beleving en directe, zintuiglijke beleving

ECONOMISCHE WAARDE = Creatie van huidige en toekomstige waarde; alsook benutting van synergievoordelen

GEBRUIKERSWAARDE = Functionaliteit, flexibiliteit en het persoonlijk comfort (lucht, warmte, akoestiek)

TECHNISCHE WAARDE = Combinatie van grondstoffengebruik en bouwproces; wat resulteert in een gebouw

Kunt u aangeven in hoeverre u de:

**BELEVINGSWAARDE belangrijker vindt dan de ECONOMISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**BELEVINGSWAARDE belangrijker vindt dan de GEBRUIKERSWAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**BELEVINGSWAARDE belangrijker vindt dan de TECHNISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ECONOMISCHE WAARDE belangrijker vindt dan de GEBRUIKERSWAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker



**ECONOMISCHE WAARDE belangrijker vindt dan de TECHNISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**GEbruikerswaarde belangrijker vindt dan de TECHNISCHE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Economische en technische waarde

Daar u lid bent van een bovenschools schoolbestuur zal de focus van de eerste twee delen van de enquête liggen op de economische en de technische waarde.

## ECONOMISCHE WAARDE

De economische waarde kan grofweg in drie deelaspecten worden onderverdeeld:

HUIDIGE WAARDE = Optimalisatie van investeringskosten, exploitatiekosten en vastgoedwaarde

SYNERGIEVOORDELEN = Voordelen door het ruimtelijk samenwerken of op het gebied van beheer samenwerken

TOEKOMSTIGE WAARDE = Toekomstige verhuurbaarheid- en herbestemmingsmogelijkheden

Kunt u aangeven in hoeverre u de:

**HUIDIGE WAARDE belangrijker vindt dan de SYNERGIEVOORDELEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**HUIDIGE WAARDE belangrijker vindt dan de TOEKOMSTIGE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**SYNERGIEVOORDELEN belangrijker vindt dan de TOEKOMSTIGE WAARDE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Huidige waarde

De huidige waarde kan grofweg in vier deelaspecten verder worden onderverdeeld:

MAXIMALISEREN VAN DE VASTGOEDWAARDE = Verhoging van de marktwaarde van het pand

MAATSCHAPPELIJK VERANTWOORD ONDERNEMEN = Een goede balans tussen economische en maatschappelijke belangen

OPTIMALISATIE VAN DE EXPLOITATIEKOSTEN = Verlaging van de maandelijkse en/of jaarlijkse exploitatielasten

OPTIMALISATIE VAN DE INVESTERINGSKOSTEN = Verlaging van de investeringskosten

Kunt u aangeven in hoeverre u:

**het MAXIMALISEREN VAN DE VASTGOEDWAARDE belangrijker vindt dan MAATSCHAPPELIJK VERANTWOORD ONDERNEMEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**het MAXIMALISEREN VAN DE VASTGOEDWAARDE belangrijker vindt dan OPTIMALISATIE VAN DE EXPLOITATIEKOSTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**het MAXIMALISEREN VAN DE VASTGOEDWAARDE belangrijker vindt dan OPTIMALISATIE VAN DE INVESTERINGSKOSTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**MAATSCHAPPELIJK VERANTWOORD ONDERNEMEN belangrijker vindt dan OPTIMALISATIE VAN DE EXPLOITATIEKOSTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**MAATSCHAPPELIJK VERANTWOORD ONDERNEMEN belangrijker vindt dan OPTIMALISATIE VAN DE INVESTERINGSKOSTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**OPTIMALISATIE VAN DE EXPLOITATIEKOSTEN belangrijker vindt dan OPTIMALISATIE VAN DE INVESTERINGSKOSTEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Synergievoordelen

Synergie kan grofweg in twee deelaspecten verder worden onderverdeeld:

BEHEERSSYNERGIE = Voordelen door samenwerking op het gebied van beheer

RUIMTELIJKE SYNERGIE = Voordelen door ruimtelijke samenwerking

Kunt u aangeven in hoeverre u de:

**BEHEERSSYNERGIE belangrijker vindt dan de RUIMTELIJKE SYNERGIE? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Toekomstige waarde

De toekomstige waarde kan grofweg in twee deelaspecten verder worden onderverdeeld:

HERBESTEMMINGSMOGELIJKHEDEN = Mate waarin het gebouw tot andere functies herbestemd kan worden

VERHUURBAARHEID VAN GEBOUWONDERDELEN = Mate waarin delen van het gebouw aan andere partijen verhuurd kan worden

Kunt u aangeven in hoeverre u de:

**HERBESTEMMINGSMOGELIJKHEDEN belangrijker vindt dan de VERHUURBAARHEID VAN GEBOUWONDERDELEN? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## TECHNISCHE WAARDE

De technische waarde kan grofweg in drie deelaspecten worden onderverdeeld:

GRONDSTOFFENGEBRUIK = Materiaal-, energie-, water(her)gebruik en bewuste omgang met afval

TECHNISCHE ASPECTEN VAN HET BOUWPROCES = Bouwsysteem en bouwwijze

TECHNISCHE ASPECTEN VAN HET GEBOUW = Schoonmaakbaarheid, onderhoudsvriendelijkheid en ICT-voorzieningen

Kunt u aangeven in hoeverre u:

**het GRONDSTOFFENGEBRUIK belangrijker vindt dan de TECHNISCHE ASPECTEN VAN HET BOUWPROCES? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**het GRONDSTOFFENGEBRUIK belangrijker vindt dan de TECHNISCHE ASPECTEN VAN HET GEBOUW? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**de TECHNISCHE ASPECTEN VAN HET BOUWPROCES belangrijker vindt dan de TECHNISCHE ASPECTEN VAN HET GEBOUW? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Grondstoffengebruik

Het grondstoffengebruik kan grofweg in vier deelaspecten verder worden onderverdeeld:

AFVALBEWUSTZIJN = Voorkomen en hergebruik van afval

ENERGIEGEBRUIK = Mate waarin efficiënt gebruik gemaakt wordt van energie

MATERIAALGEBRUIK = Mate waarin materiaal vanuit een levenscyclusbenadering wordt toegepast

WATER(HER)GEBRUIK = Mate waarin efficiënt gebruik gemaakt wordt van water

Kunt u aangeven in hoeverre u het:

**AFVALBEWUSTZIJN belangrijker vindt dan het ENERGIEGEBRUIK? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**AFVALBEWUSTZIJN belangrijker vindt dan het MATERIAALGEBRUIK? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**AFVALBEWUSTZIJN belangrijker vindt dan het WATER(HER)GEBRUIK? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ENERGIEGEBRUIK belangrijker vindt dan het MATERIAALGEBRUIK? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ENERGIEGEBRUIK belangrijker vindt dan het WATER(HER)GEBRUIK? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**MATERIAALGEBRUIK belangrijker vindt dan het WATER(HER)GEBRUIK? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Technische aspecten van het bouwproces

Het bouwproces kan grofweg in twee verschillende deelaspecten verder worden onderverdeeld:

EENVOUDIGE DETAILLERING = Eenvoud in technische oplossingen

STANDAARDISERING = De toepassing van prefab elementen in het bouwproces

Kunt u aangeven in hoeverre u:

**EENVOUDIGE DETAILLERING belangrijker vindt dan STANDAARDISERING? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## Technische aspecten van het gebouw

Het gebouw (onderdeel van de technische waarde) kan grofweg in drie deelaspecten verder worden onderverdeeld:

ICT-VOORZIENINGEN = Kwaliteit van de ICT-voorzieningen

ONDERHOUDSVRIENDELIJKHEID = Mate waarin de technische kwaliteit van de materialen het onderhoud beperkt

SCHOONMAAKBAARHEID = Mate waarin de technische kwaliteit van de materialen de schoonmaaklast beperkt

Kunt u aangeven in hoeverre u de:

**ICT-VOORZIENINGEN belangrijker vindt dan de ONDERHOUDSVRIENDELIJKHEID? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ICT-VOORZIENINGEN belangrijker vindt dan de SCHOONMAAKBAARHEID? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

**ONDERHOUDSVRIENDELIJKHEID belangrijker vindt dan de SCHOONMAAKBAARHEID? \***

1 2 3 4 5

Veel onbelangrijker      Veel belangrijker

## DEEL II

Naast het feit welke elementen in een schoolgebouw het belangrijkste zijn, ben ik ook nieuwsgierig naar hoe deze elementen gewaardeerd worden in de huidige basisscholen. Voor deze beoordeling mag u gebruik maken van de traditionele beoordelingswijze zoals die ook op basisscholen gebruikt wordt:

- 1 = zeer slecht
- 2 = slecht
- 3 = ruim onvoldoende
- 4 = onvoldoende
- 5 = twijfelachtig
- 6 = voldoende
- 7 = ruim voldoende
- 8 = goed
- 9 = zeer goed
- 10 = uitstekend

Daar u lid bent van een bovenschools schoolbestuur wil ik u vragen om uw scholenportefeuille in gedachten te houden bij deze vragen.

De definities van de elementen zullen bij de vraag vermeld worden.

## ECONOMISCHE WAARDE

Welk rapportcijfer op een schaal van 1 tot 10 geeft u de scholen die u in gedachten heeft op het gebied van:

### BEHEERSSYNERGIE? \*

Voordelen door samenwerking op het gebied van beheer

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### HERBESTEMMINGSMOGELIJKHEDEN? \*

Mate waarin het gebouw tot andere functies herbestemd kan worden

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### MAATSCHAPPELIJK VERANTWOORD ONDERNEMEN? \*

Een goede balans tussen economische en maatschappelijke belangen

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### MAXIMALISEREN VAN DE VASTGOEDWAARDE? \*

Verhoging van de marktwaarde van het pand

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### OPTIMALISATIE VAN DE EXPLOITATIEKOSTEN? \*

Verlaging van de maandelijkse en/of jaarlijkse exploitatielasten

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

### OPTIMALISATIE VAN DE INVESTERINGSKOSTEN? \*

Verlaging van de investeringskosten

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**RUIMTELIJKE SYNERGIE? \***

Voordelen door ruimtelijke samenwerking

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend**VERHUURBAARHEID VAN GEBOUWONDERDELEN? \***

Mate waarin delen van het gebouw aan andere partijen verhuurd kan worden

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend**TECHNISCHE WAARDE**

Welk rapportcijfer op een schaal van 1 tot 10 geeft u de scholen die u in gedachten heeft op het gebied van:

**AFVALBEWUSTZIJN? \***

Voorkomen en hergebruik van afval

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend**EENVOUDIGE DETAILLERING? \***

Eenvoud in technische oplossingen

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend**ENERGIEGEBRUIK? \***

Mate waarin efficiënt gebruik gemaakt wordt van energie

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend**ICT-VOORZIENINGEN? \***

Kwaliteit van de ICT-voorzieningen

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend**MATERIAALGEBRUIK? \***

Mate waarin materiaal vanuit een levenscyclusbenadering wordt toegepast

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**ONDERHOUDSVRIENDELIJKHEID? \***

Mate waarin de technische kwaliteit van de materialen het onderhoud beperkt

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**SCHOONMAAKBAARHEID? \***

Mate waarin de technische kwaliteit van de materialen de schoonmaaklast beperkt

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**STANDAARDISERING? \***

De toepassing van prefab elementen in het bouwproces

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**WATER(HER)GEBRUIK? \***

Mate waarin efficiënt gebruik gemaakt wordt van water

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

## DEEL III

Het financieringsstelsel van het primair onderwijsvastgoed is al enkele jaren onderwerp van discussie. In de komende vragen zou ik u willen laten schatten hoeveel invloed u schat dat bepaalde voorgestelde verbeteringsmaatregelen zouden kunnen hebben. Deze maatregelen zijn gegroepeerd in vijf scenario's.

Het gaat hier bij het geven van uw mening niet om een exact antwoord maar om uw eerste ingeving; om uw eerste schatting.

Hiervoor zullen u wederom paarsgewijze vergelijkingen worden voorgelegd waarbij u wederom gevraagd wordt een voorkeur uit te spreken voor één van beiden op een schaal van 1 tot 5, waarbij:

- 1 staat voor een grote negatieve invloed
- 2 staat voor een kleine negatieve invloed
- 3 staat voor geen invloed
- 4 staat voor een kleine positieve invloed
- 5 staat voor een grote positieve invloed

Voor de duidelijkheid worden de maatregelen die u moet beoordelen steeds aan het begin van de vraag toegelicht.

## SCENARIO 1: VERHOOGING VAN DE BUDGETTEN

Voorgestelde verbeteringen betreffende het verhogen van de onderwijshuisvestingsbudgetten zijn:

**HERIJKEN VAN DE NORMVERGOEDINGEN:**

Updaten van normvergoeding vanuit de Rijksoverheid aan het huidige prijspeil en de verhoogde maatschappelijke en wettelijke kwaliteitseisen.



**OORMERKEN VAN DE GEMEENTELIJKE ONDERWIJSHUISVESTINGSBUDGETTEN:**

Gemeenten verplichten het gehele bedrag dat zij van het gemeentefonds voor onderwijshuisvesting ontvangt hieraan te besteden.

**BETREKKEN VAN PRIVATE PARTIJEN:**

Het aangaan van Public Private Partnerships met bijvoorbeeld investeerders of woningcorporaties.

Kunt u aangeven hoeveel meer budget u verwacht bij het:

**HERIJKEN VAN DE NORMVERGOEDINGEN dan in de HUIDIGE SITUATIE? \***

1 2 3 4 5

Veel minder budget      Veel meer budget

**OORMERKEN VAN DE GEMEENTELIJKE ONDERWIJSHUISVESTINGSBUDGETTEN dan in de HUIDIGE SITUATIE? \***

1 2 3 4 5

Veel minder budget      Veel meer budget

**BETREKKEN VAN PRIVATE PARTIJEN dan in de HUIDIGE SITUATIE? \***

1 2 3 4 5

Veel minder budget      Veel meer budget

**HERIJKEN VAN DE NORMVERGOEDINGEN dan bij het OORMERKEN VAN DE GEMEENTELIJKE ONDERWIJSHUISVESTINGSBUDGETTEN? \***

1 2 3 4 5

Veel minder budget      Veel meer budget

**HERIJKEN VAN DE NORMVERGOEDINGEN dan bij het BETREKKEN VAN PRIVATE PARTIJEN? \***

1 2 3 4 5

Veel minder budget      Veel meer budget

**OORMERKEN VAN DE GEMEENTELIJKE ONDERWIJSHUISVESTINGSBUDGETTEN dan bij het BETREKKEN VAN PRIVATE PARTIJEN? \***

1 2 3 4 5

Veel minder budget      Veel meer budget

## SCENARIO 2: VERBETERING VAN HET FINANCIËEL MANAGEMENT

Binnen het huidige financieringsstelsel van het primair onderwijs zijn de verantwoordelijkheden en bijbehorende budgetten met betrekking tot de onderwijshuisvesting verdeeld over de schoolbesturen en de gemeenten. Voorgestelde veranderingen om zowel het financieel management van schoolbesturen en gemeenten te verbeteren zijn:

**BENCHMARKING:**

Inzicht geven in hoe andere gemeenten en schoolbesturen begroten zodat men vergelijkingsmateriaal krijgt.

VERGROTING VAN FINANCIËLE EXPERTISE:

Vergroting van de financiële kennis van gemeenten en schoolbesturen.

## Schoolbesturen

Kunt u aangeven wat voor invloed u verwacht op het financieel management van SCHOOLBESTUREN u verwacht dat:

**BENCHMARKING heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**VERGROTING VAN DE FINANCIËLE EXPERTISE heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**BENCHMARKING meer heeft ten opzichte van VERGROTING VAN DE FINANCIËLE EXPERTISE? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## Gemeenten

Kunt u aangeven wat voor invloed u verwacht op het financieel management van GEMEENTEN u verwacht dat:

**BENCHMARKING heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**VERGROTING VAN DE FINANCIËLE EXPERTISE heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**BENCHMARKING meer heeft ten opzichte van VERGROTING VAN DE FINANCIËLE EXPERTISE? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## SCENARIO 3: VERANDERING VAN HET PROGRAMMA VAN EISEN

Voorgestelde verbeteringen betreffende het programma van eisen zijn:

**GEBRUIK VAN KWALITEITSEISEN:**

Het vervangen van de modelverordening van de VNG door goed gedefinieerde kwaliteitseisen.

**GEBRUIK VAN PRESTATIEDOCUMENTEN:**

Het koppelen van duidelijk verantwoordelijke partijen aan (delen van) het programma van eisen en dit vastleggen in een document.

Kunt u aangeven wat voor invloed op nieuw te bouwen basisscholen u verwacht dat het:

**GEBRUIK VAN KWALITEITSEISEN heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**GEBRUIK VAN PRESTATIEDOCUMENTEN heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**GEBRUIK MAKEN VAN KWALITEITSEISEN meer heeft ten opzichte van het GEBRUIK MAKEN VAN PRESTATIEDOCUMENTEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## SCENARIO 4: OPTIMALISATIE VAN HET ONDERHOUDSBELEID

Voorgestelde verbeteringen binnen het onderhoudsbeleid zijn:

**INTRODUCTIE VAN RECHT OP RENOVATIE:**

Het creëren van de mogelijkheid voor schoolbesturen van aanvraag van renovatie.

**DOORDECENTRALISATIE VAN HET BUITENONDERHOUD NAAR SCHOOLBESTUREN:**

Het overhevelen van de budgetten en verantwoordelijkheden voor het buitenonderhoud van de gemeenten naar de schoolbesturen.

Kunt u aangeven wat voor invloed op het onderhoud van basisscholen u verwacht dat:

**INTRODUCTIE VAN HET RECHT OP RENOVATIE heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**DOORDECENTRALISATIE VAN HET BUITENONDERHOUD NAAR SCHOOLBESTUREN heeft ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Een grote negatieve invloed      Een grote positieve invloed

**INTRODUCTIE VAN HET RECHT OP RENOVATIE meer heeft dan DOORDECENTRALISATIE VAN HET BUITENONDERHOUD NAAR SCHOOLBESTUREN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## SCENARIO 5: INTRODUCTIE VAN HET RECHT OP VOLLEDIGE DOORDECENTRALISATIE

Momenteel zijn er zeer weinig schoolbesturen volledig doorgedecentraliseerd terwijl dit wel door velen als wenselijk wordt gezien vanwege mogelijk te behalen synergie-voordelen. Met synergie-voordelen worden in deze context voordelen bedoeld die ontstaan doordat alle verantwoordelijkheden en bijbehorende budgetten betreffende onderwijshuisvesting bij de schoolbesturen komen te liggen; in plaats van verspreid over de gemeenten en de schoolbesturen.

Een voorgestelde maatregel om dit aantal te verhogen is:

**INTRODUCTIE VAN HET RECHT OP DOORDECENTRALISATIE:**

Het versterken van de rechtspositie van de schoolbesturen bij een aanvraag tot doordecentralisatie.

Kunt u aangeven hoeveel meer gevallen van doordecentralisatie u verwacht bij:

**INTRODUCTIE VAN HET RECHT OP DOORDECENTRALISATIE ten opzichte van de HUIDIGE SITUATIE? \***

1 2 3 4 5

Veel minder gevallen      Veel meer gevallen

## Synergie-voordelen algemeen

Nogmaals; met synergie-voordelen worden in deze context voordelen bedoeld die ontstaan doordat alle verantwoordelijkheden en bijbehorende budgetten betreffende onderwijshuisvesting bij de schoolbesturen komen te liggen; in plaats van verspreid over de gemeenten en de schoolbesturen.

Op een schaal van 1 tot 10, hoe schat u de kwaliteit van een gemiddelde basisschool die tot stand is gekomen in een:

**TRADITIONELE SITUATIE ZONDER VOLLEDIGE DOORDECENTRALISATIE? \***

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

**SITUATIE VAN VOLLEDIGE DOORDECENTRALISATIE? \***

1 2 3 4 5 6 7 8 9 10

Zeer slecht           Uitstekend

## Synergie-voordelen over de levensduur

Mogelijke synergie-voordelen kunnen in verschillende mate plaatsvinden bij de:

**INITIËLE TOTALE WAARDE =**

De totale waarde die gecreëerd wordt bij de totstandkoming van het gebouw

of bij het:

**WAARDEVERLIES OVER DE TOTALE LEVENSDUUR =**

Het verlies aan waarde gedurende de levensduur van het gebouw

Hoeveel meer invloed denkt u dat volledige doordecentralisatie kan hebben op de:

**INITIËLE TOTALE WAARDE ten opzichte van het WAARDEVERLIES OVER DE TOTALE LEVENSDUUR? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## Synergie-voordelen per waarde

Synergie-voordelen kunnen in verschillende mate van toepassing zijn op de volgende vier eerder behandelde waarden:

**BELEVINGSWAARDE =**

Som van conceptuele, architectonische beleving en directe, zintuiglijke beleving

**ECONOMISCHE WAARDE =**

Creatie van huidige en toekomstige waarde; alsook benutting van synergievoordelen

**GEBRUIKERSWAARDE =**

Functionaliteit, flexibiliteit en het persoonlijk comfort (lucht, warmte, akoestiek)

**TECHNISCHE WAARDE =**

Combinatie van grondstoffengebruik en bouwproces; wat resulteert in een gebouw

Hoeveel meer invloed denkt u dat volledige doordecentralisatie kan hebben op de optimalisatie van de:

**BELEVINGSWAARDE dan op die van de ECONOMISCHE WAARDE? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**BELEVINGSWAARDE dan op die van de GEBRUIKERSWAARDE? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**BELEVINGSWAARDE dan op die van de TECHNISCHE WAARDE? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**ECONOMISCHE WAARDE dan op die van de GEBRUIKERSWAARDE? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**ECONOMISCHE WAARDE dan op die van de TECHNISCHE WAARDE? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**GEBRUIKERSWAARDE dan op die van de TECHNISCHE WAARDE? \***

Indien u denkt dat volledige doordecentralisatie geen noemenswaardige invloed heeft op de kwaliteit van scholen, dan kunt u hier een 3 invullen

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## SCENARIOVERGELIJKING

Na het beoordelen van de maatregelen per scenario, ben ik ten slotte nog benieuwd naar hoe u de vijf behandelde scenario's zelf beoordeelt:

**INTRODUCTIE VAN HET RECHT OP VOLLEDIGE DOORDECENTRALISATIE:**

Versterking van de machtspositie van schoolbesturen bij de aanvraag van een verzoek tot volledige doordecentralisatie.

**OPTIMALISATIE VAN HET ONDERHOUDSBELEID:**

Maatregelen als doordecentralisatie van het buitenonderhoud en introductie van het recht op renovatie voor schoolbesturen.

**VERANDERING VAN HET PROGRAMMA VAN EISEN:**

Het implementeren van kwaliteitseisen of prestatiedocumenten met daarin verantwoordelijke partijen voor (delen van) het programma van eisen.

**VERBETERING VAN HET FINANCIËEL MANAGEMENT:**

Maatregelen als benchmarking van zowel gemeenten als schoolbesturen of het vergroten van de financiële expertise van beiden.

**VERHOOGING VAN DE BUDGETTEN:**

Maatregelen als het aanpassen van de normvergoeding, het oormerken van de gemeentelijke onderwijshuisvestingsbudgetten of het betrekken van private partijen bij het project.

Kunt u aangeven hoeveel meer invloed op de kwaliteitsverbetering van de gemiddelde Nederlandse basisschool u verwacht dat:

**INTRODUCTIE VAN HET RECHT OP DOORDECENTRALISATIE heeft ten opzichte van OPTIMALISATIE VAN HET ONDERHOUDSBELEID? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**INTRODUCTIE VAN HET RECHT OP DOORDECENTRALISATIE heeft ten opzichte van VERANDERING VAN HET PROGRAMMA VAN EISEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**INTRODUCTIE VAN HET RECHT OP DOORDECENTRALISATIE heeft ten opzichte van VERBETERING VAN HET FINANCIËEL MANAGEMENT? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**INTRODUCTIE VAN HET RECHT OP DOORDECENTRALISATIE heeft ten opzichte van VERHOGING VAN DE BUDGETTEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**OPTIMALISATIE VAN HET ONDERHOUDSBELEID heeft ten opzichte van VERANDERING VAN HET PROGRAMMA VAN EISEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**OPTIMALISATIE VAN HET ONDERHOUDSBELEID heeft ten opzichte van VERBETERING VAN HET FINANCIËEL MANAGEMENT? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**OPTIMALISATIE VAN HET ONDERHOUDSBELEID heeft ten opzichte van VERHOGING VAN DE BUDGETTEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**VERANDERING VAN HET PROGRAMMA VAN EISEN heeft ten opzichte van VERBETERING VAN HET FINANCIËEL MANAGEMENT? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**VERANDERING VAN HET PROGRAMMA VAN EISEN heeft ten opzichte van VERHOGING VAN DE BUDGETTEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

**VERBETERING VAN HET FINANCIËEL MANAGEMENT heeft ten opzichte van VERHOGING VAN DE BUDGETTEN? \***

1 2 3 4 5

Veel minder invloed      Veel meer invloed

## Einde van de enquête

Dit was de laatste vraag. U kunt de enquête opsturen door op de knop onderaan de pagina te klikken. Ik wil u hierbij nogmaals hartelijk bedanken voor het invullen van de enquête. Mocht u nog op- of aanmerkingen hebben op de enquête dan kunt u die hieronder kwijt.

### Ruimte voor opmerkingen



Beste lezer,

een week geleden heb ik u benaderd met onderstaand verzoek, waar ik u graag aan zou willen herinneren. Mocht u de enquête al hebben ingevuld dan mag u deze mail als niet verzonden beschouwen.

De kwaliteit van de onderwijshuisvesting van het primair onderwijs en het bijbehorende financieringsstelsel is al enkele jaren onderwerp van discussie. Om de kwaliteit van basisscholen te kunnen verbeteren is er inzicht nodig in wat nu precies scholen tot goede scholen maakt en is er meer zicht nodig op welke verbeteringen in het financieringsstelsel op het meeste draagvlak kunnen rekenen.

**Hier kunt u bij helpen!**

Voor mijn afstudeerproject voor de masteropleiding Construction Management & Engineering aan de Technische Universiteit Eindhoven heb ik een enquête ontworpen met als doel bij architecten, schooldirecteuren, gemeenten en bovenschoolse schoolbesturen hun mening te achterhalen aangaande de kwaliteit van de huidige schoolgebouwen en de steun voor mogelijke verbeteringsmaatregelen voor het huidige financieringsstelsel; en daarmee uiteindelijk ook voor de schoolgebouwen.

Ik hoop dat u –als persoon die vanuit een bovenschools schoolbestuur bezig is met de onderwijshuisvesting – mij persoonlijk en de kennisontwikkeling in de onderwijshuisvestingssector in het algemeen wilt helpen door het invullen van deze enquête. Dit zal u **slechts 15 minuten** kosten. Daarnaast heeft u de mogelijkheid om **de resultaten van dit onderzoek te ontvangen** en kunt u **kans maken op een staatslot** door het achterlaten van uw e-mailadres in het enquêteformulier. Los hiervan zullen de resultaten van de enquête anoniem worden verwerkt.

De enquête kunt u vinden door op onderstaande link te klikken:

<https://docs.google.com/spreadsheet/viewform?formkey=dHRKWnJKN25qQTEweXNzNjNUeG5KcEE6MQ#gid=0>

Wanneer u besluit mee te doen zou ik uw antwoorden graag binnen één week ontvangen.

Met vriendelijke groet,

**Ruud van Giels** | Afstudeerder

Construction Management and Engineering | [www.tue.nl/cme](http://www.tue.nl/cme)  
Eindhoven University of Technology (TU/e) | [www.tue.nl](http://www.tue.nl)



**Summary for CME yearbook**

## **PUTTING THE EXTRA IN BASIC EDUCATION**

### **How can a more sustainable value creation within primary schools be achieved?**

Author: ir. R.G.C. van Giels

#### **Graduation program:**

Construction Management and Urban Development 2011-2012

Process Engineering

#### **Graduation committee:**

Prof. dr. ir. W.F. Schaefer (TU/e)

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Ir. W. Houët (HEVO)

#### **Date of graduation:**

23-08-2012

#### **ABSTRACT**

*Because of the separated responsibilities and accompanying budgets within the financing system of primary educational real estate a conflict of interest is present between municipalities and school boards; which leads to buildings of suboptimal quality. By using the Analytical Hierarchy Process, this research tries to identify which elements of a primary school are considered as being the most valuable; how these elements are evaluated in current primary schools and which proposed improvement measures for the financing system are considered as being the most fruitful. Subsequently, the impact of these measures on the possible value creation within primary schools is modeled by using the System Dynamics methodology.*

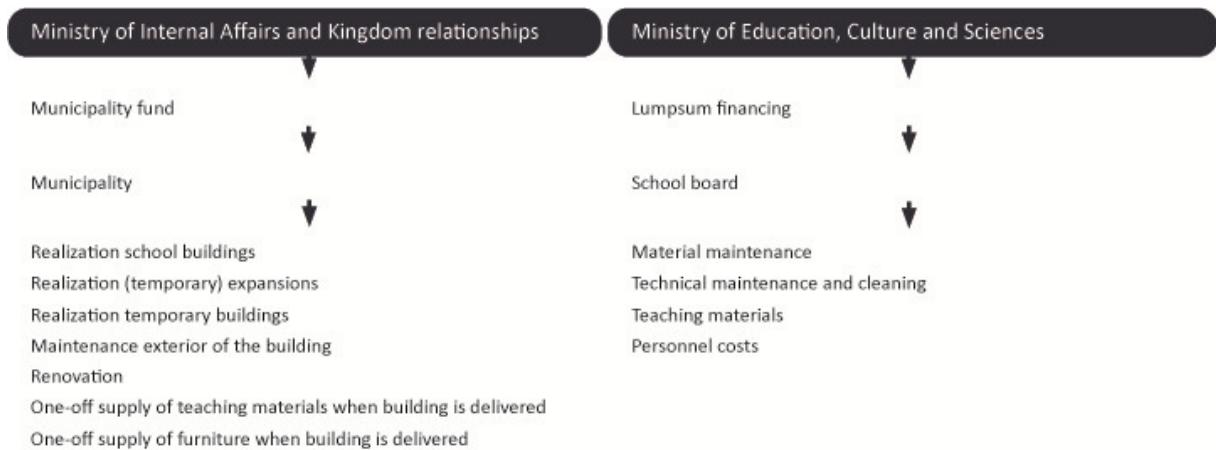
**Keywords:** sustainable value creation, primary schools, financing system, Analytical Hierarchy Process (AHP), System Dynamics (SD)

#### **PROBLEM DESCRIPTION**

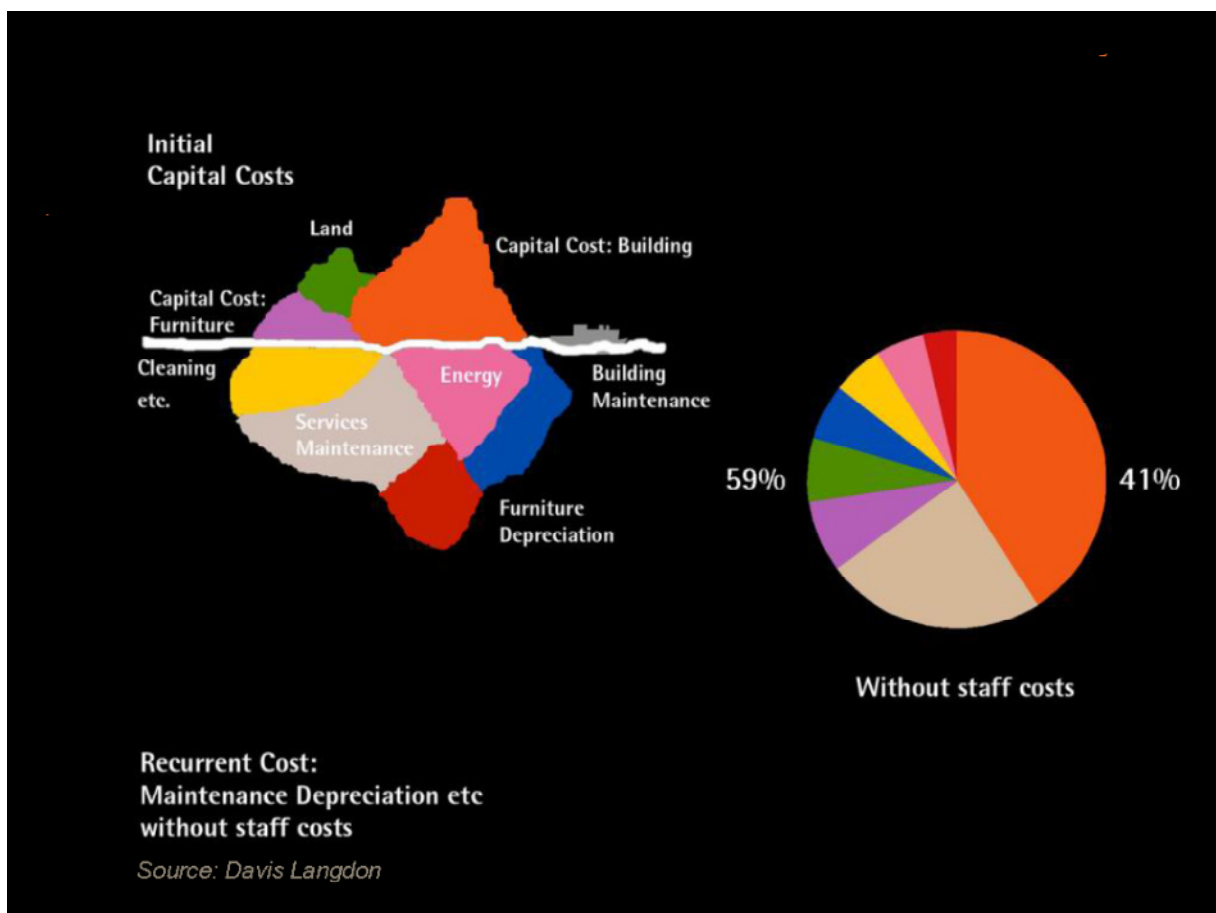
The average Dutch primary school is 35 years old (Midden, G. J. van 07-03-12). Although specific nationwide data is lacking (Pol, L. van der e.a. 2009) one can imagine that, given that 83% of Dutch municipalities use a lifetime of a school of 40 years in their accountancy reports (Langen, J. van 2012), a considerable amount of schools need to be renovated or rebuild in the coming years. Next to that, many current schools lack in the fields of indoor climate and in the proper facilitation of the educational vision (Pol, L. van der e.a. 2009).

This large (re-)development task is facilitated by a fragmented financing system which can be characterized by its separation of cash flows and accompanying responsibilities (Uhlenbusch, M. e.a. 2011). Municipalities get money via the municipality fund of the ministry of Internal Affairs and Kingdom relationships for the creation of a new school after which the economical ownership of the school is being transferred to the school board; who in their turn get money in the form of the lumpsumfinancing from the ministry of Education, Culture and Sciences for the operational expenses and daily maintenance (Fig. 1). The municipality remains responsible for the major maintenance issues. The way in which these

responsibilities are divided implicitly stimulates the municipalities to focus on the optimization of the initial investment costs instead of on the optimization of the lifecycle costs, whereas we can see that, even when the staff costs are excluded, the investment costs merely account for 41% of the total costs (Fig. 2).



**Figure 1: Separate cash flows (Uhlenbusch, M. e.a. 2011)**



**Figure 2: Exploitation versus investment costs excluding staff costs (Turner, M. 2006)**

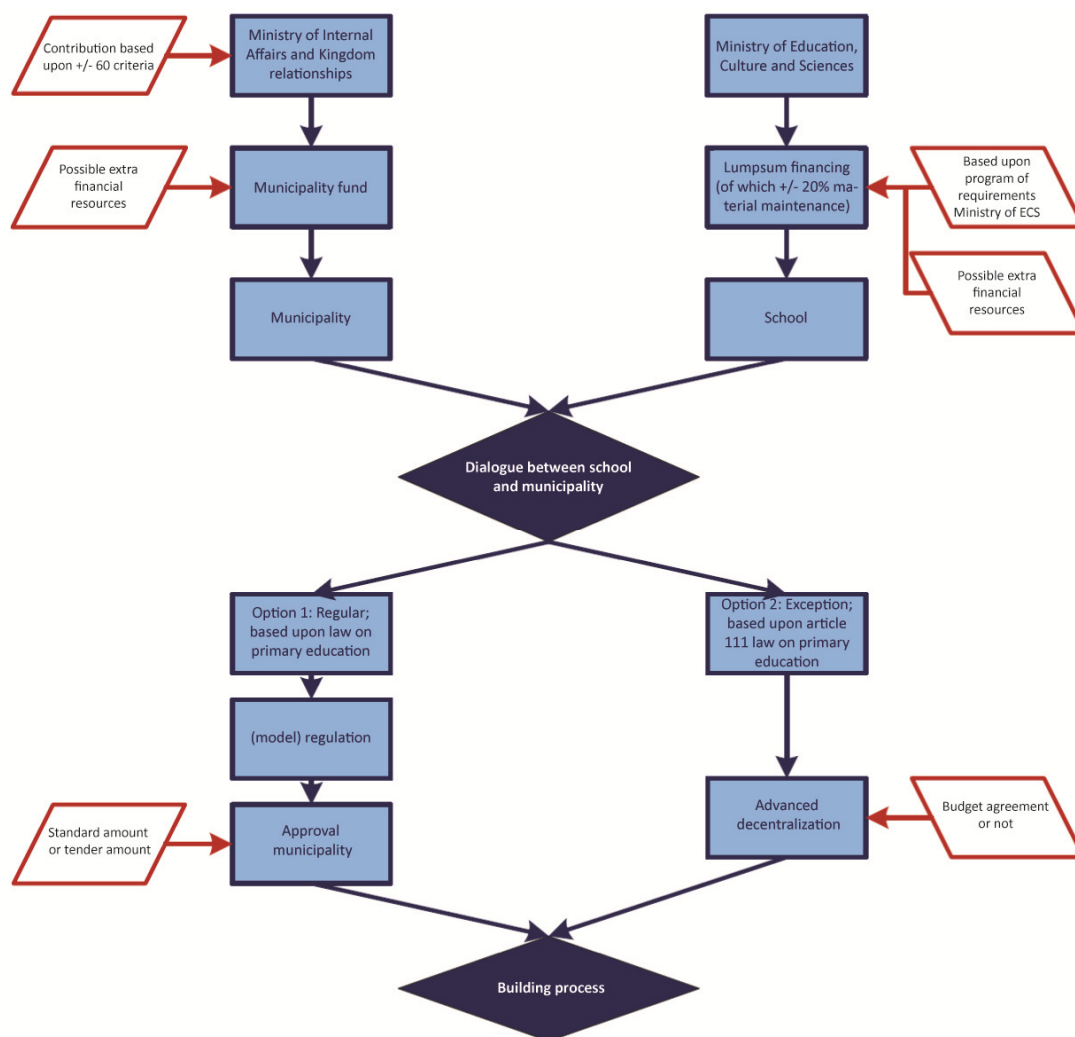
The notion that the current financial system is less than optimal is shared by many (Pol, L. van der e.a. 2009; Barendregt E. e.a. 2010 and Gramberg, P. e.a 2010 for example). The excessive focus on optimization of the investment costs is linked to the inferior indoor climate and to difficulties in the implementation of sustainable features within the building,

as these measures might ask for higher investment costs in the beginning, but might be able to recover their investment costs over the exploitation period. However, because of the lack of a clear director over the entire life cycle of a primary school, the life cycle costs and performances of the current Dutch primary schools are less than optimal. At this point in time, when research results warn us that if we keep going the way we are going we will need three Earths to meet our needs by the time we reach the year 2050 (Langen, J. van 2012), we cannot ignore the importance of sustainable (re-)development of our buildings. Since the current financial system is a threat for the efficient and sustainable value creation within primary schools, it needs to be optimized.

## METHODOLOGY

### Literature study

A first step within this research has been a literature study on the current financing system of primary educational real estate; the current problems that are caused by this system; possible improvement measures to optimize the system and on how to define this concept called sustainable value creation. To start with the first, the current financing system allows for two scenarios: either the municipality is leading in the creation and external maintenance of schools, or these responsibilities and accompanying budgets are transferred to the school boards within this municipality (Fig. 3).



**Figure 3: Cash flows and financing scenarios (Wolff, R. 2011)**

The second scenario is called advanced decentralization and is very rare, since this can only take place after an extensive process of intense collaboration on agreements between the municipality and the school boards within that municipality; and only if both parties agree. All kinds of factors influence this negotiation process, like municipalities not liking to give up the annual educational real estate budget which they receive from the municipal fund and municipalities questioning the financial management capabilities of the school boards. However, many consider this scenario as promising because of the fact that all responsibilities and budgets will be put into one hand; enabling the execution of an integral long-term housing policy focused on optimization of the buildings over the entire life-cycle.

Then, the Dutch Rijksbouwmeester has made the problems within the sector tremendously clear in her 2009 research report on the primary educational real estate sector (Pol, L. van der e.a. 2009). A combination of desk research and expert interviews has resulted in a broad overview of problems within the realms of the program of requirements, laws and regulations, quality assurance and monitoring, clientship and knowledge development, cooperation, research agenda and – most importantly for this research – budgets and cash flows. Regarding the latter, these problems have been pinpointed as a cause for the creation of schools of suboptimal quality. This insufficient quality level is backed-up by a 2010 user experience research amongst Dutch primary school teachers and principals (Bakers, J. e.a. 2010). The main problem however is that, because of the split responsibilities within the sector, there is a lack of a specific problem owner responsible for solving these problems (Leun, A. van der (red.) 2009).

Scenario	Improvement measures from literature research	Improvement measures after verification
<b>1</b> <b>Introducing the right on full advanced decentralization</b>	Introducing the right on full advanced decentralization	<b>1</b> Introducing the right on full advanced decentralization
	Enhancing the financial management of school boards	
<b>2</b> <b>Increasing the budgets</b>	Involving private parties	<b>2</b> Involving private parties
	Updating the standard allowances to current price and quality levels	<b>3</b> Updating the standard allowances to current price and quality levels
	Earmarking of the municipal educational real estate budgets	<b>4</b> Earmarking of the municipal educational real estate budgets
<b>3</b> <b>Enhancing the financial management</b>	Benchmarking of school boards	<b>5</b> Benchmarking of school boards
	Increasing financial expertise of school boards	<b>6</b> Increasing financial expertise of school boards
	Publishing rankings of well and bad managing school boards	
	Stimulate the usage of multi-annual financial plans by school boards	
	Benchmarking of municipalities	<b>7</b> Benchmarking of municipalities
	Increasing financial expertise of municipalities	<b>8</b> Increasing financial expertise of municipalities
	Publishing rankings of well and bad managing municipalities	
	Stimulating the usage of multi-annual financial plans by municipalities	
	Strengthening the juridical status of municipal financial multi-annual plans	
	Introducing a complaints desk on municipal educational real estate policy	
<b>4</b> <b>Changing the program of requirements</b>	Using quality demands	<b>9</b> Using quality demands
	Using performance documents	<b>10</b> Using performance documents
<b>5</b> <b>Optimizing the maintenance policy</b>	Introducing the right on renovation	<b>11</b> Introducing the right on renovation
	Advanced decentralization of the external maintenance	<b>12</b> Advanced decentralization of the external maintenance

**Table 1: Improvement measures for the current financing system**

Next, several improvement measures for the current financing system are proposed by several actors (Leun, A. van der (red.) e.a. 2009; Pol, L. van der e.a. 2009; Bakers, J. e.a. 2010; Barendregt, E. e.a. 2010; Gramberg, P. e.a. 2010; Uhlenbusch, M. e.a. 2011; Midden, G.J. van 07-03-12 and Bloois, R. van e.a. 03-04-12), which can be roughly grouped into five scenarios (Tab. 1). These measures have been verified in cooperation with HEVO; finally resulting in a total of twelve that have been further investigated.

Finally, sustainable value creation is defined as achieving the highest possible initial value as possible and the lowest value decay over the life-cycle of the building as possible. After a comparison with other definitions of value creation within Dutch primary schools (Bakers, J. e.a. 2010; Wolff, R. 2011 and others), for the definition of value HEVO's concept of Sustainable Performance 2.0 (Bloois, R. van e.a. 03-04-12) has been chosen to use, because of its inclusion of an economical value component; reflecting HEVO's actor perspective on sustainability which includes people, planet and profit (Uhlenbusch, M. e.a. 2011). HEVO defines the value of a building in four main values being: user value, experiential value, technical value and economical value. The four main values are then again subdivided in a total of 38 elements, which together make up the total value of a primary school. This original definition has been adjusted to 36 clustered elements in cooperation with HEVO (Tab. 2).

USER VALUE	EXPERIENTIAL VALUE	TECHNICAL VALUE	ECONOMICAL VALUE
<b>FLEXIBILITY</b>	<b>CONCEPTUAL, ARCHITECTURAL EXPERIENCE</b>	<b>USAGE OF RESOURCES</b>	<b>PRESENT VALUE</b>
Flexibility of the building	Architecture and appearance	Waste awareness	Corporate Social Responsibility
Flexibility of the group spaces	Sustainability	Energy usage	Maximization of the real estate value
	Ecology	Material usage	Optimization of the exploitation costs
	Atmosphere and image	Water (re-)usage	Optimization of the investment costs
<b>FUNCTIONALITY</b>	<b>DIRECT, SENSUAL EXPERIENCE</b>	<b>TECHNICAL ASPECTS OF THE BUILDING PROCESS</b>	<b>SYNERGY ADVANTAGES</b>
Functionality of the educational concept	Daylight entrance	Simplicity of technical solutions	Management synergy
Functionality of the supportive functions	Influence on the indoor climate	Standardization	Spatial synergy
Functionality of the playground	Social security		
Multi-functionality of the spaces	Transparency	<b>TECHNICAL ASPECTS OF THE BUILDING</b>	<b>FUTURE VALUE</b>
Accessibility of the building	Visibility of nature and landscape	ICT-facilities	Possibilities for redevelopment
<b>PERSONAL COMFORT</b>		Maintainability	Rentability of parts of the building
Acoustic comfort		Cleanability	
Air quality			
Thermal comfort			

**Table 2: Adjusted definition of value by HEVO (based upon Bloois, R. van e.a. 03-04-12)**

## Modeling

These four literature research tracks have provided the necessary input for the creation of a System Dynamics (SD) model (Sterman, J.D. 2000) of the primary educational real estate financing system. In this dynamic model the effect of implementation of the twelve different proposed improvement measures (Tab. 1) on the sustainable value creation of the average Dutch primary school can be modeled. The factors in the second model (Fig. 5) influence the possible initial value creation and value decay in the first model (Fig. 4). Both financing concepts of that of advanced decentralization and that of the regular way of governance are included in this model, as well as HEVO's definition of Sustainable Performance 2.0.

## Data collection

By conducting a questionnaire amongst users and architects of primary schools as well as municipalities and school boards – based upon the Analytical Hierarchy Process (AHP) (Teknomo, K. 2006) – the relative importance of the 36 elements of value is determined as well as the evaluation of these elements in current primary schools. Next to this, the municipalities and school boards are questioned on their relative support for the proposed improvements of the financing system.

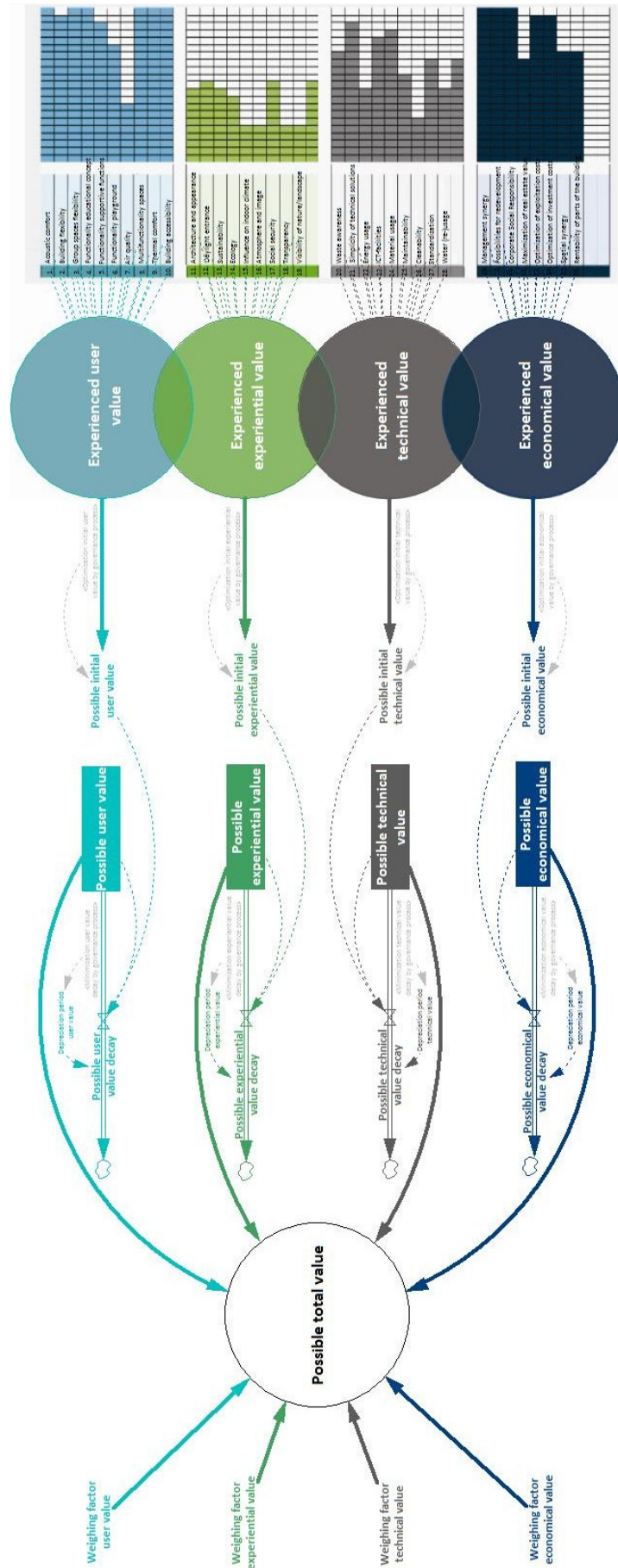


Figure 4: Modeling of sustainable value creation



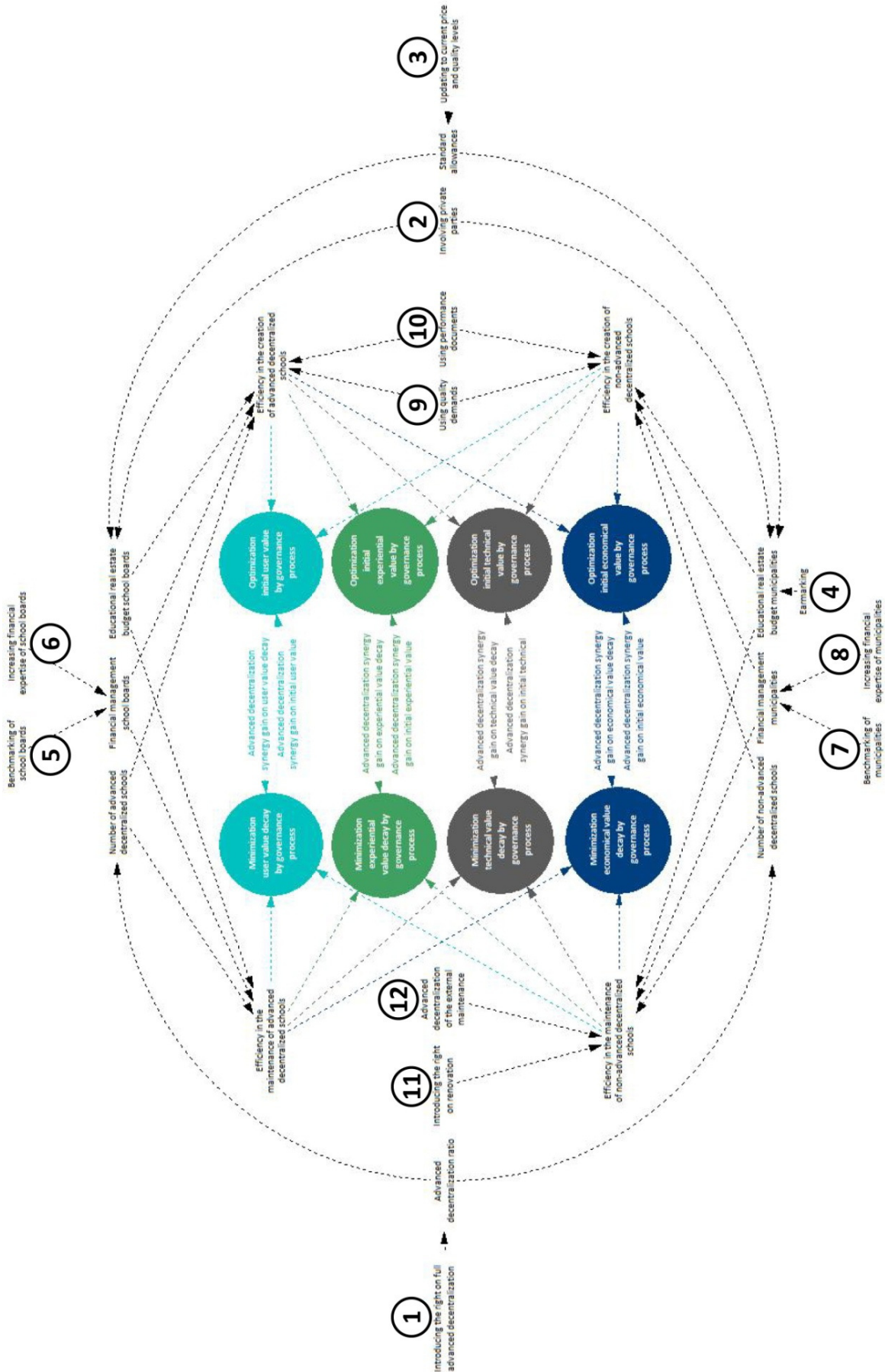


Figure 5: Modeling of influential factors on sustainable value creation

## RESULTS

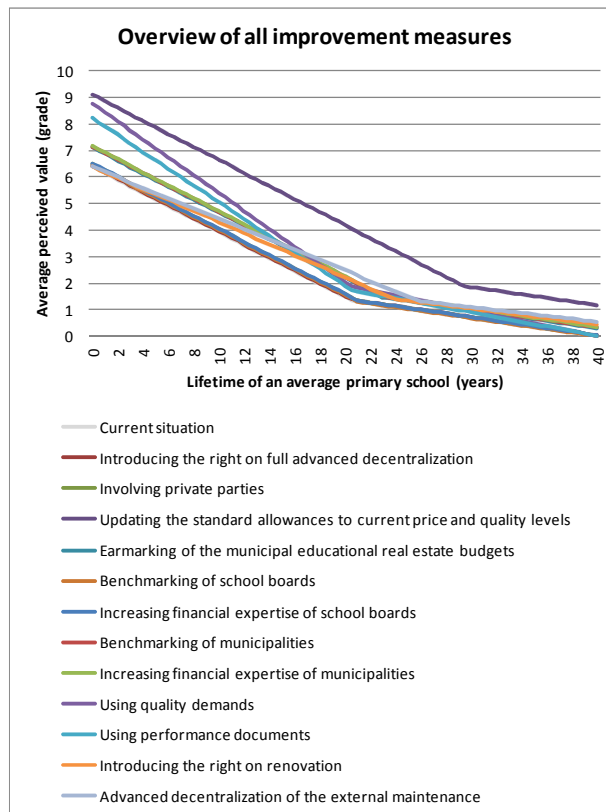
The gathered insight in the relative importance and the evaluation of the value elements by these target groups (Tab. 3) is interesting for HEVO as, being a project management and housing advice agency in the educational sector, it provides the company insight on how to approach their clients and collaboration partners.

	USERS			ARCHITECTS			SCHOOL BOARDS			MUNICIPALITIES			AVERAGE		
	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade	Weighing factor per value	Weighing factor total	Grade
<b>USER VALUE</b>	100%	43,9%	6,0	100%	34,4%	7,0	48,8%			39,1%			100%	38,5%	6,5
<b>FLEXIBILITY</b>	30%	13,2%	5,1	29%	10,0%	6,6							30%	11,4%	5,9
Flexibility of the building	15%	6,4%	5,2	15%	5,1%	7,0							15%	5,7%	6,1
Flexibility of the group spaces	15%	6,8%	5,0	14%	4,9%	6,3							15%	5,8%	5,7
<b>FUNCTIONALITY</b>	29%	12,8%	6,7	28%	9,7%	7,0							29%	11,1%	6,9
Functionality of the educational concept	8%	3,7%	6,4	7%	2,6%	7,2							8%	3,1%	6,8
Functionality of the supportive functions	4%	1,7%	6,2	4%	1,4%	6,8							4%	1,5%	6,5
Functionality of the playground	5%	2,4%	7,3	6%	2,0%	6,3							6%	2,2%	6,8
Multi-functionality of the spaces	5%	2,3%	6,3	6%	1,9%	7,1							5%	2,1%	6,7
Accessibility of the building	6%	2,7%	7,4	5%	1,8%	7,6							6%	2,2%	7,5
<b>PERSONAL COMFORT</b>	41%	17,9%	6,1	43%	14,7%	7,3							42%	16,0%	6,7
Acoustic comfort	15%	6,6%	7,2	15%	5,0%	7,2							15%	5,7%	7,2
Air quality	13%	5,6%	5,5	16%	5,3%	7,3							14%	5,4%	6,4
Thermal comfort	13%	5,6%	5,3	13%	4,3%	7,4							13%	4,9%	6,4
<b>EXPERIENTIAL VALUE</b>	100%	24,0%	6,4	100%	27,2%	7,0	17,5%			20,6%			100%	25,1%	6,7
<b>CONCEPTUAL, ARCHITECTURAL EXPERIENCE</b>	44%	10,5%	6,1	42%	11,5%	6,8							43%	10,8%	6,5
Architecture and appearance	7%	1,7%	6,5	9%	2,4%	7,2							8%	2,0%	6,9
Sustainability	12%	3,0%	5,0	13%	3,4%	6,9							12%	3,1%	6,0
Ecology	7%	1,7%	4,9	9%	2,5%	5,7							8%	2,1%	5,3
Atmosphere and image	17%	4,1%	7,2	12%	3,2%	7,4							14%	3,6%	7,3
<b>DIRECT, SENSUAL EXPERIENCE</b>	56%	13,5%	6,6	58%	15,7%	7,1							57%	14,3%	6,8
Daylight entrance	11%	2,6%	7,5	13%	3,4%	7,3							12%	3,0%	7,4
Influence on the indoor climate	12%	2,9%	4,6	13%	3,5%	6,7							13%	3,2%	5,6
Social security	20%	4,7%	7,6	14%	3,8%	7,4							17%	4,2%	7,5
Transparency	7%	1,8%	6,5	9%	2,4%	7,2							8%	2,1%	6,8
Visibility of nature and landscape	6%	1,5%	6,3	9%	2,4%	6,6							8%	1,9%	6,4
<b>TECHNICAL VALUE</b>	17,5%			18,3%			100%	16,9%	5,7	100%	18,5%	6,0	100%	17,4%	5,8
<b>USAGE OF RESOURCES</b>							25%	4,2%	5,1	34%	6,4%	5,9	30%	5,2%	5,5
Waste awareness							5%	0,8%	5,6	6%	1,2%	5,9	6%	1,0%	5,7
Energy usage							10%	1,6%	5,1	12%	2,2%	5,5	11%	1,9%	5,3
Material usage							5%	0,9%	5,5	8%	1,5%	6,2	7%	1,2%	5,9
Water (re-)usage							5%	0,8%	4,2	8%	1,5%	6,3	6%	1,1%	5,3
<b>TECHNICAL ASPECTS OF THE BUILDING PROCESS</b>							19%	3,2%	5,4	24%	4,5%	6,2	22%	3,8%	5,8
Simplicity of technical solutions							12%	2,1%	5,7	15%	2,8%	6,4	14%	2,4%	6,1
Standardization							7%	1,1%	4,7	9%	1,7%	5,9	8%	1,4%	5,3
<b>TECHNICAL ASPECTS OF THE BUILDING</b>							56%	9,5%	6,1	41%	7,6%	5,8	49%	8,4%	6,0
ICT-facilities							15%	2,5%	6,9	11%	2,1%	5,3	13%	2,3%	6,1
Maintainability							21%	3,5%	5,7	18%	3,4%	5,8	19%	3,4%	5,8
Cleanability							21%	3,5%	5,9	12%	2,2%	6,4	16%	2,8%	6,1
<b>ECONOMICAL VALUE</b>	14,6%			20,1%			100%	16,8%	5,4	100%	21,9%	5,6	100%	19,0%	5,5
<b>PRESENT VALUE</b>							42%	7,1%	5,0	30%	6,5%	5,4	36%	6,7%	5,2
Corporate Social Responsibility							4%	0,7%	5,8	3%	0,7%	6,0	4%	0,7%	5,9
Maximization of the real estate value							12%	2,0%	3,7	9%	2,0%	4,4	11%	2,0%	4,1
Optimization of the exploitation costs							18%	3,1%	5,5	10%	2,2%	5,7	14%	2,6%	5,6
Optimization of the investment costs							8%	1,3%	5,6	7%	1,6%	6,0	8%	1,4%	5,8
<b>SYNERGY ADVANTAGES</b>							32%	5,4%	6,1	39%	8,6%	5,9	36%	6,8%	6,0
Management synergy							18%	3,0%	6,1	21%	4,6%	5,6	19%	3,7%	5,9
Spatial synergy							14%	2,4%	6,0	18%	3,9%	6,2	16%	3,1%	6,1
<b>FUTURE VALUE</b>							26%	4,3%	5,3	31%	6,8%	5,5	28%	5,4%	5,4
Possibilities for redevelopment							11%	1,8%	4,3	15%	3,3%	5,3	13%	2,5%	4,8
Rentability of parts of the building							15%	2,5%	5,9	16%	3,4%	5,8	15%	2,9%	5,8
													100,0%		6,2

**Table 3: The questionnaire results regarding the value elements per target group**

Next to this, this gathered data serves as input for the SD-model. Concluding, one can say that most general support exists for improvement measures focused on an increase of the budget and changes in the usage of the program of requirements (Fig. 6). Apart from the

general answers, several presumptions are confirmed as municipalities would like to see an increase of the financial management capabilities of school boards whereas school boards prefer measures considering advanced decentralization. Furthermore, overall the school boards expect more value gain within their schools as a result of the several proposed improvement measures of the financing system than municipalities do.



**Figure 6: Average perceived value of all improvement measures**

## DISCUSSION

From a comparative investigation amongst scientific literature on value creation within real estate in general and primary schools in particular it has become clear that the qualitative dynamic system approach towards sustainable value creation as it has been used in this research – investigating value in a quantitative way over the entire life-cycle of a building – is a relatively new approach. This might result in a possibility for the university to publish a scientific paper on this approach towards value creation. Future research could focus on the influence of other factors on the quality of primary schools or on the application of this method on other real estate sectors. From a more practical point of view, the target groups approached could benefit from more insight in each other's evaluation of value creation within primary schools and each other's support for the different improvement measures; as well can HEVO.

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