M&I/Partners/

adviseurs voor management en informatie

Benchmarking the organizational benefits of IT
A practical approach

De kracht van toewijding

M&I/Partners/

adviseurs voor management en informatie

Benchmarking the organizational benefits of IT
A practical approach

Master's Thesis Economics and ICT

This report was written for the Erasmus Universiteit Rotterdam and M&I/Partners by mr. D. van Wingerden BSc (diderik.van.wingerden@mxi.nl) of M&I/Partners[bv].

Amersfoort, May 23, 2008

Preface

This document presents the findings of the research project on benchmarking the business benefits of IT. This research was conducted between April 2007 and April 2008 and was done as my master's thesis project as student of the master programme "Economics & ICT", which is part of the study programme "Informatics & Economics" at the Erasmus School of Economics, faculty of the Erasmus University Rotterdam.

This document serves two goals. First it is the document on which my supervisor, Prof. Dr. Gert J. van der Pijl and co-supervisor, Nees Jan van Eck MSc, of the Erasmus University Rotterdam will base their decision if I have met the demands for a final master's thesis before graduation. Second it is a means to document and transfer the gained results and insight to M&I/Partners, the organization which has stated the research problem and invited me to perform a research project.

It should be noted that M&I/Partners regards the specifics of the developed instruments as a competitive advantage. For this reason not all research results are distributed publicly. Confidential parts are included in appendices and may be omitted from this version of the thesis document.

I would like to thank the people who have contributed to my research project. Without you this research could not have been performed. I owe gratitude to: Egon Berghout and Patrick van Eekeren for welcoming me to M&I/Partners, giving me the opportunity to perform my research at this company and helping me in the initial phase of my research, Gert van der Pijl, Nees Jan van Eck and Peter van Dijk for supervising my research and helping me out at challenging times, the employees of the housing associations, municipalities, financial service provider and international real estate company for their input during the interviews, with housing associations A, C and D in particular for participating in the field test. Your input is anonymised in this document, but you know who you are. I also owe gratitude to Dick IJpelaar, Ton van Reeken and Rob Poels for their valuable expert contribution in the field of IT economics and my colleagues Mark van der Velden, Ies van Rij and Davinia Hochheimer for their assistance during the project.

Combining a new job at M&I/Partners and finishing my master's thesis has been challenging for me, as is also shown by the delayed completion of this work. I would like to thank Chris Frowein for encouraging me to complete my research and M&I/Partners for giving me the necessary room to do so. Finally I thank my girlfriend, Mylène, for her understanding and support at difficult times and when I had to spend yet even more free time on this project.

Diderik van Wingerden
Amersfoort, April 2008

Table of Contents

Summary

This document presents the results of a master's thesis project for the programme "Economics & ICT", part of the study programme "Informatics & Economics" at the Erasmus School of Economics, Erasmus University Rotterdam. This project was combined with an internship at M&I/Partners. Since 2002 M&I/Partners has been conducting IT benchmarks in the housing association, municipality and health care industry. The focus of these benchmarks has been on IT costs: the Total Cost of Ownership (TCO). Participants of these benchmarks have increasingly urged the need to complement the benchmark with an IT benefits or value counterpart, for a more extensive elaboration and explanation of the variations in IT costs levels. The goal of this research has been to develop a practical prototype of a benchmark instrument for evaluating the organizational benefits of IT and to serve as a "benefits" counterpart of the existing M&I/Partners benchmarks.

Using existing literature and existing IT evaluation methods, an IT benefits benchmark instrument has been designed. This instrument consists of two existing methods: the method of Bedell and the Information Economics method, and one self-created method to complement these existing methods: the IT infrastructure method. The designed instrument was tested in an empirical study. This empirical study consisted of qualitative field research, using the extended case method and semi-structured interviews to question IT managers of six housing associations, two municipalities, a financial service provider, an international real estate company and three IT economics experts. Additionally a field test was conducted, applying and testing the instrument with three of the interviewed housing associations.

The results of the empirical study show that the developed IT benefits benchmark instrument is useful for housing associations, although a number of improvements can be made. The study is inconclusive on the use of the instrument for municipalities: since these organizations are typically larger and more complex than housing associations, it is questionable if the needed business process categories and information systems (IS) model (business process and IS model) can be created. However, the model could at least be created for municipal activities required by law. The instrument does not seem to be useful for the international real estate company as a whole. Since this company consists of many business units that operate independently and have divergent activities, creating the needed business process and IS model for the entire organization will be difficult. However, it may be possible to compare individual business units to those of other organizations, even in other industries. The interviewed financial service provider also consisted of various business units. Comparing business units in the financial service industry may however not be possible, since activities may be too diverse to create comparable results. Regarding the applicability and usefulness of the benchmark results as indicated during the interviews, it is noticeable that many of the uses do not require comparison of results between organizations: organization-specific measurement and results also suffice.

A limitation of the instrument is that the IT benefits are evaluated for current organizational strategy, structure and business processes. The results do not include indications for new products, services, new business or IT strategies, new organizational structures or redesign of existing business processes. Also, the interviewees indicated that the benchmark results will be more useful when they are integrated with the IT costs (TCO) results of the M&I/Partners IT benchmark.

The method of Bedell seems the most useful method of the three in a benchmarking context and is recommended for further application. However, the method did need a lot of explanation during data gathering and presentation of the results. The used indicators and scores also have too much room for interpretation and subjectivity. These shortcomings can be improved by simplifying terminology and improving definitions and descriptions. The interviewed organizations stressed the need to involve line or top management, key users and the IT department in data gathering. This involvement will result in more reliable and valid data and better organizational support for the benchmark results. The method of Bedell also contains a fundamental shortcoming that should be overcome in order to remain useful for housing associations in the future and for applying the method in other industries. This shortcoming is that the method assumes a one-to-one relationship between business processes and information systems. This assumption was valid at the time the method was created, but in contemporary organizations this assumption does not hold anymore: information systems are increasingly coupled, integrated and layered on top of each other and used throughout the organization for various business processes.

Before applying the instrument "for real" in the housing association industry, it is recommended to improve the existing business process and IS model. Furthermore, when applying the instrument for other industries, additional business process and IS models are needed. The research results include guidelines on how to create such models (see paragraph 6.3.1). A number of rules and instructions should also be added to further guarantee the quality of the gathered data. The created calculation and presentation format of results should be simplified by selecting a limited number of result indicators and figures. Then for each indicator and figure a description should be added of what conclusions can be drawn for participants individually or for the industry as a whole. Including the intermediate results as a separate appendix will also help participants understand the benchmark outcomes.

The method of Bedell is recommended for future study in a benchmarking context. By overcoming the shortcoming mentioned above the measurement of IT infrastructure will effectively be integrated into the method. Parts of the Information Economics method may also be integrated. Another recommendation for future study is to integrate the instrument's results with the IT costs indicators of the M&I/Partners IT benchmarks and to further simplify terminology, indicators and scores. Furthermore, the instrument should be tested for other industries, especially those containing large and complex organizations. The focus should then be on the feasibility of creating a process and IS model: finding a balance between generic usability of the model for all organizations in an industry, while still being sufficiently precise to reflect the actual situation for each participant.

1   Introduction

In 1993 Henderson and Venkatraman in their often used paper on Strategic Alignment of IT state that "managers are still confronted with basic questions such as" (Henderson and Venkatraman 1993):

- *"What are the implications of IT in my business operations? Today? In the future?"*
- *"What are the alternative perspectives for leveraging IT capabilities for business operations?"*
- *"Is the locus of IT competence inside or outside the operation?"*
- *"What is the executive role of senior management for leveraging IT capabilities?"*
- *"How should the IT function be organized, and what is the role of IT outsourcing?"*
- *"What are the appropriate criteria for assessing IT-based benefits?"*

Although these questions were posed many years ago, they are still highly relevant for managers today, as the struggle to get the most value from IT investments is far from over. IT spending has since then increased tremendously and it is believed that many IT investments do not produce results as intended (Berghout and Renkema 2005, Nijland 2004). In many organizations less than 8% of the IT budget is believed to be actually spent on initiatives that bring value to the enterprise. The Butler Group (2005) has investigated that organizations have become quite competent at measuring IT costs, but not the value. The absence of tools and methods is stated to be a major contributor to the lack of successful measurement.

Since 2002 M&I/Partners has been conducting yearly IT benchmarks in the housing association, municipality and health care industry. The focus of these benchmarks has been primarily on IT costs: the Total Cost of Ownership (TCO), complemented with a simple measurement of application functionality and IT process maturity. An important question resulting from the benchmark outcomes has always been: what causes the differences in IT cost levels? Does an organization with a lower IT costs level do better than an organization with a high level? Or is a higher IT costs level justified when more benefit or value is delivered to the organization? Recently various benchmark participants, primarily in the housing association industry, have urged the need for a more elaborate exploration of these IT benefits and value. This exploration should result in an instrument for measurement and comparison of the IT benefits and value between organizations and should serve as a counterpart of IT costs. In this light M&I/Partners has formulated a research problem for developing such an instrument.

This research has developed a working definition for the benefits of IT and a way to measure these benefits within an organization. This measurement serves as a "snap-shot" of the benefits that IT brings at a certain point in time. When snap-shots are taken from different organizations, these can be compared to each other. The result is an IT evaluation instrument comparing IT benefits between organizations: an IT benefits benchmark instrument. Organizations can use the results of a benchmark in many ways, for example for illumination and learning (Nijland 2004), allowing them to see how well they are doing compared to competitors, identify new area's for investment or disinvestment or as a way to improve value of IT over time. The accomplishments of these usages can naturally be measured by doing a new benchmark. The goal of the instrument developed in this research is to provide management with an explanation of the differences in IT costs levels resulting from the M&I/Partners IT benchmarks by providing insight into the organizational benefits of IT, seen from various perspectives and compared to other organizations.

The remainder of this chapter sketches an outline of the research project. Paragraph 1.1 describes the project context; paragraph 1.2 presents the research objective. Then paragraph 1.3 gives a general overview of how the research is carried out: the research framework. In paragraph 1.4 the research issue is described, containing the research questions. Finally paragraph 1.5 contains the outline of the remainder of this document.

1.1 Project context

This research project was conducted in the context of the Erasmus University of Rotterdam (EUR) and M&I/Partners.

First, the research project has been done for the EUR course "Master Thesis Informatics & Economics" (FEWMTIE), which is an obligatory course before graduation. Students have to conduct a research project and write a master's thesis to complete this course. The grade for the thesis will be determined by a supervisor and co-supervisor of the Erasmus University Rotterdam. The student, the supervisor and co-supervisor will communicate during the project on the research being conducted, with the supervisor and co-supervisor guiding the student if and where necessary. The supervisor for this research project was Prof. Dr. Gert J. van der Pijl, a staff member of the Erasmus School of Economics at the Erasmus University of Rotterdam. The co-supervisor for this project was Nees Jan van Eck MSc, also a staff member of the Erasmus School of Economics.

Second, the research project has been done for M&I/Partners, a company that provides independent advice on management and information, located in Amersfoort. M&I/Partners currently employs 60 consultants and does its work mainly in the fields of business & IT, information management and IT infrastructures. M&I/Partners operates primarily for the Dutch market; typical clients are ministries, municipalities, organizations involved in public order and security, education and health care.

Since 2002 M&I/Partners has been conducting yearly IT benchmarks for a growing number of organizations in various industries. The primary focus of these IT benchmarks is on measuring and comparing the IT costs levels of participating organizations: the "Total Cost of Ownership" (TCO), complemented with a simple measurement of functionality and IT process quality. The results of the benchmark are reported anonymously to the participants, but anonymity is taken away during interactive sessions with all participants. The sessions are regarded as very valuable by these participants. The results help the organizations gain insight in their IT spending and increase control over their IT budget. At the time of writing a benchmark is performed in the industries: housing associations (40 participants), municipalities (17 participants) and health care (14 participants). In the rest of this document these existing IT benchmarks of M&I/Partners will be referred to as the "M&I/Partners IT benchmarks".

Participants of the M&I/Partners IT benchmark, especially in the housing association industry, have increasingly urged the need for adding an instrument for evaluating and benchmarking the organizational benefits of IT. Such an instrument should help IT managers getting a much needed insight into the benefits that IT delivers to the organization, explain differences in IT costs levels and identify if higher IT costs levels can be justified. By adding an IT benefits counterpart to the existing IT benchmarks, M&I/Partners hopes to fulfil this need. The created instrument should allow organizations gain insight into the benefits that IT brings them, how these benefits relate to costs, how other organizations in the same industry are doing and how they can improve their organization in getting more benefits and value from IT.

This research should be seen in context with previous research by M&I/Partners in the field of IT economics and IT management:
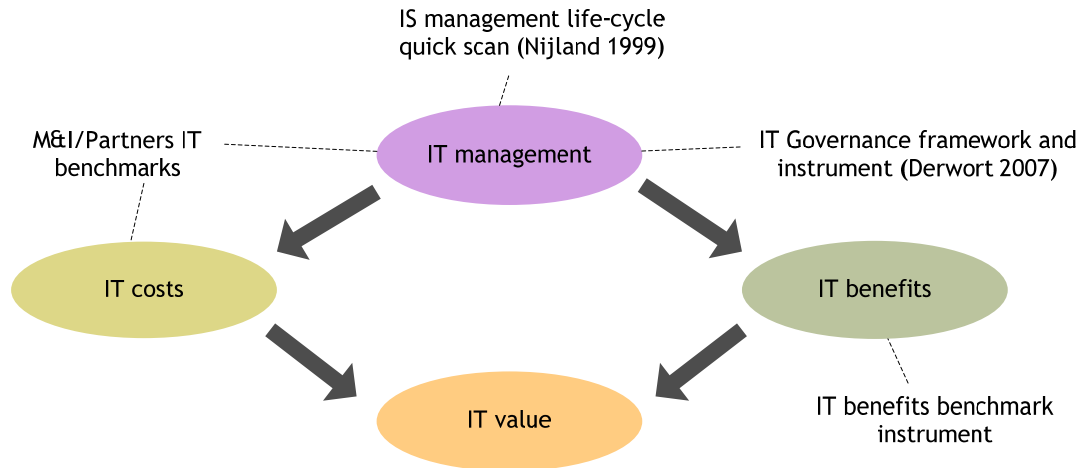
Figure 1.1: M&I/Partners research on IT management, IT costs and IT benefits in context

IT management is studied as part of an IT governance research project by Derwort (2007) and by Nijland (1999), both in the form of an internship at M&I/Partners and resulting in an instrument that can be used for IT evaluation.

1.2 Research objective

The objective of this research project has been to develop a practical instrument for an IT benefits benchmark which evaluates the organizational benefits of IT and compares these between organizations. One of the applications of the instrument is to provide insight into the differences in IT costs levels of the M&I/Partners IT benchmarks. A contribution has been made by analysing existing literature on IT benefits measurement and benchmarking, designing a benchmark instrument from literature and testing the instrument in practice.

Conditions for the practicality of the instrument were that it should be easy to use, relatively cheap to execute and generally applicable across industries. The resulting indicators from different organizations within the same industry should be comparable and give food for discussion within and between participating organizations and should be usable together or be integrated with the M&I/Partners IT benchmarks, which also has the before mentioned characteristics.

The realisation of this research objective should be sufficient as a master's thesis for the researcher's graduation at the EUR and as a first step towards the development of an IT benefits benchmark for M&I/Partners. It should be noted that the research objective was to *contribute* to the development of an IT benefit benchmark instrument for M&I/Partners: a practical instrument has resulted, but the objective was not to deliver a complete and ready to implement benchmark instrumentation set including process descriptions, hand books, templates and the like. The developed instrument is a prototype of an IT benefits benchmark instrument. This prototype consists of:

▪ A list of questions for data gathering that should be answered by participating organizations, including what questions should be asked to which people (or roles) in the organization and what answering options are valid (open or closed questions, lists of possible answers).

- Information on how the answers to the questions are transformed into IT benefit indicators.
- Information on how IT benefit indicators from participating organizations can be compared to each other and what insight is gained from the comparison.

The list of questions and answering options is included in Appendix B of this document. Information on the transformation of IT benefit indicators and comparison is included in Appendix E. It should be noted that specific details of the developed instrument are regarded confidential by M&I/Partners. For this reason some appendices may be omitted from this version of the document.

1.3 Research questions

When analysing the research objective and given the additional conditions as stated in the previous paragraph, a number of issues come to mind, such as: what organizational benefits can IT have? Can these be measured, and if so: how? Are they interesting in a comparison between organizations? What is a benchmark instrument and what kind of instrument is the M&I/Partners IT benchmark? What uses and goals does the M&I/Partners IT benchmark have and what are its limitations? Do existing methods or models exist that can be used in the instrument to be created? In order to cope with these issues, a limited number of research questions have been formulated that should assist in the attainment of the research objective:

Main questions

1. *What IT benefit aspects are interesting for measurement and comparison in a benchmark instrument?*
2. *How can these aspects be measured, compared and translated into a practical benchmark instrument?*

Sub-questions

1.1 *What is a benchmark instrument, who uses it and what are its goals?*
1.2 *What are the uses, goals and limitations of the existing M&I/Partners IT benchmarks?*
1.3 *What aspects of the benefits of IT in an organization are identified in literature and of interest to be used in a benchmark instrument?*

2.1 *What existing methods and models can be used to measure IT benefit aspects?*
2.2 *How can the selected methods and models be translated and complemented into a usable instrument?*

1.4 Research methodology

The goal of the research methodology is to provide a systematic way for getting answers to the research questions and by that fulfilling the research objective. The methodology of this research consisted of:
- Studying existing literature.
- Designing an IT benefits benchmark instrument from that literature.
- Testing the validity of the designed instrument in an empirical study.
- Drawing conclusions from the empirical study and improving the instrument.

An elaborate description of the research process is presented in chapter 2: "Research framework".

1.5   Outline of this document

The remainder of this document is structured as follows: chapter two presents the research framework describing the process of the research conducted. Then chapter three explores relevant literature on IT benefits evaluation and benchmarking. Chapter four uses this literature and contains details on the design of the benchmark instrument.

Then chapter five addresses the setup and process of the empirical study conducted, empirical data gathered and analysis of the empirical results. Chapter six is devoted to the conclusions of the research, a discussion on limitations of the instrument, indications for improvement and directions for further research. Chapter seven contains a list of figures and tables contained in this document and chapter eight provides a list of references to used literature. Appendix A presents an investigation of existing methods for use in the instrument, appendix B describes the details of the designed instrument, appendix C highlights the interview structure and topics used during empirical study, appendix D contains the created business process categories and information systems model for housing associations, appendix E is devoted to the result calculation and presentation format for the instrument and finally appendix F presents an estimation of effort and cost if the instrument would be applied in a first benchmarking round.

2 Research framework

This chapter continues from paragraph 1.4 and contains the research framework. A research framework is a visual representation of the process by which the research project is conducted. It includes the theoretical areas, field work, result and the relationships between those. Below the research framework for this research project is presented:
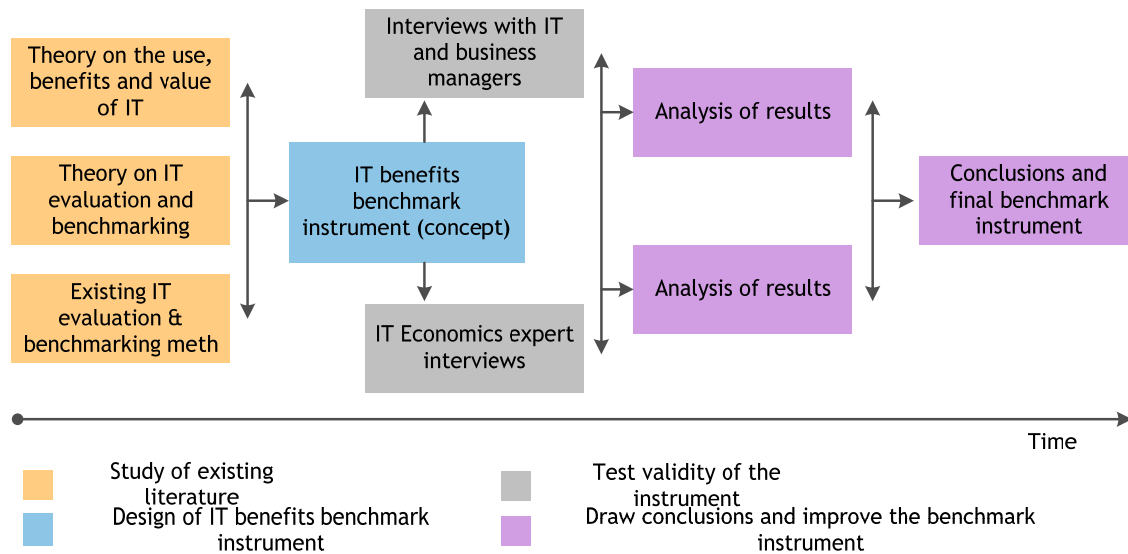
Figure 2.1: The research framework

Each paragraph in this chapter addresses one of the following parts of the framework:
1. Study of existing literature.
2. Design of an IT benefits benchmark instrument.
3. Test validity of the benchmark instrument.
4. Draw conclusions and improve the benchmark instrument.

The final paragraph addresses limitations of the research methodology chosen.

2.1 Study of existing literature

A study of existing literature has been performed in order to provide insight into the theoretical topics related to the research objective. This study was then used as a theoretical foundation for designing the IT benefits benchmark instrument.

Existing literature on the following topics was studied:
- The role and use of IT in organizations, benefit and value characteristics involved and management of these value and benefit characteristics.
- IT evaluation and benchmarking characteristics.
- Existing IT evaluation and benchmarking methods.
- The current use of the M&I/Partners IT benchmarks including participant's goals, benchmark process, strengths and limitations

For finding literature the following sources were used:

- Books and articles recommended by experts at M&I/Partners, supervisors at EUR and as recommended in informal conversations with co-workers and fellow-students.
- Academic literature (books and journals) available at the University Library of the EUR and other Dutch universities.
- Books and articles found using Google and Google Scholar.
- Books and articles found in the library of M&I/Partners.
- Digital sources available at M&I/Partners.
- Digital sources available at EUR.

Chapter 3 describes the result of the literature study. This literature has been used for designing the instrument.

2.2 Design of an IT benefits benchmark instrument

The results of the literature study were used for identifying what IT benefit aspects are relevant for measurement and comparison related to the goals of the benchmark instrument. These aspects, together with the preconditions for the instrument as stated by M&I/Partners, were used for selecting existing methods that could be used in the instrument's design. When no existing method could be found for a certain IT benefit aspect, a new method was created. The selected methods were transformed into a practical instrument, consisting of a list of questions for data gathering, calculations to create result indicators and figures for comparison and a process on how the benchmark should be carried out. Additional literature was used on topics where necessary.

Chapter 4 presents the result of the instrument design. Appendix B presents the questions for data gathering. This appendix is considered confidential material by M&I/Partners and may be omitted from this version of the thesis.

2.3 Test validity of the benchmark instrument

An empirical study was conducted, consisting of qualitative field research in order to test the validity of the designed instrument. The empirical study consisted of two parts: first the extended case method (Babbie 2004) was used for validating the instrument within a number of organizations and second interviews were used for validating the instrument and theoretical foundations with a number of IT Economics experts.

According to Babbie (2004) the extended case method allows for a flexible way of testing the instrument. By using semi-structured interviews the interviewer can adapt to observations during the interview and get more valid results, for example on a topic that the interviewee appears to have much knowledge or experience of. Also by transcribing and analysing each interview shortly after it was held, the conclusions can be used for improving or focussing the topics that need more attention in the next interview (Babbie 2004). The semi-structured interview contained the following topics:

- The interviewee's ideas of benchmarking IT benefits.
- An overview and explanation of the structure of the instrument.
- Testing if data gathering would be valid and reliable.
- The time taken to complete data gathering.
- Employees to involve in the benchmarking process.
- Result indicators and figures.
- Usefulness of the benchmark instrument.
- Willingness to participate when the instrument would be complete.

Organizations from various industries were selected for testing whether the instrument would be usable across industries. Since housing associations and also municipalities participating in the M&I/Partners IT benchmarks have requested the addition of an IT benefits instrument, the developed instrument was tested in those industries. Additionally, the goal was to test the instrument with at least one profit organization, to conclude if it would be useful in both a non-profit as a profit industry. A practical approach was taken on what organizations to select: based on accessibility using M&I/Partners' network and availability and willingness of organizations to participate. The goal was to interview an IT manager and business manager within each organization in a joined session.

The interviews with IT economics experts contained broadly the same topics as for the organizations. However, the focus was more on the theoretical foundations of the instrument: how existing methods are used and incorporated into the instrument and how the instrument attempts to measure and compare IT benefit aspects in organizations. Again a practical approach was taken on what experts to select: based on accessibility using M&I/Partners' network and availability and willingness of experts to participate.

M&I/Partners requested that if sufficient time would be available during the research project, a field test should also be conducted. In this field test the instrument should be fully tested in a small group of organizations.

Regarding the validity and reliability (Babbie 2004) of the results of the empirical study a distinction should be made between the validity and reliability of the interviews and the validity and reliability of the data gathered for the benchmark. The validity and reliability of the data gathered for the benchmark was tested by asking specific questions during the interviews and allowing the interviewees to complete part of the data gathering questions. Regarding the validity and reliability of the interviews, the advantage of qualitative field research is high validity of the results: the interviews are in-depth, nuances are noticed and the semi-structured interview method allows for flexibility in posing additional questions and requesting clarifications (Babbie 2004). The reliability of the interviews would be low, since the interview consisted of open ended questions and the interviewer was also the designer of the instrument. This meant that the researcher's views, beliefs and knowledge of the instrument would influence the response of the interviewee (Babbie 2004).

Regarding internal validity of the interviews, meaning that conclusions are drawn based upon what actually happened during the interview and are not based on other influences (Babbie 2004), some risks existed:
1. Since the interviewer was also the designer of the instrument, which was known by the interviewee, the interviewee may not pose invalidities of the instrument as explicitly as he or she would otherwise.
2. Since the research topic is complex, the interviewee may not have enough insight into the research area and designed instrument.
3. The interviewees are employees with busy schedules, not having enough time and attention for the questions posed during the interview.
4. Since the interviewer was also the designer of the instrument he may assume too quickly that the interviewee "likes" the instrument, while indications otherwise would be ignored.

These risks on internal invalidity were reduced by the following measures:
▪ Some of the selected organizations were those requesting the development of an IT benefits benchmark, so their motivation for maximizing the quality of the instrument would be high (risk 1 and 3).
▪ A number of IT Economics experts were also interviewed. These experts have in-depth knowledge of related theory and extended experience in the field (risk 2).

- The interviews with organizations not participating in the M&I/Partners IT benchmarks were done with an additional expert as interviewee, resulting in a more interesting discussion for the participating organization (risk 3).
- Each interview was recorded and transcribed. The transcription was sent to the interviewee for approval on contents (risk 1 and 4).

Regarding external validity, meaning that the conclusions are also valid in the "real" world (Babbie 2004), the following remark is made: since a number of organizations were selected that posed the request for adding an IT benefit benchmark and that already have substantial experience with benchmarking, the question was if the instrument is useful and applicable across industries and within organizations not having a lot of benchmarking experience. By also interviewing a number of organizations in other industries that do not participate in the M&I/Partners IT benchmark, a better conclusion could be drawn on the general usability of the instrument. The external validity was also improved by the interviews with the IT economics experts who can relate the instrument to both theory and broad experience in the field.

Chapter 5 presents the setup and process of the conducted field research and results of the empirical study.

2.4   Draw conclusions and improve the benchmark instrument

The results of the empirical study were used to indicate the usefulness, limitations, possible drawbacks and points of attention of the benchmark instrument and to indicate improvements for the instrument.

Chapter 6 concludes and discusses this research project, including a presentation of improvements for the instrument.

2.5   Limitations

A limitation of the research was that it would probably not be feasible within the time frame of the research to validate the instrument by conducting it in a small group of organizations. Although it was yet unknown how much time and effort it would take to execute the benchmark, a comparison was made to the M&I/Partners IT benchmarks. Conducting this benchmark takes from January to September, from the initial kick-off meeting to the final report. The gathering of data for input takes three to six days of effort for each participant.

It should be noted that the result of this research was not to be a complete instrumentation set (see also paragraph 1.2). This means that additional effort is required to get the instrument ready for operational use like the M&I/Partners IT benchmarks currently are.

It should also be noted that parts of the instrument and the results from the interviews are kept confidential or are anonymised.

3 Benchmarking the benefits of IT: a theoretical framework

3.1 Introduction

In 1993 Henderson and Venkatraman in their often used paper on Strategic Alignment of IT state that "managers are still confronted with basic questions such as" (Henderson and Venkatraman 1993):

- *"What are the implications of IT in my business operations? Today? In the future?"*
- *"What are the alternative perspectives for leveraging IT capabilities for business operations?"*
- *"Is the locus of IT competence inside or outside the operation?"*
- *"What is the executive role of senior management for leveraging IT capabilities?"*
- *"How should the IT function be organized, and what is the role of IT outsourcing?"*
- *"What are the appropriate criteria for assessing IT-based benefits?"*

Although these questions were posed many years ago, they are still highly relevant for managers today, as the struggle to get the most value from IT investments is far from over. IT spending has since then increased tremendously and it is believed that many IT investments do not produce results as intended (Berghout and Renkema 2005, Nijland 2004). In many organizations less than 8% of the IT budget is believed to be actually spent on initiatives that bring value to the enterprise. The Butler Group (2005) has investigated that organizations have become quite competent at measuring IT costs, but not the value. The absence of tools and methods is stated to be a major contributor to the lack of successful measurement.

This research has developed an instrument for evaluating and benchmarking the benefits of IT in organizations, helping managers in getting a much needed insight into the organizational benefits that IT brings. This insight will help them in finding answers to the questions stated above.

Before presenting the developed benchmark instrument (see chapter 4), this chapter will put the theory of IT benchmarking into context. Paragraph 3.2 describes the evolving role and use of IT in organizations, including some contemporary developments. Then paragraph 3.3 defines the benefits and value of IT, the difficulties with measuring these benefits and value and elaborates on the many types of benefits and value that have evolved as a result of the increasing use of IT in organizations, concluding with the notion that in order to control the cost, risks and all of the benefit and value types, IT should be managed across the entire life cycle. Paragraph 3.4 continues with an important aspect of the IT management life cycle: the need for evaluating IT in order to learn and to improve decision making. Paragraph 3.5 describes a specific form of IT evaluation: IT benchmarking for organizational improvement and learning. Finally paragraph 3.6 elaborates on a number of existing IT evaluation and benchmarking methods that could potentially be used for developing the IT benefits benchmark instrument.

3.2 The evolving role of IT in organizations

As information technology has become more advanced over the years, so has the use of that technology in organizations. As a consequence of this the ways that IT can deliver benefits and value to an organization have increased and have become more complex. Paragraph 3.2.1 gives a brief description of history on the evolving use of IT and paragraph 3.2.2 indicates two contemporary developments that have increased the complexity of IT use and the ways in which benefits and value are created.

3.2.1 A brief history of IT use

Over the past few decades, with the coming of the Internet and the ever decreasing cost of hardware and increasing processing power, the use of IT has become more and more complex and intertwined with the organization. As the possible benefits of IT use have increased, so has the spending on IT.

To clarify why IT has become so important to organizations over the past decades it is useful to give a brief description of the historical development of electronic computers and their changing role in organizations (Thorp 1998, Van Reeken 2000, Bannister et al. 2006).

The first electronic computers were developed and used during World War II. In the 1960's large companies used computers for batch jobs by punch cards. Then in the 1960's and 1970's with the introduction of minicomputers, computers could be used on-line and interactively. In 1981 IBM unveiled its Personal Computer (PC). In the 1980's the PC became more powerful, each employee could have his own PC and thousands of programs were developed by software vendors. People wanted to connect their pc's, resulting in Local Area Networks (LAN's). In 1969 ARPANET was created, evolving over 20 years into the Internet as we know it today.

As technology evolved, so has the role that IT plays in organizations. Various authors identify stages that the use of IT went through (Thorp 1998, Van Reeken 2000, Bannister et al. 2006, Mutsaers et al. 1998). The number of stages identified varies from three (Thorp 1998) to nine (Mutsaers et al. 1998), with an indication that even more may exist (Van Reeken 2000). However, when analysing the identified stages, it is more a matter of definition than really different points of view.

Thorp (1998) presents a simple model with three stages: the first stage is automation of work, which means that the same things are done as before, only in a more efficient way. The advantage is operational efficiency. The second stage is information management, which means that operational activities and processes could be restructured, making them more efficient, but also more effective on a tactical level. The third stage is business transformation: IT enables new ways of doing business, doing things differently and changing the rules of an industry. In this stage IT is linked with strategic effectiveness and positioning. With each stage the level of complexity increases and IT becomes more intertwined with the organization. Applications of all stages can be found in organizations nowadays.

Mutsaers et al. (1998) present a more complex model containing nine stages, based on the well-known and widespread Stages Theory of Nolan. This model traditionally contains six stages of development of the use of IT in organizations, divided over two eras: the so-called S curves. The authors add a third era and three new stages in order to deal with recent business and IT issues. The following figure shows the Nolan Stages Theory, including the addition of a third era and accompanying stages:
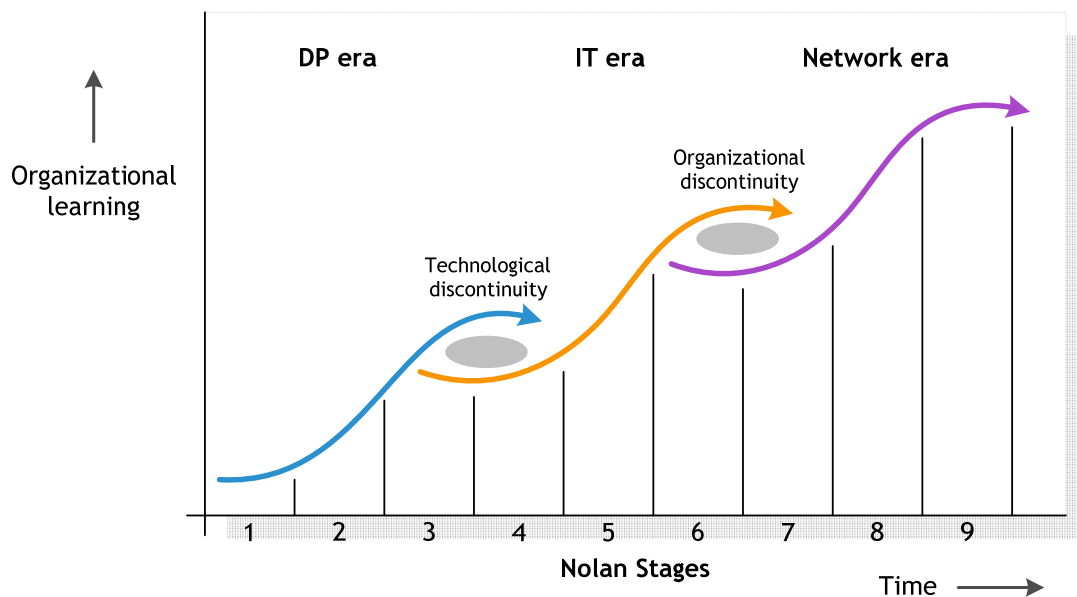
Figure 3.1: The Nolan Stages theory (Mutsaers et al. 1998)

Each era and the included stages have distinguished characteristics in both IT and business terms. The transitions from the Data Processing (DP) era to the Information Technology (IT) era and from the IT era to the Network era are accompanied by a technological and an organizational discontinuity. The core notion of the model is that for each stage organizational learning regarding IT should be in balance for four identified growth processes: two demand-side and two supply-side growth processes (Mutsaers et al. 1998). The remainder of this paragraph briefly describes the mentioned growth processes, eras, stages and discontinuities.

The identified demand-side growth processes are (Mutsaers et al. 1998):
▪ Applications portfolio: the information systems that are currently in use.
▪ User community: the organization's employees using these information systems.

The identified supply-side growth processes are (Mutsaers et al. 1998):
▪ IT organization: the provided IT resources (employees and technology).
▪ IT management practices: the instruments, techniques, tools and controls that are used by IT management to provide effective and efficient IT.

The first S curve is the DP era and has its origin in the 1970s and 1980s. At this time IT is primarily used to improve efficiency through automation: the traditional functional hierarchy of organizations is not changed. This era contains the following stages (Mutsaers et al. 1998):
▪ *Stage 1: Initiation.* The focus is on cost reduction through automation of administrative tasks. The use of IT is on the operational level.
▪ *Stage 2: Contagion.* The focus is on satisfying users by investing in hardware, software and personnel. Top management has little control over these investments and they are not formally justified. Data integration is limited to batch processing.
▪ *Stage 3: Control.* Due to encountered failures in automation and since IT costs are becoming a considerable part of budget, management wants to exert control over the IT investments. The information plan is one of the used control instruments.

The second S curve is the IT era, initiated by a "technological discontinuity" caused by technological innovations such as the personal computer, spread sheets and data communication networks at the beginning of the 1980s. The focus of IT shifts to internal effectiveness, instead of solely on automation. This era contains the following stages (Mutsaers et al. 1998):

- *Stage 4: Integration.* Applications are increasingly integrated, allowing new ways of doing business. Information systems are also justified based on business objectives instead of only cost reductions.
- *Stage 5: Architecture.* Since applications and data are dispersed throughout the organization and data is increasingly considered a critical resource, a corporate data architecture is developed. Top management is more involved and information systems are more and more integrated with customers and suppliers.
- *Stage 6: Demassing.* Departments and business units are stressing the need for more flexibility than is possible with the now centrally organized IT department. Parts of the IT function are outsourced and departments and business units get more control and responsibility over their information systems.

The third S curve is the Network era and has its origin in the increasing pressure from competition and increasing speed of changes. The traditional hierarchical organization including the structured and centralized IT department are becoming obsolete and organizations are becoming (IT-enabled) networks. Business unit management is now responsible for IT and IT is managed as a strategic resource. This era contains the following stages (Mutsaers et al. 1998):

- *Stage 7: Functional infrastructure.* An additional layer of infrastructure is created: the functional infrastructure layer. This layer contains modules with organization-wide functionality. The focus is on integration and flexibility of functionality. Organizations form alliances with customers and suppliers to create common parts of the infrastructure.
- *Stage 8: Tailored growth.* Users are increasingly supported to create top layer applications that make use of and combine the modules in the functional infrastructure.
- *Stage 9: Rapid reaction.* The available functionality is used to adapt quickly to new business demands. Users are able to create and adapt applications as needed by changing application parameters. Top management is responsible for the common infrastructure and the external focus of the organization increases.

3.2.2   Recent developments: IT Infrastructure and outsourcing

Traditionally each organizational department had its own (often tailor-made) information systems to support its business processes. However, with the advancement of IT, increasing technological standardizaton, availability of integrated enterprise-wide software packages and the increasing competitive global environment, the possibility and need to create a flexible and adaptive set of information systems supporting strategic initiatives have emerged. This is the so-called IT Infrastructure, the part of the centralized IT systems that transcends individual departments. Renkema (2000) states that infrastrucure has become more than a technological artefact and in this regard speaks of an "IT-based Infrastructure". Investmens in this IT Infrastructure have risen relative to the departemental IT investments. Infrastructure investments are typically of high cost and their consequences are far-reaching and difficult to foresee and therefore are among the most complex and high risk decisions managers have to make (Renkema 2000). As a consequence indicating and measuring the current and future benefits and value of IT Infrastructure is very difficult, but necessary to show that the investments pay off.

As information technology has become standardized and systems integrated, a lot of the systems are now centrally operated and managed in the organization, especially for the non-primary, supporting business processes. With this the possibity of outsourcing these standardized systems and even entire business processes has emerged. As business units of large organizations and alliances in an industry create so-called Shared Service Centers (SSC) or outsource to a third party, identifying the benefits and value of IT is even increasingly difficult as they transcend the organizational boundaries.

3.3   The benefits and value of IT for organizations

As the use of IT has become increasingly complex and intertwined in the organization, so have the ways in which IT delivers benefits and value to that organization. Paragraph 3.3.1 defines organizational benefits and value, then paragraph 3.3.2 describes the difficulties of demonstrating and measuring IT benefits and relating this to IT spending, referred to as the IT productivity paradox. Having established that IT can deliver benefits in many ways, paragraph 3.3.3 gives an overview of literature on the many types and classifications of IT benefits. Then paragraph 3.3.4 concludes with the notion that to control all the possible types of IT benefits, its costs, risks and resulting value, IT has to be managed across the entire life cycle.

3.3.1   Organizational benefits and value of IT defined

Berghout and Renkema (2005) define value as the sum of financial and non-financial costs and benefits. This means that an IT investment can have zero or negative value when the (financial and non-financial) costs outweigh the (financial and non-financial) benefits.

Lucas (1999) defines IT value differently: the value of IT includes all financial, non-financial, direct, indirect, tangible and intangible contributions from investments in IT.

Van der Zee (2001) in his BtripleE-framework defines the value of IT at three different levels of the organization:
▪   *"Business value of IT"*: IT's contribution to business objectives and business strategy.
▪   *"Effectiveness of IT"*: IT's contribution to supporting business processes, activities and employees.
▪   *"Effectiveness and Efficiency of IT supply"*: IT supply's alignment with business requirements at minimum costs.

Parker et al. (1988) define IT value as:

"The true economic impact of information technology"

Although many more definitions exist, it becomes clear from those stated above that IT "value" is sometimes used as encompassing only the positive contributions to the organization (Lucas 1999 and in part Van der Zee 2001) and in other times also taking into account the negative contributions, or the cost (Parker et al. 1988, Berghout and Renkema 2005). The terms "benefits" and "value" are often used interchangeably. For this research the definitions as proposed by Berghout and Renkema (2005) will be used, stating a clear distinction between IT benefits and value. The following table gives an insight into this distinction:

Table 3.1: Distinguishing IT benefits and IT value (after Berghout and Renkema 2005)			
Investment consequences	Positive	Negative	Total
Financial	Financial benefits	Financial cost	Profit or loss
Non-financial	Non-financial benefits	Non-financial costs	Contribution
Total	Benefits	Costs	Value

The focus of this research is on identifying, measuring and comparing the ways that IT benefits the organization. Therefore this will from here on be referred to as "IT benefits" or "benefits of IT".

3.3.2   The IT Productivity Paradox

As the possibilities for using IT in organizations grew over the years (see paragraph 3.2), the investments in IT rose quickly. As large amounts of money were spent, both researchers and managers began to wonder if those investments showed a payoff.

Brynjolfsson (1993) coined the term "productivity paradox", as it appeared to be very difficult to show a relationship between amounts of money invested in IT and increased productivity in aggregated economical statistics on a macro-level or an increase in the financial bottom line of organizations. Numerous researchers have studied this phenomenon both on macro, industry and organizational level and tried to explain why or if the paradox exists and where IT value and benefits can most definitely be found and measured (Hitt and Brynjolfsson 1996, Thorp 1998, Lucas 1999, Renkema 2000).

When focussing on the organizational level and summarizing the explanations given, the following reasons are mentioned:
- IT benefits are often non-financial.
- Causal ambiguity.
- Lack of data.
- IT benefits end up outside the organization.

Each reason will be explained below.

IT benefits are often non-financial

The benefits of IT are often not easily quantified, let alone transformed to a monetary value. Benefits such as cost savings or cost avoidance are relatively easy to measure, but often an IT investment results in a multitude of benefits, for which the larger and more important part give hard to measure benefits. These include for example: increased customer satisfaction, increased customer loyalty, differentiation of a product or opportunities for future investments. Also these benefits are expected to materialise in the future, disconnecting them with the time the investment was made and posing a certain risk of not materialising at all.

Causal ambiguity

IT benefits are often called to be "indirect", meaning that the outcome of an IT investment is not connected to achievement of organizational goals, e.g. improved financial performance, in one direct step. Lucas (1999) calls this phenomenon "causal ambiguity": it is hard to relate deployed IT applications to financial performance of the firm, for there are many other factors that also influence financial performance, some of which are under the influence of managers and the organization, while others are not.

Also an information system (IS) may not be worth much by itself and only be valuable if used in combination with other systems or processes inside an organizational context. The impact of the sum will exceed individual contributions. This also means that benefits gained from an identical IT investment are different for different organizations and that the type and amount of benefits will change through time. Wigand et al. (in Teubner 2005) use the following figure to explain the causal ambiguity contained in the IT Productivity Paradox:
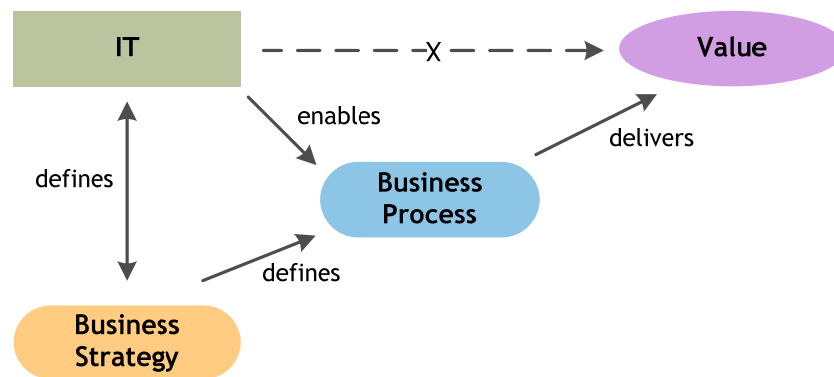
Figure 3.2: Explanation of the IT productivity paradox (Wigand et al. in Teubner 2005)

Lack of data

A lack of firm level data is often identified as one of the problems when measuring the impact of IT on organizations. Since IT can bring benefits in many ways, and the benefits are often indirect and non-financial, the traditional financial-focussed approach of measurement is insufficient. An organization has to put serious effort in implementing metrics to measure the impact of IT on organizational outcomes. These non-financial measurements often lack.

IT value ends up outside the organization

The increasing availability of information and communication leads to changes in industry structures: entry barriers change, bargaining power relationships are altered, which may lead to increased competitiveness and reduced profitability. The benefits of an IT investment may therefore end up outside the organization. Brynjolfsson and Smith (2003) for example study this phenomenon and find that consumers benefit greatly from organizational investments in IT. This is called the "consumer surplus" of IT investments.

3.3.3   An elaboration of the many types of IT benefits

The conclusion from the IT Productivity Paradox is that IT brings benefits and therefore has value, but a lot of these benefits are indirect and non-financial, meaning that the resulting value cannot be attributed directly to organizational outcomes in a quantified way. In this regard many researchers describe how IT can bring benefits to the organization.

To give an idea in what ways IT can bring benefits, this paragraph lists some classifications of types of IT benefits as found in literature:
▪ A comprehensive list of IT benefits obtained from experience during empiric research, by Ward and Daniel (2006).
▪ A classification from a historical perspective, by Van Reeken (2000).
▪ Strategic and competitive benefits, by Hitt and Brynjolfsson (1996).
▪ Benefits from different investment types, by Lucas (1999).

Each classification is described below.

A comprehensive list of IT benefits obtained from experience

Ward and Daniel (2006) present a generic list of IT benefits (improved after Farbey et al. 1993), categorized according to Mintzberg's people-oriented view of the structure of an organization:

- Strategic benefits:
  - Support for the organization's strategy or vision.
  - Long- or short-term viability of the organization.
  - Provide customers with unique value proposition.
  - Desire to be seen as innovative.
  - Permit new business models.
  - Permit new forms of organization.
  - Build barriers to industry.
  - Lock-in customers.
  - Geographic or market expansion.
- Management benefits:
  - Increased agility.
  - Better control through improved information.
  - Growing the skills of the workforce.
  - Meeting the highest professional standards.
  - Ease of operation, allowing use by less experiences staff.
  - Improve the quality of working life.
  - Existing systems have become inadequate.
  - Less crises.
  - Flatter organizational structure.
- Operational benefits:
  - More effective use of existing IT and systems.
  - Improved quality at reduced cost.
  - Improved turnaround time.
  - Reduced headcount.
  - Reduction in property costs.
  - Increased income from better quality products.
  - Timelines shorten and accessibility of data improves.
- Functional / Support benefits:
  - Employee self-service.
  - Improved recruitment and retention processes.
  - Provision of infrastructure systems.
  - Improved communication and collaboration opportunities.
  - Adoption of/adherence to standards.
  - Compatibility with customers' and/or suppliers' systems.
  - Enforcement of regulatory or legal requirements.
  - Identification/promulgation of best practice.
  - Implementation of metrics.
  - Production of standard reports.
  - Business continuity/disaster recovery.

A classification from a historical perspective

Van Reeken (2000) takes a historical approach by identifying what types of IT investments can be made and what benefits are expected:

- *Efficiency*. "Type 1" investment: Automation. Substitution of manual labour with automated systems, value can be calculated by financial measures like ROI.

- *Effectiveness.* "Type 2" investment: Information. Increasing effectiveness by using IT for things previously impossible. Extra costs are made to make better results possible, such as improvement of management information, faster customer service, error reduction and the like. Benefits lie in effectiveness improvements which are often hard to calculate beforehand. Financial measures are not sufficient to weigh the benefits against the costs.
- *Supporting business strategy and competitive situation.* "Type 3" investment: Connection. Connecting IT to the business strategy by reorganizing the company including its information systems. Central database systems across functional areas in the organization are created, reducing inefficiencies and mistakes and creating strategic fit to meet the competition: competitive advantage or necessity. Since the IT investment crosses departmental boundaries involvement of top management is needed for coordination, resulting in a connection to business strategy and reorganization of the organization. The benefits of IT are hard to measure.
- *Improved customer satisfaction and product/service quality by integrating the value chain.* "Type 4" investment: Transformation. This type continues on the previous type and further restructures the organization. The traditional highly structured and coordinated organization per functional area is restructured resulting in integrated business processes across functional areas. Non-value adding activities are abandoned and business processes are optimized. This is often referred to as Business Process Redesign (BPR), with a focus on the value chain inside the organization, and business network redesign, with a focus on the supply chain also outside the organization.
- *Ability to adapt to future changes.* "Type 5" investment: Anticipation. IT is now integrated in the entire organization, but as the environment continuously changes, the organization also needs to change over time. This results in a shifting focus from creating IT to support the current organization and processes to create IT to anticipate for future changes. This flexibility is found in the IT Infrastructure and accompanying IT Architecture.
- *Increased profitability.* "Type 6" investment: Entrepreneurship. Increase of business scope: the flexibility of IT in the organization now allows for new ways of doing business. The organization can enter new markets, create new products or services or add informational components to its existing products or services. This improves the value added to existing customers in existing markets, or allows for entire new markets to be entered or even created.

Van Reeken mentions that type 1 to 3 focus on alignment: taking advantage of IT by optimizing support for existing business strategy, while type 4 to 6 focus on impact: reshaping the business strategy by exploiting the possibilities of IT.

Strategic and competitive benefits

Hitt and Brynjolfsson (1996) analyse the strategic and competitive benefits of IT for an organization, based on Porter's 5-forces model (1979). The following benefits are identified:
- Creation of new industry entry-barriers.
- Exploitation of existing industry entry-barriers.
- Keeping up with competition (avoid losing market share, competitive necessity).
- Competitive advantage.
- Opportunity to differentiate the product, production or delivery and create or enter a new market segment.
- Support of current business, finding innovative ways to support current business.
- Increased productivity (value should be retained inside the organization).
- Opportunity to redistribute the existing value in an industry (bargaining power).

Benefits from different investment types

Lucas (1999) recognizes that not all IT investments result in an ROI that can be estimated with some level of confidence beforehand or measured easily afterwards, but states that this does not mean that the investment has no value. The author identifies a number of types of IT Investments, called the "IT Investment Opportunity Matrix" and relates these to various types of IT benefits. From the IT Investment Opportunity Matrix the following benefits are identified:

- Supporting current business
- Supporting opportunities for future business
- Allowing the company to comply with laws and regulations
- Automating an otherwise very labour-intensive task
- Providing a direct return in the form of cost savings or increased revenue
- Providing an indirect return in the form of increased customer satisfaction or customer loyalty
- Keeping up with competitors
- Providing a strategic opportunity
- Transforming an organization fundamentally

As a final note on the various types of IT benefits Parker et al. (1988) keep it simple and distinguish between two types of IT benefit:

- improvement of the performance of current business
- improvement of the outlook for new business opportunities and strategies

Concluding from the above elaboration the organizational benefits from IT come in many ways. Of course a lot of the types overlap and they exist on different organizational levels. Regarding the difficulty of identifying and measuring IT benefits two dimensions of complexity are important to distinguish: measurability (financial and non-financial benefits) and causality (direct and indirect benefits). Given an organizational context each IT benefit could be placed somewhere over these dimensions, as a benefit from an IT investment or information system may be more or less directly related to organizational goals and more or less easy to measure financially. This notion is presented in the following figure:
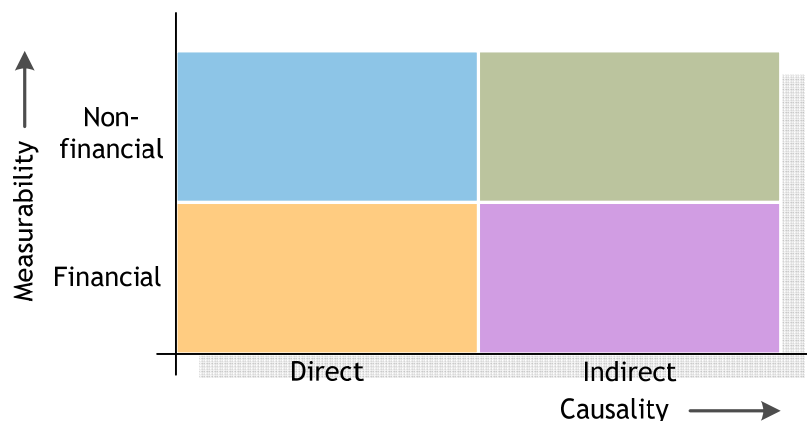
Figure 3.3: The complexity of IT benefits: dimensions of measurability and causality

Although the mentioned benefit types cannot easily be placed in this figure without a given organizational context, it will be important for managers to acknowledge all these types of IT benefits and identify in what situation which types are relevant to control, in order to maximize the benefits and value obtained from IT.

3.3.4   Getting maximum value: the need for managing IT across the entire life cycle

As becomes clear in the previous paragraph the benefits of IT come in many ways and the type and amount of benefit achieved depends on many factors. This means that managers need to control these factors in order to achieve the benefits and hence value from IT. Managing IT in a way that maximizes the probability of value creation can only be done by managing this value from the conception of an idea to the actual realization of the intended information system (or organizational change) through the operational lifetime until abandoning the information system.

This notion is known as managing IT across the entire life cycle (Berghout and Nijland 2002, Swinkels 2000). The stages of full life cycle management for IT are shown in the following figure:
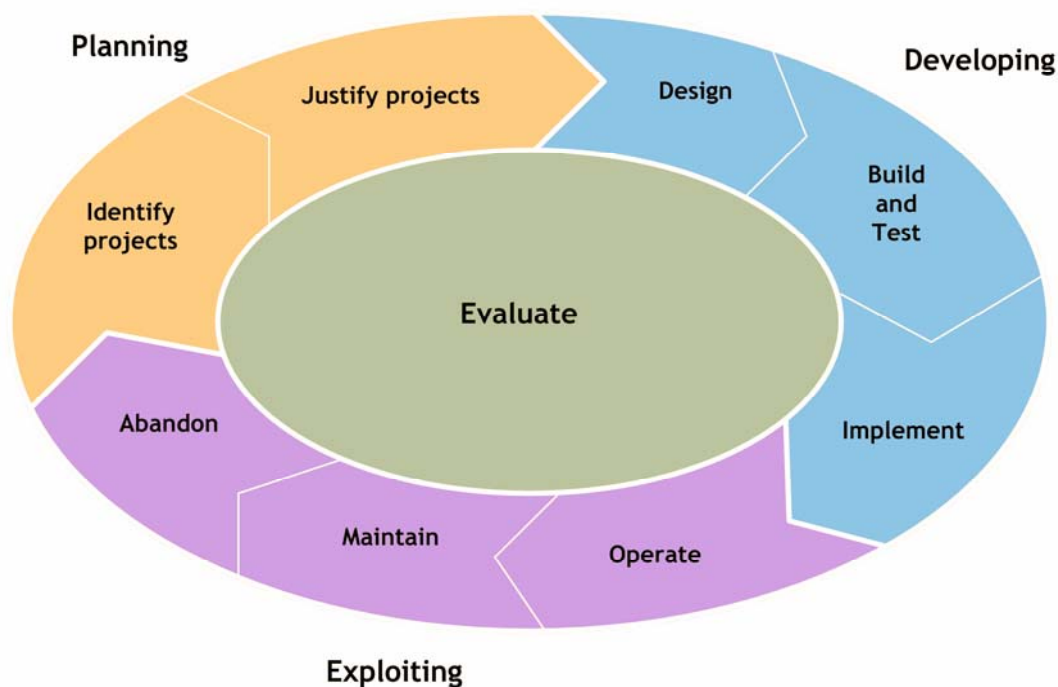
Figure 3.4: The stages and activities of full life cycle management for IT (Berghout and Nijland 2002)

Each stage and accompanying activities will be explained below (summarized from Berghout and Nijland 2002).

Planning stage
New investment possibilities can be identified by using three approaches: the bottom-up, top-down and inside-out approach. Firstly bottom-up evaluates the technical and functional quality of currently operational systems and the estimated effect of improvements. The method of Bedell (1985) is an example of a bottom-up evaluation method. Secondly top-down takes organizational goals and business strategy as a starting point. Porter's 5-forces framework (Porter 1979) for a competitive analysis in the industry can for example be used for a top-down evaluation. Thirdly inside-out looks at new IT possibilities, often identified with the help of external IT experts.

When new investment possibilities are identified, they are justified (analysis of costs, benefits and risks) and prioritized in a way that IT resources are directed towards the most beneficial investments. Methods as Information Economics (Parker et al. 1988), Balanced IT Scorecard or the Investment Portfolio (Berghout and Renkema 2005) can be used for that.

When a priorization is made, management decides on which investment proposals to implement and which not.

Developing stage

In the developing stage the chosen investment proposals are designed, built, tested and implemented into the organization. This is not a straightforward process and many details unknown in the planning stage have to be worked out, while keeping an eye on the intended benefits and estimated costs and risks. Also the organizational context may change, changing the justification of the investment made in the planning stage.

Control should be exerted over the functionality (benefits), resources (costs) and planning (benefits and costs). When a too large deviation is expected from the original plan (due to unforeseen circumstances in development or changing circumstances in the organization) senior management should be involved and a new justification should be made, resulting in a possibly different priorization and even cancellation of the project.

Exploiting stage

The information system is now in exploitation. All of the intended benefits and most of the anticipated costs are realized in this stage. The possibilities to change the benefits (through changes in functionality) and influence on the costs are minimal however. Cost allocation and charge out are used to manage costs. Service-level agreements (SLAs) and user satisfaction interviews are often used to manage benefits.

Identifying when to abandon an information system for which the benefits no longer weigh up to the costs is an important activity, as this can save the organization a lot of money.

Evaluate

Evaluation is not a stage in itself, but an activity that should take place in each stage mentioned above. First a top-down, bottom-up and inside-out evaluation should be made for identifying beneficial investments. Second a justification evaluation should be made for prioritising investments. Third during development continuous evaluation of planned and actual benefits, costs and time should be performed. Fourth when the system is in exploitation evaluation of costs and benefits should be done to identify if the investment pays off as planned and when it should be abandoned.

In short: the evaluation activities should be performed throughout the management life cycle in order to control intended costs and benefits and to build up an organizational knowledge base for learning from past experience to gain more from current and future investments. It should be noted that besides the (intended) information systems, also management practices and the evaluation methods themselves can be the subject of evaluation.

3.4   The use of IT evaluation

Evaluation is used in all stages of the IT management life cycle (see paragraph 3.3.4) and is therefore an integral part of managing IT. Evaluation can be used for identifying, justifying and prioritising investment proposals (ex ante evaluation) and for evaluating the results of an investment, the entire IT portfolio and also for evaluating IT management practices (ex post evaluation). Benchmarking is a special form of ex post IT evaluation and will be described in the next paragraph (3.5). This paragraph gives an overview of aspects involved in IT evaluation.

Before elaborating on the various aspects of IT evaluation, two definitions are given.

Bannister et al. (2006) define evaluation as:
"the act of comparing a process, an artefact, a person, an organization or any other situation with other comparable entities and/or with a set of standards which the evaluator regards as appropriate to that situation"

Remenyi and Sherwood-Smith (1997) give a formal definition of evaluation and state that:
"Evaluation is a series of activities incorporating understanding, measurement and assessment. It is either a conscious or tacit process which aims to establish the value of or the contribution made by a particular situation. It can also relate to the determination of worth of an object."

The remainder of paragraph 3.4 gives an overview of the following IT evaluation aspects: different purposes of evaluation (paragraph 3.4.1), objects of evaluation (paragraph 3.4.2), perspectives for evaluation (paragraph 3.4.3) and the evaluation process (paragraph 3.4.4).

3.4.1 Different purposes of evaluation

Relating to the goal or purpose of an evaluation a distinction is often made between summative and formative evaluation (Remenyi and Sherwood-Smith 1997, Nijland 2004). Summative evaluation emphasises the performance and attainment of objectives, judging if projects will achieve or have achieved their objectives. Formative evaluation is designed for illumination and learning in order to improve ongoing efforts.

Nijland (2004) mentions the following objectives of IT evaluation:
- To justify investments (summative or formative).
- To enable organisations to decide between competing projects which claim the same resources (summative).
- To enable decisions concerning expansion, improvement or the postponement of projects (formative).
- To gain information for project planning (summative or formative).
- To act as a control mechanism on expenditure, benefits and the development and implementation of projects (summative).
- To act as a learning device enabling improved appraisal and systems development to take place in the future (formative).
- To evaluate and train personnel responsible for systems development and implementation (formative).
- To ensure that systems continue to perform well (summative or formative).
- To enable decisions concerning the adaptation, modification or dismissal of information systems (summative or formative).
- To allocate (and distribute) costs and benefits to appropriate organisational departments or business units (summative).

When looking at the stages and activities of the IT management life cycle (see paragraph 3.3.4) the following purposes of evaluation become apparent:
- Identification of investment opportunities.
- Justification of investment proposals.
- Prioritization and deciding on investment proposals.
- Realization of benefits and control of costs and risks of projects during development.
- Monitoring of performance (costs and benefits) of information systems during exploitation.
- Identifying when information systems should be abandoned.
- Learning from and improving management practices in each stage.

It should be noted that evaluation can be evaluated as well. Formative evaluation of evaluation practices is evaluating for improving evaluation for the purposes as mentioned above. The goal of the IT benefits benchmark instrument developed in this research is formative in nature (see chapter 4).

3.4.2 Objects of evaluation

Various types of objects can be under evaluation. These include amongst others (Remenyi and Sherwood-Smith 1997):

- Single investment proposals or the entire investment portfolio.
- Single information systems or the entire information systems portfolio
- Business strategies
- Business processes
- Management practices
- New IT developments
- Organizations

These objects are compared to other objects of the same type, a set of standards, ideas or best-practices.

3.4.3 Perspectives for evaluation

IT evaluation is a multidisciplinary field of study, including many theories on the nature of evaluation and perspectives taken when an evaluation is performed. Theories used for evaluation and creation of evaluation methods include: Economics/Accounting Theory, Interpretative Approach, Critical Approach, Structuration Theory, Grounded Theory, Contingency Approach, Soft Systems Methodology and Process Theory, Cognitive mapping, Social theory and Post-modernism (Berghout and Remenyi 2005). Each theory relates to the perspectives taken for evaluation, which can be: financial, technical, business, social and the human perspective (Remenyi and Sherwood-Smith 1997).

3.4.4 The evaluation process

Performing an IT evaluation can be seen as a political process involving the interest of many people and groups in an organization, the so-called stakeholders. As people are central to evaluation the motives and goals of the evaluators and the context in which the evaluation takes place are important in selecting an evaluation approach or method.

Different approaches and methods used in different ways will produce different results. Bannister et al. (2006) suggest the use of multiple evaluation methods and combine the results to overcome this. However, a choice should still be made on which evaluation methods to use, how they will be used and how the results will be combined for the purpose intended.

As learning is an important goal of evaluation (formative evaluation) this can only be achieved when the participants in the evaluation all have a definite opinion of the situation under evaluation. This means that they have a complete level of understanding and are certain that the outcome is acceptable or desirable (Remenyi and Sherwood-Smith 1997). The process of many evaluation methods therefore relies on active participation, communication and consensus between stakeholders or decision makers, so the outcome is understood and shared (Parker et al. 1988, Remenyi and Sherwood-Smith 1997, Berghout and Renkema 2005).

Nijland (2004) studies the use of IT evaluation in organizations. An important notion of his research is that when evaluation is used for improving decision making, the evaluation result can be perceived as a failure, while the evaluation does have a (positive) effect on the organization.

3.5 The use of IT benchmarking

The previous paragraph defined IT evaluation and described related aspects. This paragraph discusses IT benchmarking: a specific form of IT evaluation. IT benchmarking is an ex post evaluation practice for measuring a certain aspects of an organization and comparing these to other organizations. The common goal is to provide insight into the aspects in order to learn and improve.

This paragraph is structured as follows: paragraph 3.5.1 gives various definitions of benchmarking in order to clarify what benchmarking is and does, and then paragraph 3.5.2 describes the evolution of benchmarking. Paragraph 3.5.3 elaborates on various benchmarking types, paragraph 3.5.4 describes a common benchmarking process and finally paragraph 3.5.5 indicates what conditions should be met in order for benchmarking to work.

3.5.1 What is benchmarking?

Many definitions exist on what benchmarking exactly is. However, two concepts seem to be central: measurement and improvement (Waalewijn et al. 1996, Nelissen and De Goede 1999). Benchmarking is often described as the process of measuring one or several aspects of an organization, measuring the same aspects in one or more other organizations, comparing the results and thereby finding so-called "best practices" to incrementally or radically improve the organization.

Some definitions of benchmarking:
"Benchmarking can be described as the continuous process of measuring products, services and practices against leaders, allowing the identification of best practices which will lead to sustained and superior performance."
(Bullivant in Nelissen and De Goede 1999)

"[..] a process that helps agencies to find high performance levels (benchmarks) in other organizations and learn enough about how they are achieving those levels so the practice or process producing the performance can be applied in one's own agency."
(Keehley in Nelissen and De Goede 1999)

Waalewijn et al. (1996) describe benchmarking as:
"Benchmarking is the technique for systematically and thoroughly investigating the performance and accompanying operational and management practices of organizations with an outstanding performance in a certain area. The goal of this technique is to compare one's own performance and practices to the best and to translate new ideas and insights for one's own organization in order to drastically improve performance."
(translated from Dutch to English)

Van Eekeren (2003) states that:
"The core of benchmarking: learning about your own organization through other organizations."

Authors emphasize that benchmarking is a process: it is not a one-time measurement activity, but should be a continuous process of measuring, comparing and improving. This means that benchmarking takes serious effort and should be embedded in the organization, having support of top management.

To conclude this paragraph the following figure provides insight into the benchmarking characteristics, goals and conditions for success:
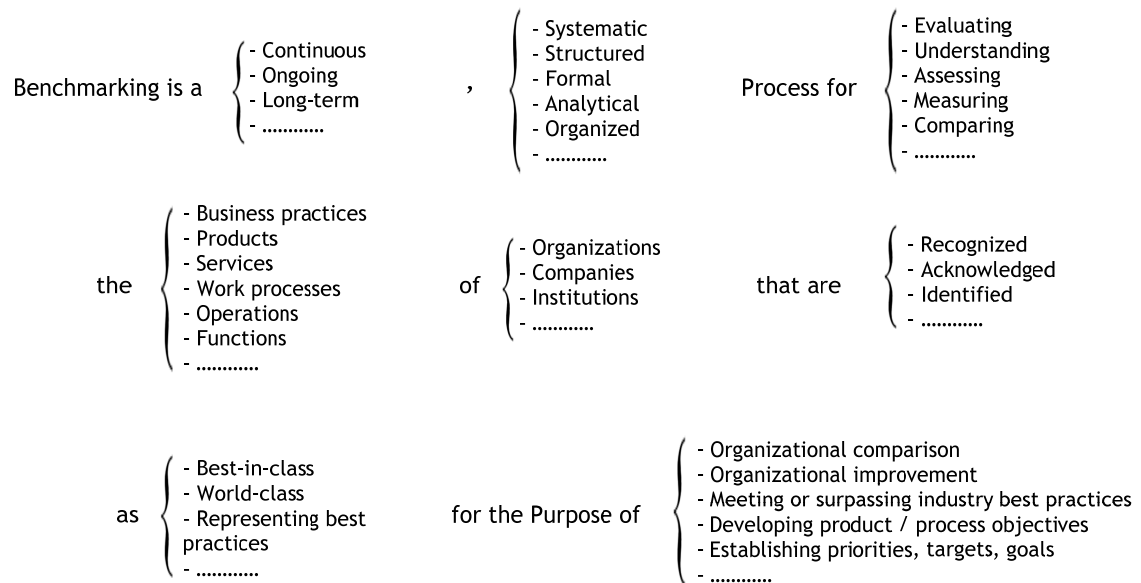
Figure 3.5: *Benchmarking characteristics, goals and conditions for success (Spendolini in Van Der Zee 2001)*

3.5.2   The evolution of benchmarking

Various authors describe the history or evolution of benchmarking in contemporary management practices (Waalewijn et al. 1996, Nelissen and De Goede 1999). To give an idea how benchmarking has evolved over time, a summary of the often identified evolutionary stages is given below:
▪ *Reverse Engineering.* This is the activity of analysing the product of a direct competitor in order to find (technical) improvements that can be copied.
▪ *Operational Benchmarking.* This form of benchmarking can be divided into "competitive benchmarking" and "process benchmarking". In competitive benchmarking not only the product of direct competitors are analysed, but also its processes. In process benchmarking also non-competitors are included to find the best-in-class for a certain process.
▪ *Strategic Benchmarking.* This form of benchmarking aims at finding radical breakthroughs in the way an organization does its business. Comparing to organizations outside one's industry is often needed to find such a radical change. A fundamental change of the organization is often needed on various aspects like: marketing, production, knowledge and culture.

The benchmarking activity is often seen as part of Total Quality Management (TQM) and is located accordingly in the organizational structure. The goal of TQM is to incrementally and systematically improve the organization. Benchmarking adds the possibility of finding radical improvements to change the organization in a more fundamental way (Waalewijn et al. 1996). The relationship between TQM and benchmarking can be seen in the following figure:
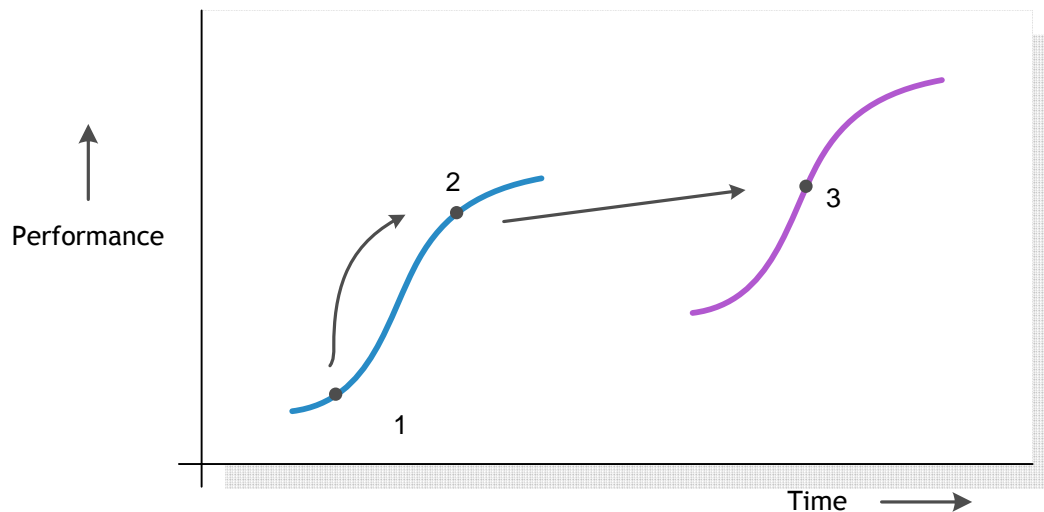
Figure 3.6: Improving performance through TQM and benchmarking (Waalewijn et al. 1996)

Applying TQM will lead to incremental improvements on the same S-curve (from point 1 to 2). Applying benchmarking could also lead to the incremental improvement on the S-curve, but adds a possibility of radically improving to a new S-curve (from point 2 to 3).

3.5.3   Different benchmarking types

Many different types of benchmarking exist, each with different characteristics fit for a certain purpose. Depending on the goal of a benchmark initiative, the organizational context and available means, an organization has to choose what type best fits the situation. The dimensions identified in literature that make up the various benchmarking types (Waalewijn et al. 1996, Nelissen and De Goede 1999, Van Eekeren et al. 2006) are:

- *Goal of the benchmark.* The focus of improvement can be on internal efficiency or external effectiveness.
- *Object of measurement.* A distinction is made between objects that can be measured (quantitative) or only described (qualitative). Furthermore a distinction can be made between measuring the performance of the product or service or the process that created the product or service.
- *Standard or tailor-made.* A standard benchmark is based on fixed definitions and a database used for comparison. A tailor-made benchmark is created specifically for solving a problem in a certain context. If a tailor-made benchmark is created in joint effort with several organizations, is repeated periodically and a database built up, it can become like a standard benchmark.
- *Benchmarking partners.* Partners can be internal business units, direct competitors, organizations inside the industry (this enhances comparability), or in other industries (can lead to radical improvements resulting in a competitive advantage).
- *Profit or non-profit.* For competitive reasons for profit organizations data gathering will be more difficult (sensitive information), which may sooner lead to a choice for a standard anonymized benchmark. Non-profit organizations have less problems providing information and giving organizations insight into their operations.
- *Organizational level.* The benchmark can be performed between departments, divisions or even entire organizations.
- *Anonymity.* Anonymous benchmarks exist in two forms: participants are not known to each other, or participants are known to each other but the benchmark results cannot be traced to each participant. Knowing each participant and their benchmark result will lead to the best basis for learning.

- *Passive or interactive.* In passive benchmarks participants provide the data and receive a report with the results. In an interactive benchmark participants are aided in interpreting the results and implementing improvements or best practices.

3.5.4 The benchmarking process

Since benchmarking can be seen as a process, it involves a number of activities to perform. Many authors describe the benchmarking process, resulting in different activities to take along the way. Below a description is given of the activities for a simple benchmarking process (summarized from Waalewijn et al. 1996, Nelissen and De Goede 1999, Van Eekeren et al. 2006, Van Dijk et al. 2004).

- *Determine the goal and scope.* It should be clear to all stakeholders in the organization what the goal and deliverables of the benchmark will be. These should be discussed and agreed upon. Given the goal, the organization should decide what resources it is willing to devote and what time horizon is plausible.
- *Determine objects to investigate.* Given the goal of the benchmark the objects to investigate should be determined. For each object a definition should be made in a way that the benchmarking partners will also be able to use in their situation. This makes sure that the same objects will be measured and compared, which is especially important in a more quantitative benchmark. A balance should be made between the need for detailed information and the practical considerations of costs, time and willingness of partners to gather that information. Objects of investigation are for example: IT costs, information systems or business processes (see also paragraph 3.4.2).
- *Find benchmarking partners.* Organizations should be found that are willing to participate in the benchmark. The motives for the partner to participate may be different, as long as the organizations agree on the resources necessary and objects to investigate. For tailor-made benchmarks it may be more difficult to find partners, since each partner may have an opinion on what objects to investigate and how the process takes place. These opinions should be aligned. Also, the more experience an organization has with benchmarking, the better an organization will be capable of benchmarking with organizations less alike. Radical improvement breakthroughs can only be expected by comparing with less alike organizations.
- *Gather information.* Information should be gathered on the subjects to investigate for both the organization and the benchmarking partners. This activity takes a lot of effort, partly depending on the complexity of the objects under investigation. In some situations one or more validation steps will be necessary to improve the quality of the gathered information.
- *Analyse information and find the gap.* The gathered information is analyzed and presented in some form to the participating organizations. The analyzed information is used to gain insight into possible gaps between the performance and practices between the investigated objects. Interactive sessions may be needed to investigate what practices or causes lay behind the quantitative presentation of the object's performance.
- *Implement practices to close the gap.* If gaps are found, and possibilities for improvement identified, practices should be implemented to improve the organization. Simply copying practices will not always lead to wanted results: managers have their own responsibility in interpreting and translating the results for their own organization.
- *Monitor results.* The organization should monitor if the implemented practices lead to the intended improvement. Monitoring can be done by doing a "mini-benchmark" in the organization to measure the objects again.

- *Perform a new benchmark.* The organization should determine if it is necessary to (periodically) repeat the benchmark, for example to monitor improved performance, or to alter the benchmark or create a new benchmark, with new goals, new objects to investigate or new benchmarking partners, in order to find new ways of improving. Perfect practices do not exist: if the organization gets more experience in benchmarking, it could look for partners in other industries or benchmark more complex objects.

The above description only gives an overview of the typical activities to perform. For each benchmark the activities should be tailored to the specific context.

Some of the activities will take more effort than others. In general most benchmarks take more than a year to complete. This means that an organization should seriously consider if it is willing and able to free the resources (time and money) necessary for a successful benchmark.

3.5.5 Conditions for benchmarking to work

For benchmarking to work and actually result in an improved organization, the following conditions (or risks) should be kept in mind (Waalewijn et al. 1996, Nelissen and De Goede 1999):

- *Prevent analysis paralysis.* Analyzing all details can result in endless discussions slowing down the process of improvement. A focus should be kept on identifying differences and uncovering of unexpected results, in order to find fundamental breakthroughs.
- *Gathering information of competitors may be difficult.* It may be complicated to gather reliable and valid data of direct competitors, since this information may be regarded as sensitive and not given for competitive reasons. Therefore it is important to know: who will gather the information and what interests are at stake? Politics and personal interests will play its role in gathering information, discussing the results and implementing improvements. For example: will the gathered information of one's own organization be trustworthy? Benchmarking demands openness, sharing of information and insight and a high level of trust. A risk of quantified benchmark results is that they are taken as the absolute norm and used for personal or political reasons, instead of trying to identify what is behind the metrics for improving the organization.
- *Benchmarking takes time, effort and money.* If resources are not sufficiently available, this may result in less valid or reliable information, less attention for improving and finally a failure to achieve the goals set.
- *Some objects are hard to benchmark.* Objects under investigation like services or skills are more difficult to quantify and to benchmark. Definitions should therefore be clear and the interpretation equal with each participant. If the objects are not measured properly or the benchmarking subject is too broad, the risk of jumping to conclusions emerges.
- *The organization should be ready for benchmarking.* Implementing improvement will be difficult without an organizational structure in which quality improvement is incorporated. The complete organization should be involved and committed in improvement: resistance to change results in not improving. A benchmark-enhancing culture, benchmark-enhancing structure and commitment of top management should be present. Elements of a benchmark-enhancing culture are: focus on external demands (customers or best-in-class organizations) as opposed to internal priorities, striving for the best of the best, willingness to change, willingness to learn and unlearn. A benchmark-enhancing structure is: focus on processes and activities, instead of people, functions or departments, presence of a TQM-system, presence of communication processes to enhance sharing of information, a team-focused approach, training facilities (benchmarking should be taught) and presence of monitoring mechanisms.

Support of top management should go beyond sponsorship (providing the resources): the importance of the benchmark should be propagated and top management should be involved in the process.

- *Understand your own organization and processes.* Before a useful comparison can be made to other organizations, the own organization (or process under investigation), should be sufficiently understood. An already existing investigation of processes from TQM practices can be helpful.
- *The role of consultants in the benchmarking process should be limited.* The organization itself should develop skills and experience to perform benchmarks. If the role of the consultant is too large, commitment to the results of the benchmark will be low. In some situations consultants are necessary, for example in the first phase of the process or in situations where benchmarking would simply not take hold.

3.6 A selection of IT evaluation and benchmarking methods

Having presented the purpose and characteristics of IT evaluation and benchmarking, this paragraph will discuss a number of commonly known IT evaluation and benchmarking methods. As will be explained in chapter 4, the benchmark instrument to be designed will be based as much as possible on existing methods in order to benefit from knowledge contained in those methods and to give the benchmark a level of recognisability and credibility. This paragraph describes the methods that were investigated for use in the benchmark, as recommended by my supervisors, experts at M&I/Partners, external experts and as found during a study of literature.

Many more methods than the ones described in this paragraph exist however. Berghout and Renkema (2005) identify over 70 methods for ex ante evaluation of IT investments. They note that new methods are created every day, a lot of which are created specifically for a certain goal by consultancy companies and not published for competitive reasons. Andresen (2001) identifies 82 methods when developing a framework for selecting IT evaluation methods for the Danish construction industry.

It should be noted that not all of the described methods are identified as a "method" per se by their authors. Some are described as a framework, model or instrument, with varying levels of detailing out how to apply in practical process. For practicality all of these will be called "methods" in this research. For a method to be included in the investigation, it should:
- Include a specification for measuring one or more aspects of the organizational value or benefit of IT (including effectiveness, efficiency or productivity like measures), this can be both quantitative or qualitative.
- Have a complete documentation that is available for use.
- Contain a description on how to carry out the method, or at least on how to measure the indicators; a set of rules or best practices is not sufficient.

The following methods have been identified as potentially usable for the benchmark instrument to be designed and will be discussed in this paragraph:
- "The method of Bedell" (1985).
- The "Information Economics" method by Parker et al. (1988).
- "Return on Management" by Strassmann (Berghout and Renkema 2005, Poels 2006).
- "IT Business Value" by Broadbent and Weill (1998).
- "Quality of Information" by Van der Pijl (1993).
- "Benchmarking Organizational Performance" by Nievelt and Willcocks (1999).
- "BtripleE" by Van der Zee (2001).

Since the benchmark instrument was to be an addition to the already existing benchmarks of M&I/Partners, a description of the "M&I/Partners IT benchmarks" is also included.

The "IT Assessment" method by Noland and Norton was identified, but is not included since complete documentation was not available. The "Business IT Alignment" method (Luftman et al. 2002) was also identified, but is not be included for reasons of scope: the benchmark instrument focuses on measuring the IT benefits of the information systems and infrastructure in operation (see chapter 4), instead of measuring IT value indirectly by investigation the maturity or quality of management processes, internal communication practices or mutual understanding between business and IT people as is done by the Business IT Alignment method. The "Strategic Option Generator" (Wiseman) was not included since the method is more like a checklist: no description is given how the model could be operationalized in a methodological way (although this could be added, see Bergeron et al. 1991). The "IT21 check-up for IT fitness" (Teubner 2005) was not discussed, since the complete method is commercially exploited by IBM and not publicly available.

3.6.1   The method of Bedell

Description

The method of Bedell is a portfolio method to be used for selection of IS investment proposals (Berghout and Renkema 2005). The method answers three questions (Van Reeken 1992):

- Do strategic reasons exist to invest in IS above the current level in the organization? In other words: how does the strategic importance of IS compare to the current effect of IS?
- For which organizational activities can improvements be made by investing in IS?
- Which IS investment proposals should be selected? (prioritising possible investments)

The central idea of the method is that a balance should be found between "quality" and "importance": investing in IT is more necessary if the difference between quality and importance of IT applications becomes less beneficial. IT applications are more important when they support more important information functions and when these functions in turn support more important business activities (Berghout and Renkema 2005).

The three questions mentioned above can be answered by qualitative scoring on the following issues (Berghout and Renkema 2005):

- The importance of each business activity to the goals of the organization.
- The importance of each information function to the goals of the business activity.
- The quality of the IT support for each information function, measured by effectiveness, efficiency and timing.

These issues are scored by senior management, user management and IT specialists. A number of metrics are calculated from these scores. These metrics answer the first two questions stated above. The third question can be answered by scoring each investment proposal and calculating additional metrics.

Various researchers describe and use the method of Bedell, with some of them adapting the method for their use (Berghout and Renkema 2005, Delahaye and Van Reeken 1992, Van Reeken 1992, Van der Pijl 1993). Berghout and Renkema (2005) and Van Reeken (1992) include a summary of the general approach of Bedell's method, which will be summarized below. This gives a general idea of how the method can be used.

However, before the method can be applied, an analysis should be made of the organization's activities and information functions (if none is present). This analysis could be made using Porter's Value Chain Analysis (Van Reeken 1992).

The method used a lot of acronyms for identifying estimations and calculated metrics. For this research both English and Dutch literature on Bedell's method was used. Since the acronyms are different in each language, both the English and the Dutch is included in the following text. See also table 3.2 with an overview of all the acronyms, including translations.

The method of Bedell is divided into 10 steps (summarized from Berghout and Renkema 2005 and Van Reeken 1992):

- *Step 1: Estimate the importance of the identified organizational activities.* The level of importance can be: critical to strategy (10 points), strategic (8 points), direct contribution (6 points), capacity enhancing (4 points), administrative contribution (2 points) and contrary to the goals (0 points). Result: the Importance of an Activity for the Organization (IAO, Dutch: BAO).
- *Step 2: Estimate the importance of the identified information functions for each organizational activity.* The level of importance can be: strategic (10 points), vital (5 points), supporting (1 point) or not important (0 points). Result: the Importance of a System for the Activity (ISA, Dutch: BFA).
- *Step 3: Estimate the quality (effectiveness) of the present information system for each information function.* The level of quality can be: high (10 points), moderate (5 points), low (1 point), unusable (or no) system (0 points). Result: the Effectiveness (quality) of the System for the Activity (information function) (ESA, Dutch: KSF).
- *Step 4: Calculate the effectiveness of the information systems for the organization.* Multiply ISA and ESA, resulting in ESA: the effectiveness of the system for the activity. Summate all ESA for an activity and divide by the sum of ISA, resulting in EIA: effectiveness of information for the activity. Multiply ESA with IAO and ISA with IAO, and then divide by their sums, resulting in EIO: the effectiveness of information for the organization. Result: the Effectiveness of each System for each Activity (ESA, Dutch: ESA), the Effectiveness of Information for each Activity (EIA, Dutch: EIA) and the Effectiveness of Information for the Organization (EIO, Dutch: EIO).
- *Step 5: Estimate potential importance of information systems for each organizational activity.* Using information of developments and trends in the industry and IT estimate the potential importance of information systems for an activity: strategic (10 points), operational (5 points), and supporting (1 point), no use (0 points). Multiply IAO and IIA. This results in the focus factor for each activity: how interesting the activity is for investing in IS. Divide the sum of the focus factors and sum of IOA results in IIO: the (potential) importance of information to the organization. Result: the Importance of Information for an Activity (IIA, Dutch: BIA), the Focus-factor, the Importance of Information for the Organization (IIO, Dutch: BIO).
- *Step 6: Should the organization invest in IS?* The EIO and IIO indicators, both normalized to a 10-point scale, should be close together in the optimal situation: then the effectiveness (quality) of information systems matches the (potential) importance of information systems. If the IIO is substantially or moderately higher than EIO, the organization should invest aggressively or selectively. If the EIO is substantially or moderately higher than IIO, the organization should disinvest or stabilize. This result can be shown in a figure (see figure 3.7).
- *Step 7: In which activities to invest?* The focus factor and EIA indicators, both on a 10-point scale, and present for each activity separately, should be close together in the best situation. A figure can be used, similar to the one in step 6, to investigate for which activities investing in IS will be most interesting.
- *Step 8: In which information systems (functions) to invest?* Multiply the sum of ISA with IAO, resulting in ISO: importance of the system (function) for the organization, multiply

ESA with IAO, resulting in ESO: effectiveness of the system for the organization. Bedell (1985) does not explicitly state how ESO is calculated, especially if an information system is used for multiple functions in multiple activities.

The result is a figure showing the importance of an information system (function) related to the effectiveness (quality) of the information system for the entire organization. Result: the Importance of a System for the Organization (ISO, Dutch: BFO) and the Effectiveness of a System for the Organization (ESO, Dutch: KSO).

- *Step 9: Selection of investment proposals.* Using the information from the previous steps, a request for investment proposals can be made in the area's that are most beneficial to the organization. For each proposal the costs (C) and estimated effectiveness (ESA') are estimated. Result: Cost (C, Dutch: K) and the estimated Effectiveness of the (proposed) System for the Organization (ESA', Dutch: KSF').

- *Step 10: Prioritise investment proposals.* For each proposal the Project Return Index (PRI) is calculated by multiplying ISO with the difference between ESA' en ESA, which is then divided by the costs of the investment: C. The result is a prioritised list of investment proposals. Result: the Project Return Index (PRI, Dutch: PRI).

The table below provides an overview of all the indicators used. Both the English and Dutch versions and a short description on the estimation or calculation of the indicator are given.

Table 3.2: Indicators used in the method of Bedell		
in English	**in Dutch**	**Description**
IAO *Importance of Activity to Organization*	BAO *Belang van Activiteit voor Organisatie*	Estimate importance of each activity
ISA *Importance of System for Activity*	BFA *Belang van Functie voor Activiteit*	Estimate importance of each system (function) for all activities (individually).
ESA *Effectiveness of System for Activity*	KSF *Kwaliteit van Systeem voor Functie*	Estimate quality (effectiveness) of each system for the information function of the activity.
EIA *Effectiveness of Information for Activity*	EIA *Effectiviteit van Informatie voor de Activiteit*	For each activity: sum(ISA*ESA) / sum(ISA)
EIO *Effectiveness of Information for the Organization*	EIO *Effectiviteit van Informatie voor de Organisatie*	sum(EIA*IAO) / sum(ISA*IAO)
IIA *(potential) Importance of Information for Activity*	BIA *(potentieel) Belang Informatie voor Activiteit*	Estimate potential importance of IT for each activity.
Focus factor	Focus factor	For each activity: IAO * IIA
IIO *Importance of Information for Organization*	BIO *Belang van Informatie voor Organisatie*	sum(focus factor) / sum(IAO)
ISO *Importance of System for Organization*	BFO *Belang Functie voor Organisatie*	ISA * IAO
ESO *Effectiveness of System for*	KSO *Kwaliteit van Systeem voor*	ESA * IAO

Table 3.2: Indicators used in the method of Bedell		
in English	**in Dutch**	**Description**
Organization	*Organisatie*	
C *Costs*	K *Kosten*	Estimate costs of investment proposals.
PRI *Project Return Index*	PRI *Project Rendement Index*	ISO*(ESA' – ESA) / C

The method uses figures to plot the calculated indicators. In each figure a 45-degree line is drawn, which is regarded as the ideal line for the indicator to be on. See figure 3.7 for an example result of step 6.
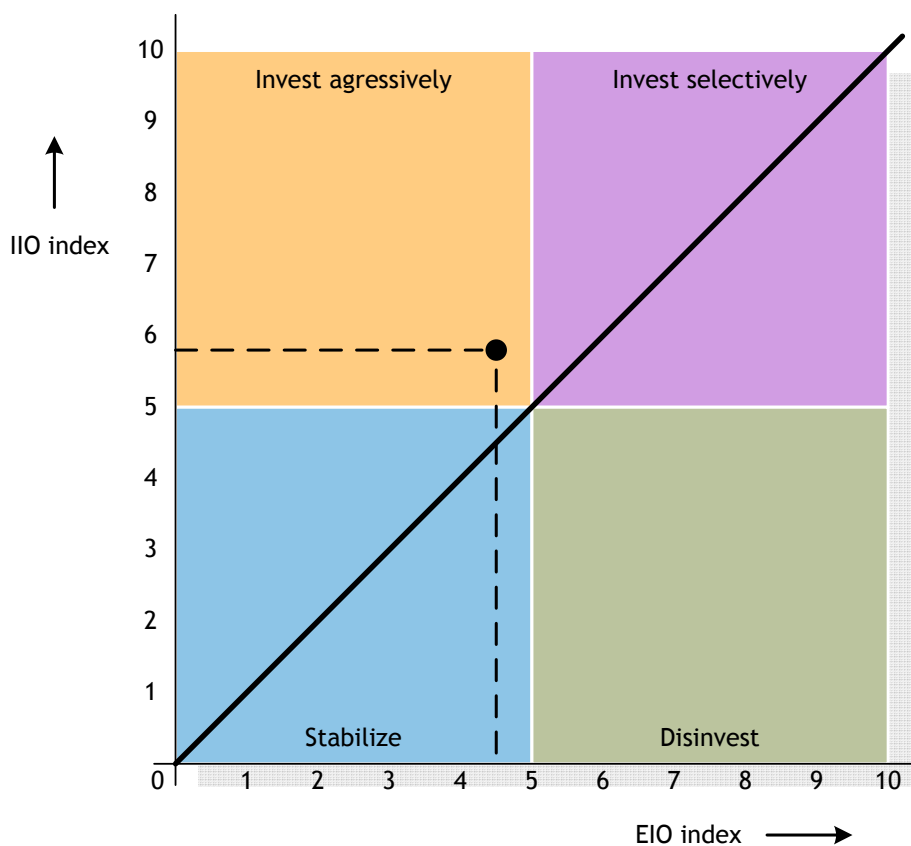
Figure 3.7: Should the organization invest in IS? (Van Reeken 1992)

Van Reeken (1992) creates a clear distinction between the importance of the *information function* for the activity, as opposed to the importance of the current *information system*, whereas Bedell (1985) does not do so explicitly. This distinction is important, as the information system currently in use may be very ineffective and therefore regarded as unimportant, but the information function that is supported, may be very important to the activity. Van Reeken (1992) also introduces the term "quality" for estimating the information system instead of "effectiveness", since that term better covers what Bedell uses the indicator for: estimation of the effectiveness for the activity, efficiency and technological state.

The difference between the (strategic) importance of an information system for an activity (ISA) and the potentially (strategic) importance of information for an activity should be noted (IIA). Bedell (1985) states that IIA should be estimated independent of the current organizational situation: it may very well be that IT could be of strategic importance to an activity, but no IS is currently in use to take advantage of that. On the other hand the ambition of organization for investing in IT may be too high, resulting in highly effective and strategically used information systems that simply cost too much. Van Reeken (1992) notices that Bedell could have introduced an indicator for estimating the potential importance of information for each information function instead of the entire activity, resulting in the Importance of Information for a Function (IIF).

Strengths

The method of Bedell is the only method that provides a consistent approach and detailed methodology for relating the quality and effectiveness of the current information systems to the strategically important areas in an organization (bottom-up, see paragraph 3.3.4), while also taking into account in what areas the organization can benefit most from contemporary developments in IT. The method can therefore be used to identify for what organizational areas IT investment proposals should be made, before a proposal call is sent out. Another strength is that the result of the method can also be that investing more resources in IT is not necessary and these resources can better be diverted to other parts of the organization.

Weaknesses

An often seen critique to the method is the arbitrary nature of the quantitative scale given to the qualitative indications in the estimations. Bedell (1985) states that the current scores are based on experience. Van Reeken (1992) mentions that, depending on the situation, changes can be made to the scale, and regards it as a starting point to get the discussion on prioritizing investments more objective than before.

Another critique is that the scale for estimating the effectiveness for information systems is not detailed and sophisticated enough, as it incorporates both the level of ambition for an IS, the efficiency and technical characteristics and only can be scored as 10, 5, 1 or 0. Also, since the method takes the organization's strategy and importance of information as a given, the only factor of influence is ESA (to ESA'), so estimating ESA well is very important for the resulting indicators. This means that the method does not include the possibility for strategic reorientation, resulting in other strategically important activities or a change in the strategic importance of information. Van Reeken (1992) proposes using a Value Chain Analysis instead of a division of activities by departments to provide a new orientation on the organization's activities. He also proposes using the Critical Success Factors (CSF) method by Rockart for strategic reorientation. A distinction could be made between level of ambition and quality, but Van Reeken (1992) does not indicate how the method could be adapted for that.

Bedell (1985) does not state how to cope with a situation in which an information system supports more information functions or activities. Van Reeken (1992) proposes: the sum of ESA multiplied by ISA and IAO.

Regarding the used figures Bedell (1985) divides those in a four quadrant grid (see figure 3.7) and connects conclusions to what the organization should do if the indicator ends up in a certain quadrant. Van Reeken (1992) argues that this is illogical: the horizontal deviation from the 45-degree line is important to consider and consequently presents an alternative figure: see figure 3.8 for an example.
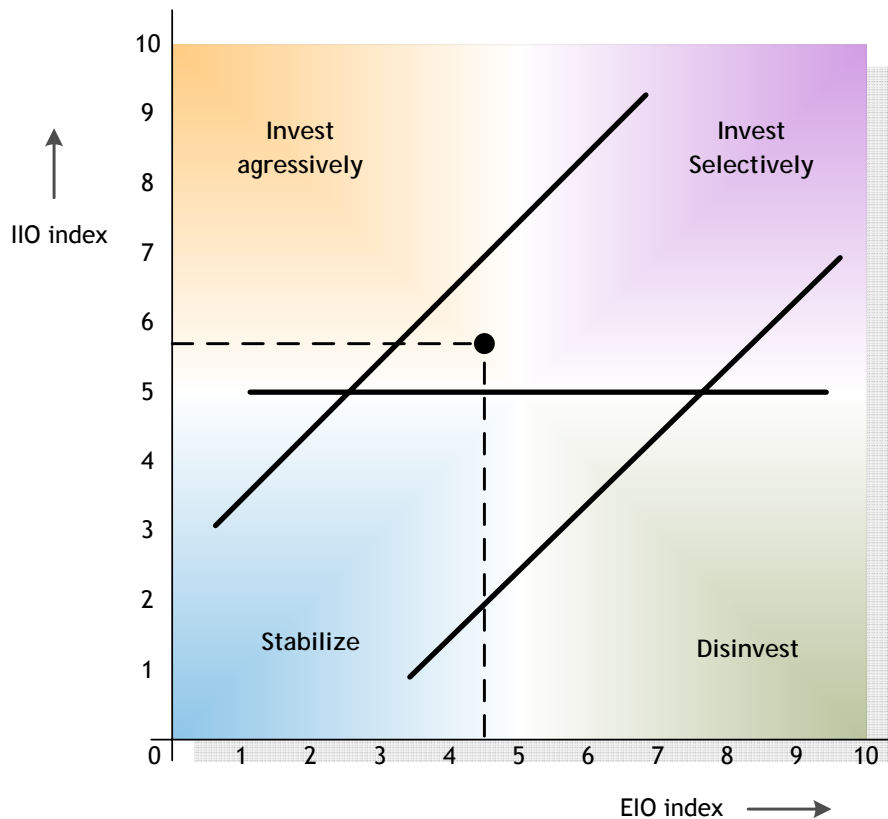
Figure 3.8: Should the organization invest in IS? Alternative figure proposed by Van Reeken (1992)

In practice one investment proposal may depend on another. An infrastructure investment may for example be necessary before a certain information system can be implemented. The method does not account for this situation when prioritizing proposals. Van Reeken (1992) proposes to combine dependent projects and prioritize them as new proposals.

3.6.2   Information Economics

Description

In 1988 Parker et al. proposed a new method for evaluating the benefits, costs and risks of IT investment proposals. This as opposed to the traditional cost-benefit analysis. They state that as the use of IT becomes more complex in organizations, the value of an IT investment cannot be calculated anymore by a straightforward calculation of the return of investment (ROI). They propose a more advanced way of calculating the ROI and add a number of non-financial value indicators and risk indicators, in order to better evaluate and prioritize investment proposals.

Senior management can use the method as a means for an objective way of communicating about and coming to consensus on the benefits, risks and costs of each proposal, resulting in a prioritized list of proposals. Parker et al. (1988) explicitly state that the method should not be used as an absolute norm in a mechanical way, but is only a means to come to an agreement in a more objective way.

The method uses the following indicators for estimating the value of an investment proposal:

- *Enhanced ROI.* Simple ROI enhanced by quantified benefits from value linking, value acceleration, value restructuring and innovation.
- *Strategic Match.* The correspondence of a proposal to corporate strategic goals, or the contribution to move towards the corporate purpose and long-term direction.
- *Competitive Advantage.* The advantage that can be obtained in the market place (based on Porter's 5-forces model, 1979): alter industry structure, improve position in an industry or take advantage of new business opportunities.
- *Management Information.* The improvement of information on core activities; Critical Success Factors (CSFs) should be defined by the organization to be able to estimate this indicator.
- *Competitive Response.* The risk of not undertaking or loss of market share if the investment is not or not timely implemented. A pre-emptive investment could lead to a competitive advantage.
- *Strategic IS Architecture.* Fit of the investment into the overall IS direction. This requires a long-term IS plan (architecture or blue print).

The authors state that indicators two through six can be used to quantify all forms of benefit which could previously not be quantified. This quantification results in the "true economic impact of information systems."

The method uses the following indicators for estimating the risks of an investment proposal:

- *Organizational Risk.* The need for the organization to develop new management or operational skills, or the requirement of a large organizational change process.
- *IS Infrastructure Risk.* The degree to which cooperation between different areas in the IS organization is necessary. More complex projects across multiple functional areas include factors not under the direct control of the project manager, thus increasing the risk.
- *Definitional Uncertainty.* The degree to which users are able to explicitly state what the specifications of the system are. If these can be less firmly specified, the uncertainty is higher.
- *Technical Uncertainty.* Dependence on new or untried technologies, including skills, hardware or software.

Each value and risk indicator will be scored on a zero to five scale, and then each indicator gets a weight on a zero to ten scale. The scales and weights are multiplied and summed, resulting in the final score of the proposal. Parker et al. (1988) provide descriptions for each score of each indicator, but indicate that the scores can be changed to better fit the need in a given organizational context. The weights should be determined during the evaluation process.

Strengths

A strength of the method is that it provides a consistent and methodological way for estimating both financial, non-financial, business, IT and risk aspects of an investment, which can be used for a more objective discussion between business and IT managers in order to come to consensus and prioritize proposals better than was previously possible.

Weaknesses

A disadvantage of the method is that it can only be used for a single line of business (LOB). Also, dependency of project is not taken into account in the prioritization. This could be solved by combining dependent proposals to new project proposals and score them accordingly (this is identical to the weakness of the method of Bedell, see paragraph 3.6.1).

Another disadvantage is that the choice of value and risk indicators seems arbitrary and is not founded on theory: adding new or missing indicators may therefore be imaginable.

Furthermore, the method regards risk as "negative value" and subtracts risk from benefits. A critique is that risk is manageable and therefore it is too simplistic to simply subtract it from the benefits. If a project is inherently risky, but an organization may get a lot of value from it, the risks can be managed and reduced (Van Reeken 1992).

A difficulty when using the method is how to include investment proposals for IT infrastructure investments, since these investments do not directly provide value for the business. In his later work Benson (Benson et al. 2004) proposes to regard infrastructure investments as separate LOBs and indicates how to deal with prioritizing among multiple LOBs.

3.6.3   Return on Management

Description

In his research Strassmann has convincingly shown that the performance of an organization is not related to the spending on IT (Van der Zee 2001, Berghout and Renkema 2005, Poels 2006, see also the IT Productivity Paradox in paragraph 3.3.2). Therefore IT spending is not a good indicator of the business value that IT delivers. Instead Strassmann states that management practices determine the benefits of IT. A number of ratios are defined that relate financial performance indicators to management indicators to express the value of IT for the organization (Waal and Aker 2003). The best known indicator of the method is Return On Management (ROM), but another four are defined. Each indicator is described below:

- *Return On Management (ROM).* The added value of management related to the costs of management, calculated by subtracting the costs not under the influence of management from the financial results of the organization (Berghout and Renkema 2005).
- *Productivity of Information Resources.* Indicates the contribution of IT in the total operational costs of producing one product.
- *Information Intensity.* Indicates how information intensive an organization is, but can also indicate the productivity of employees. A low value of this indicator indicates a high effectiveness and efficiency of IT, but only if this results in a higher performance of the organization.
- *Relative Importance of Information.* Indicates how much information is needed to provide the organization's revenue. Strassmann indicates that this indicator is not very useful, since many factors influence revenue. An improvement of the indicator would be to use profit instead of revenue in the calculation.
- *Information Productivity.* An indicator of efficiency as IT spending is related to the financial performance of the organization.

The following table contains the calculation for each indicator (Berghout and Renkema 2005, Poels 2006):

Table 3.3: Indicators of the Return On Management-method	
Indicator	Calculation
Return On Management (ROM)	$1 + \dfrac{\text{economic profit before taxes}}{\text{full cost of management}}$
Information Management costs (IM) (this indicator is used for the indicators below)	sales costs + general costs + administrative costs + R&D expenses
Productivity of Information Resources	$\dfrac{\text{IM}}{\text{costs of goods sold}}$
Information Intensity	$\dfrac{\text{IM}}{\text{number of employees}}$
Relative Importance of Information	$\dfrac{\text{IM}}{\text{revenue}}$ or $\dfrac{\text{IM}}{\text{profit}}$
Information Productivity	$\dfrac{\text{Economic Value Added (EVA)}}{\text{IT costs}}$
EVA (is used in the indicator above)	(ROIC – WACC) * invested capital

A non-public, commercially exploited database is used containing the information of many organizations to compare the indicators of an organization under study to other organizations. The resulting indicators can be used to evaluate the entire organization, but can also be used for justifying a certain investment proposal or organizational change.

Strengths

The strength of the method is that it uses financial numbers to calculate indicators, which gives them a level of objectivity. The notion that the value, benefits and productivity of IT are strongly related to how IT is managed is supported by many authors, so the incorporation of this notion is therefore a strong feature of the method. The possibility for organizations to compare their indicators with many other organizations from the same industry or other industries may be very useful to learn from others (benchmarking).

Weaknesses

A weakness of the method is that the financial information to be gathered is not strictly defined and sometimes regarded as unusual for financial managers. This makes gathering of information and calculations difficult. This lack of clear definition also lowers the reliability of the gathered information when comparing between organizations (Poels 2006). Since costs are not restricted to IT costs, an indicator like Return On Assets (ROA) or Return On Equity (ROE) might just provide the same insight as ROM (Van der Zee 2001). The best regarded indicators are those related to the profit of an organization. However, profit is not only related to management factors, so using profit as a performance measure for management seems questionable. Also, many organizations are not profit oriented, like government organizations and other non-profit organizations. For these organizations indicators relating to profit are not useful.

3.6.4   IT Business Value

Description

Weill and Broadbent (1998) devise the concept of the "IT portfolio", which divides all organizational IT assets over a number of areas related to the function of the asset: strategic, informational, transactional and infrastructural assets. Each area has its own characteristics on how IT brings value to the business. Strategic systems provide a competitive advantage, informational systems provide value in information needed to manage and control the organization, transactional systems provide value in efficiency of recurring processes by automation and infrastructure provides value in fast and economically efficient implementation of new applications.

The authors then devise a hierarchy of four levels of value indicators that measure the value of IT related to the functional areas: financial value, operational value, applications value and firm wide infrastructure value. It is noted that the indicators higher in the hierarchy (which are on a higher organizational level), are influenced by more non-IT factors in a more complex way. This is called "dilution of impact" and relates to the "causal ambiguity" as mentioned by Thorp (1998), see paragraph 3.3.2.

The authors define IT Total Cost of Ownership (TCO) as the total investment in computing and communication technology, including hardware, software, telecommunications, data processing, data storage and experts. They state that IT spending should be balanced among the areas as mentioned above and that it should be aligned with the strategic context of the organization.

The following figure presents the functional areas of IT and the value characteristics to be managed.
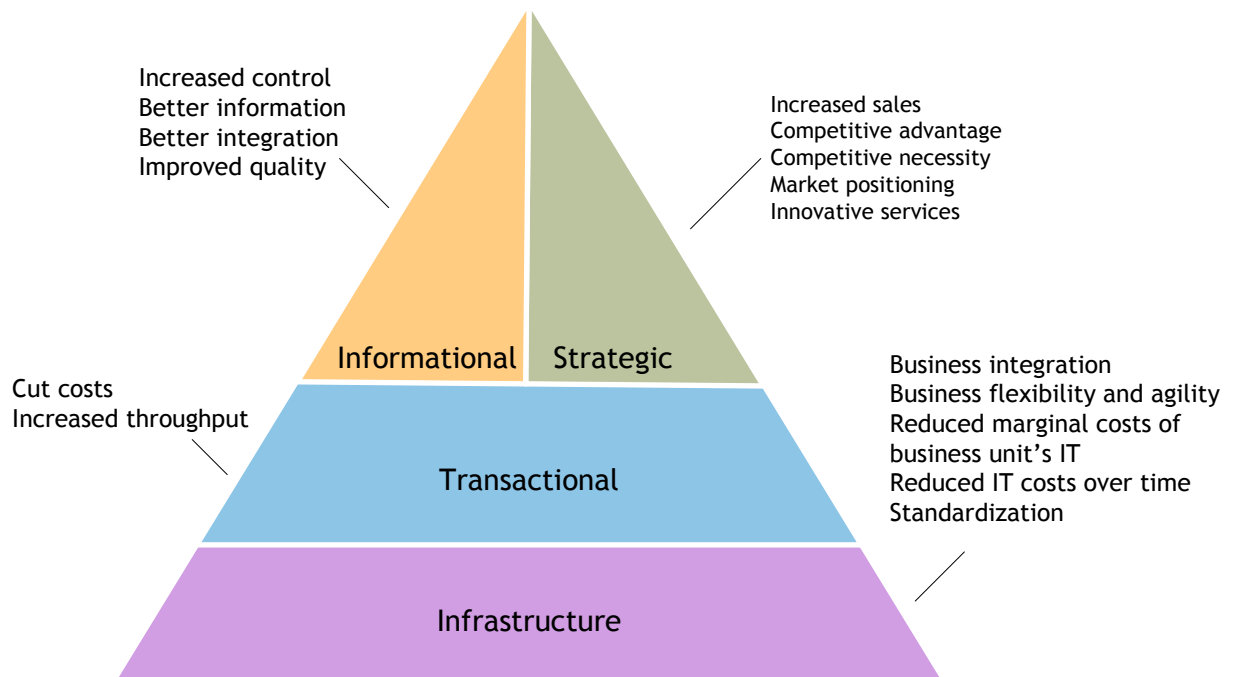
Figure 3.9: Functional areas of the IT-portfolio (Weill and Broadbent 1998)

The following table contains the indicators used to measure the business value of IT at different levels in the hierarchy (Poels 2006):

Table 3.4: Indicators of the Business value of IT at different organizational levels	
Level of business value	Indicator
Financial Business Value	Revenue growth Return on Assets Revenue per employee
Operational Business Value	Time to bring a new product to market Sales from new products Product or service quality
Applications Business Value	Time to implement a new application Cost to implement a new application
IT Infrastructure Business Value	Infrastructure availability Cost per transaction Cost per workstation

Strengths

The strength of the method is that it recognized that IT delivers value in various ways to the organization. This results in a hierarchy of various value characteristics, both financially and non-financially. These value characteristics are operationalized to practical indicators that can be measured in an organizational context.

Weaknesses

The indicators, especially on the higher hierarchical level, are also influenced by other factors than IT. The authors recognize this as the "dilution of impact", but no indication is given on how to overcome this. Poels (2006) has investigated the use of the method in the financial services industry and has found several indicators not useful. These indicators are: ROA, Product or service quality (relates to strategic proposition, not to value of IT), Time and cost to implement a new application (has more to do with management than performance of IT) and Cost per transaction (because the nature of financial products diverges too much).

3.6.5   Quality of Information

Description

Van der Pijl (1993) develops a theoretical framework for assessing the quality of information in an organization. This framework brings together two approaches to information quality on various elements of the organization. The two quality approaches are: the causal and teleological point of view. The causal point of view sees the quality of information as the result of the quality of the process in which it was produced. The teleological point of view takes the angle of the organizational goals that have to be served. See figure 3.10 for a model of the quality framework with the causal and teleological points of view and the elements of the organization under evaluation.
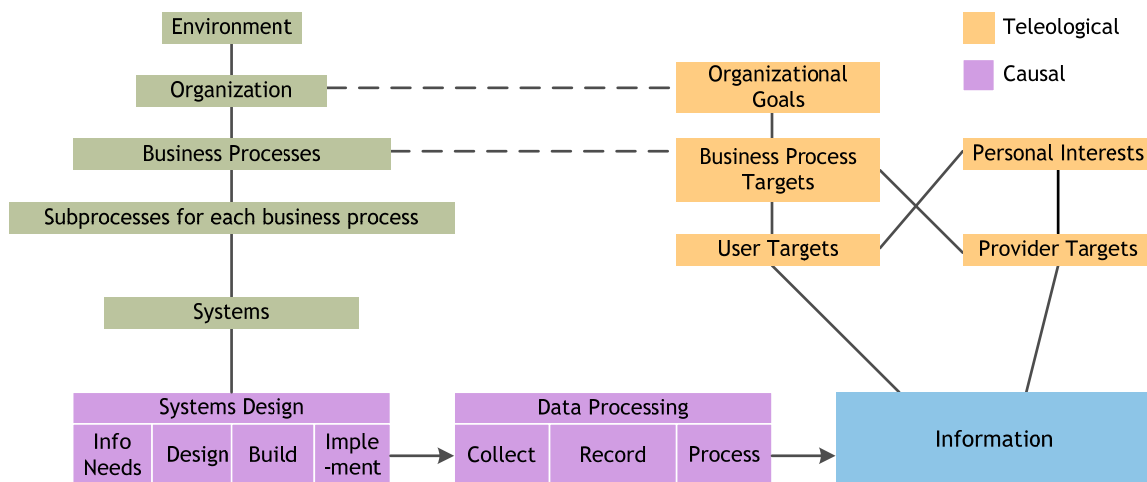
Figure 3.10: The quality model (Van der Pijl 1994)

The teleological point of view is used to devise a method assessing the environment, organizational goals, strategies and process targets and relating these to aspects of the quality of information. The focus of the method is on revealing the goal and targets of the organization and determining if information systems currently support these sufficiently and how they should ideally support these. The organizational structure and culture are also considered by a comparison between the ideal "soll" situations with the current "ist" situation. The method is proven to be helpful for management to structure their ideas on the current role and possible future role of information in the organization. By applying the method, gaps in the information structure, and therefore the quality from the teleological viewpoint, are found and the results can be used to devise an information policy.

Strengths

The strength of the method is that it provides a comprehensive way for performing a thorough assessment of the goal-related aspects of information quality on all levels in the organization, including:
▪ A competitive analysis on the organization's environment.
▪ Organizational strategy.
▪ Information support for processes.
▪ Quality aspects of both users and providers of information systems.
▪ Organizational structure.
▪ Culture.

By determining both the ideal "soll" situation and the current "ist" situation, the result can be used directly for devising a new set of policies to improve the quality of information. Since the method takes a lot of effort to complete, it is mentioned that only a sub set of the method, e.g. assessing a single information system in relation to its supported processes and targets, can be used. Another strong feature of the method is that it recognizes that different parts of the organization deal with different parts of the environment, resulting in the notion that the organization does not necessarily have a strictly determined structure of goals and targets.

Weaknesses

Although it is possible to use only a sub set of the method, it will take a lot of effort to complete the method for evaluating the quality of information for the entire organization.
For one of the described case studies (see Van Der Pijl 1993) the effort consisted of: setting up a steering committee, analysing 19 documents, doing 27 semi-structured interviews of one-and-a-half hour by two interviewers and analysing and reporting the gathered information in a working group consisting of the researchers and three employees.

3.6.6   Benchmarking Organizational Performance

Description

Benchmarking Organizational Performance (BOP) is a benchmarking method based on a database with statistical information on financial and non-financial organizational variables of over 300 organizations (Nievelt and Willcocks 1999). The method can be used to measure the current competitive situation of an organization, compare it to the organizational data in the database and find a strategy for the best way forward. The database contains statistical information on various organizations across industries, not just "best of breed" organizations, since it is believed that comparing to best of breed organizations and simply adopting best practices will not lead to good results. The strategies for the best way forward are summarized as: a back to basics or exit strategy (if the competitive situation is weak), an upgrade strategy (if the competitive situation is medium) and a leadership strategy (if the competitive situation is strong).

To develop a database with statistically valid insights over 100 variables organizational variables were statistically analysed, among which: market characteristics, employees, structure, purchases, spending on IT and financial balance sheet items. As the overall dependent variable a measure of economic performance independent of organization or industry the Organizational Performance Index (OPI) was devised, based on overhead productivity. OPI is calculated as:

$$\text{OPI} = 1 + \frac{\text{economic profit (before taxes)}}{\text{full overhead cost}}$$

The result of the statistical analysis is a set of five stand-alone variables and nine pairs of interaction variables that have the strongest effect on OPI. See the following figure with the variables and interactions, projected on the organizational "score card".
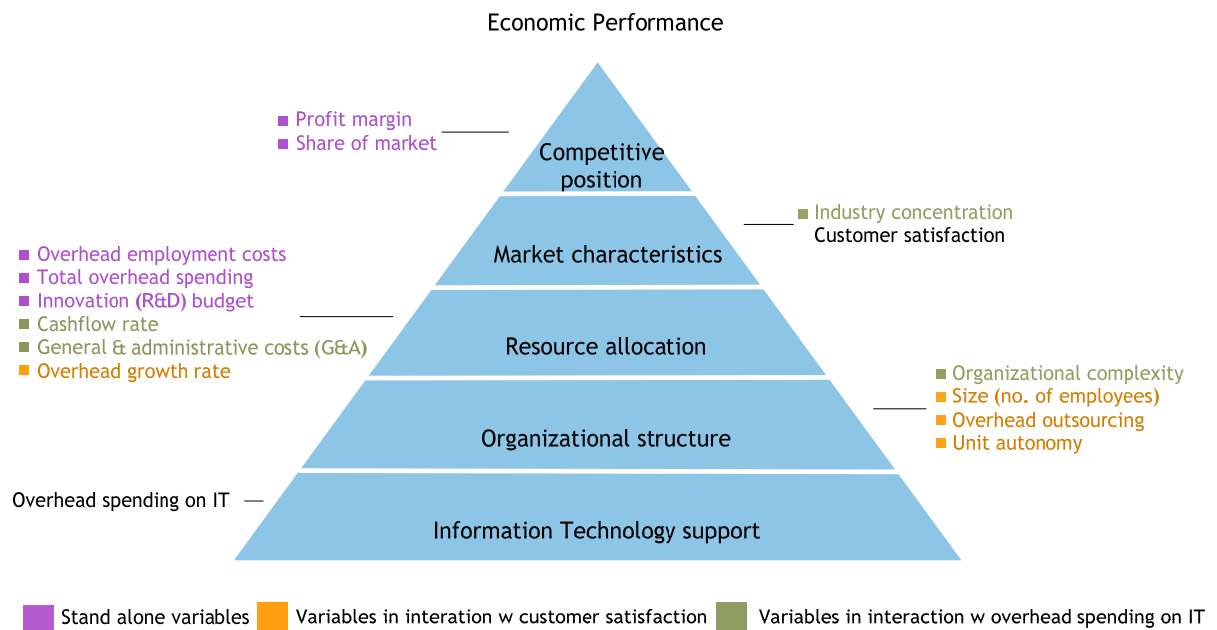
Figure 3.11: The OPI model factors (adapted from Nievelt and Willcocks 1999)

Strengths

No literature could be found on use of the benchmark by other authors. Based on the description by Nievelt and Willcocks (1999) it can be said that the statistically valid analysis is a strong feature of the method. Also the fact that the method does not rely solely on statistics, but also includes an interpretation of the statistics and what this means for an organization's strategy is a strong feature. Another strength is that not only best of breed organizations are included, but organizations of all levels of performance in multiple industries. Thus the organization under analysis will be able to find its current position in a better way, improving the conclusions drawn from the results.

Weaknesses

The description of the method (Nievelt and Willcocks 1999) includes little information on the process used and effort needed to gather information for each organization. It is mentioned however that managers should not put too much effort in trying to detail the information: a pragmatic approach is recommended. Another difficulty when applying the method is that the built-up database is not for public use. This means that a new database has to be built up and statistically analyzed using at least 30 cases (organizations). With regard to applying the method for various types of organizations the authors mention that the method can be used across industries. It seems however that for government or other non-profit organizations the method is less useful, since the most important dependent performance measure (OPI) depends on economic profit. Moreover the resulting recommendations are based on the organization's "competitive position": this is relevant for organization in a competitive market, but less useful for organizations that are not (such as government agencies). Finally, with regard to the subject under study, it should be noted that the method is a general performance benchmark. The contribution of IT for the organization is only one of many causal factors.

3.6.7 BtripleE

Description

Van der Zee (2001) devises the BtripleE framework, a conceptual model for simplifying and ordering the measures of IT value. The framework divides the IT value measures over three organizational levels:

- *Business value of IT*. This is the contribution of IT to business objectives and business strategy.
- *Effectiveness of IT*. IT's effective support of business processes, activities and employees.
- *Effectiveness and Efficiency of IT supply*. Alignment of IT supply with business requirements at a minimum of costs.

Taking the first letter of each value measure results in a one time "B" and three times "E", hence the name "BtripleE". See figure 3.12 for an overview of the BtripleE framework:
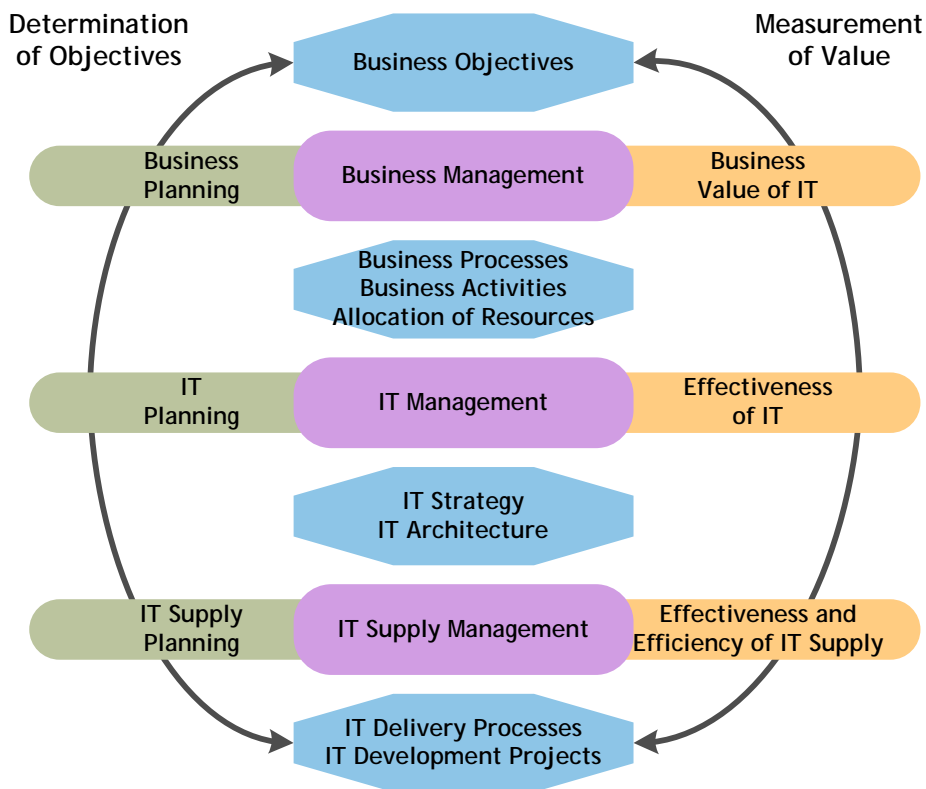
Figure 3.12: *The BtripleE Framework for IT planning and validation (van der Zee 2001)*

The author stresses the need for measuring IT value in different ways at different organizational levels in order to improve the effectiveness and efficiency. The BtripleE framework can be used for devising IT evaluation approaches and methods that can be incorporated into the planning and control cycle of an organization. Benchmarking is mentioned as one way of using the framework: three case studies are presented of how the BtripleE framework was used in designing a benchmark instrument.

For each organizational level as mentioned above a number of measures is described that can be used to get insight into the value that is delivered through IT:

- The "Business value of IT" level consists of four categories of measures:
  Dynamics of IT costs (four IT cost ratios).
  Improved financial performance (3 different IT cost ratios related to five financial ratios).
  Improved business performance (industry and organization specific, based on the Balanced Scorecard perspectives).
  Contribution of IT in realizing strategic goals (IT costs or IT asset value related to Critical Success Factors).
- The "Effectiveness of IT" level consists of three categories of criteria (depending on the situation an adequate measure should be found for each criterion):
  Business processes and business activities (two criteria).
  Users of IT (5 criteria).
  IT architecture and supply (11 criteria).
- The "Effectiveness and Efficiency of IT supply" level consists of measures divided over 20 score cards:
  Based on the four perspectives of the Balanced Scorecard:
  - Financial.
  - Customer.
  - Internal.
  - Innovation and Learning.
  Based on five IT supply processes:
  - IT infrastructure management.
  - IT development management.
  - Client support.
  - Account management (depending on the situation).
  - IT supply management (depending on the situation).

Strengths

The BtripleE framework is very comprehensive in detailing the aspects and usable measures for each level of IT value in varying situations: literature is explained and examples are given. Guidelines are mentioned on how to use benchmarking and incorporate a measurement program in the planning and control cycle of an organization and a number of cases are presented on the use of the framework. The reader can develop his own approach or method by using elements from the framework.

Weaknesses

The BtripleE framework is not a clear cut method that can be executed in an organization. However, a number of situational cases are presented on how a benchmark can be designed using the framework.

3.6.8   M&I/Partners IT benchmarks

Description

Over the past few years M&I/Partners has been successful in developing and carrying out IT benchmarks for housing associations, municipalities and health care institutions. The primary goal of the benchmarks is to provide a means for insight into IT cost and improve IT cost management (see figure 3.13). Each benchmark instrument is tailored to the industry, although the major part of each version is to measure and compare the total IT cost of the organization: the Total Cost of Ownership (TCO). The TCO model used varies little per industry.

For housing associations the following IT cost components are measured: IT management, work environment, LAN, WAN, applications and data processing and speech applications (van Eekeren 2003). Besides TCO the housing associations benchmark also contains a relatively simple measurement of functional (or application) maturity and IT processes, based on the CobiT framework (Control Objectives for Information and related Technology).
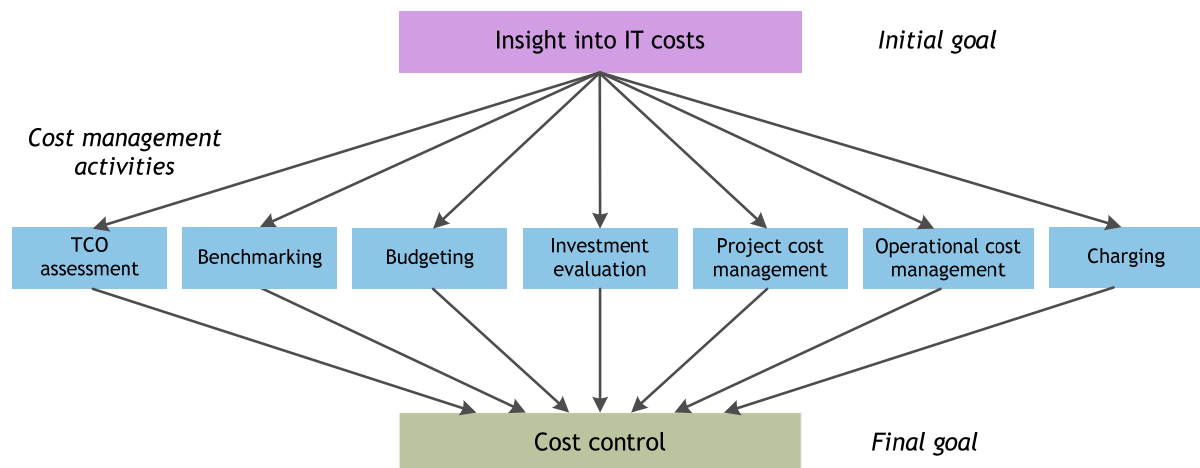
Figure 3.13: Overview of cost management activities (Van Maanen and Berghout 2001)

The benchmark process takes almost a full year and runs parallel to the planning and control cycle of the participating organizations. Each participant has to complete an Excel sheet for data gathering, which is validated by an M&I/Partners expert. The gathering of data takes about three to six days for each participant, depending on the quality of bookkeeping and the accumulated level of experience in participation. The gathered data is processed and results in an elaborate standard report for each organization. Information in the report is anonymized, except for the information of the organization itself. The report is not publicly available, but is used in interactive sessions with all participants during which the anonymity is temporarily removed (see paragraph 3.5.3). Besides using the report in interactive sessions the participants use it internally as they see fit. When (IT) managers were asked how the results of the benchmark were used in their organization, the responses were (Van Eekeren 2003):
- "It creates an awareness of certain cost components".
- "It provides an insight into own costs compared to other in the same line of business".
- "It is indicative of the maturity of the dedication of the IT department within the organization compared to that of other organizations in our line of business".
- "It offers a starting point for a more efficient organization of the IT department".
- "It helps us better argue decisions regarding investments".
- "It confirms certain opinions I have about my own IT department".
- "It provides a basis for determining the fees of the IT service".
- "It provides an organizational model for managing IT-related costs".
- "It assists in communicating with internal clients of the IT department".
- "It becomes part of company management because it contributes to the process of continuous improvement".

The success of the benchmarks is attributed mainly to the interactive sessions in which like-minded people of participating organizations meet and get a chance to discuss on the causes of the differences in reported indicators. The quality of the discussion is improved by temporarily removing the anonymity.

Van Eekeren (2003) states that the results from the benchmark serve as an excellent input for managers for decision making, but the reported indicators should not be perceived as a norm. The position of a participant with regard to the indicators is less important than the interpretation of the numbers. The interpretation should be used for taking focused action for improvement.

Strengths

The strength of the benchmarks is that each version is tailored to issues and difficulties unique to that industry. A general model of cost, functional maturity and control processes is adapted to industry specifics and improved each year using feedback from the participants. This improves the completeness, validity and usability of the reported information. The use of interactive sessions is also a strong feature: this allows participants to investigate together what is behind the reported indicators and to gain insight into causes that can be improved. It should be noted that although the benchmark process takes almost a year, the effort for each participant is very limited. Also, the costs of participation are relatively low, since the instrument is conducted in a standardized form for a lot of organizations.

Weaknesses

Participants are not selected based on best of breed or industry leadership. This means that industry best practices are not necessarily present in the benchmark results, as industry leaders are not identified and may not participate. Also radical improvements may not be found since all participants are from the same industry and radical improvements are typically found outside an industry (see paragraph 3.5).

The focus of the benchmarks is primarily on IT cost. Participants have indicated that the benchmark results provide insufficient insight into reasons that could lead to the difference observed in IT cost levels. The current measurement of functionality and IT processes come up short. In order to improve the benchmarks and meet the wishes of the participants, M&I/Partners has formulated and initiated this research project of which the objective is to devise a method for gaining insight into the benefits and value obtained from IT.

4 Designing the benchmark instrument

This chapter describes the design of the IT benefits benchmark instrument. This description is structured as follows: paragraph 4.1 presents the stated preconditions and scoping and defines the type of the benchmark instrument. Then paragraph 4.2 develops a typology of IT benefits for ex post evaluation, for aiding in the selection of existing methods and paragraph 4.3 describes the selection of existing methods for use in the instrument. Paragraph 4.4 presents the transformation of the selected methods into a benchmark instrument, including the benchmarking process and limitations of the selected methods; finally paragraph 4.5 highlights a list of aspects of the resulting instrument that are tested in the empirical study (see chapter 5).

4.1 Preconditions, scoping and the benchmark type

This paragraph addresses the preconditions for the benchmark instrument as stated by M&I/Partners (paragraph 4.1.1), the choices made on the scope of the instrument (paragraph 4.1.2) and a definition of the benchmark type (paragraph 4.1.3).

4.1.1 Stated preconditions by M&I/Partners

Since the IT benefits benchmark instrument was to be an addition to the existing M&I/Partners IT benchmarks, M&I/Partners has stated a number of preconditions:

- *The instrument should be usable for formative evaluation.* The instrument should be a means for participants to find explanations for variations in IT costs levels, by evaluation and comparison of the benefits obtained from IT in their organizations. This evaluation can then be used in a discussion with colleagues and other participating organizations in order to learn and improve the organizational benefits and value from IT (see also paragraph 1.2).
- *The benchmark results should be more than a number.* The benchmark results should allow for a discussion on the topics "behind" the measurements, even if the results are anonymized. This means that the benchmark should not just give quantified indicators to be used as a final grade or norm, but should give insight into the reasons why the indicators result as they do (see also paragraph 3.6.8).
- *The instrument should provide an ex post evaluation of the investment in computing and communication technology.* As the TCO section of the M&I/Partners IT benchmarks measures the cost of the total investments in IT, the benefit benchmark should measure all benefits of those investments. This as opposed to an ex ante evaluation of the benefits of a chosen IT strategy or proposed IT projects.
- *The instrument should be usable for various industries.* It should take a limited amount of effort to adapt the instrument for application in multiple industries, both profit and not-for-profit.
- *The gathering of data should take limited effort.* The effort needed for each participant to complete the questions for data gathering should be comparable to the effort for the M&I/Partners IT benchmarks: a few days per participant on average.

Reasoning from these preconditions the following remarks are made on the design of the instrument:
- *The entire scope of IT infrastructure and systems should be included for evaluation.* The instrument should measure the benefits of the IT investments that are included in the TCO part of the M&I/Partners IT benchmarks. This means that the benefits of the following IT investments are measured: IT management, work environment, LAN, WAN, applications and data processing and speech applications (see paragraph 3.6.8).

The result of this condition is that practically the entire scope of IT infrastructure and systems should be included for evaluation. This scope relates closely to the definition used by Weill and Broadbent (1998): "the total investment in computing and communication technology, including hardware, software, telecommunications, data processing, data storage and experts" (see paragraph 3.6.4).

▪ *The entire spectrum of IT benefits should be covered.* Since the benefits of IT come in many ways, both financial, non-financial, direct and indirect (see paragraph 3.3.3), a choice will have to be made on what IT benefit aspects are useful to measure, while at the same time covering the spectrum of possible benefit types as obtained from all the investments in IT.

▪ *The use of recorded financial and managerial information is limited.* Since the benefits of IT are in part non-financial and since organizations often lack systems for measuring non-financial data in a consistent way, the use of existing financial and managerial information in organizations is very limited (see paragraph 3.6.3 and 3.6.4). Non-financial managerial information that may be present, for example in the form of a Balanced Scorecard, will not be very useful, since each participating organization will have defined different Key Performance Indicators (KPIs) or have defined the same KPI in a different way (when looked at in more detail). Furthermore, the financial indicator "profit" that is often used as dependent variable (see paragraph 3.6.3 and 3.6.6) will not be very useful either, since the instrument should be applicable for not-for-profit organizations.

4.1.2   Scope of the benchmark instrument

As with any research project, available time was limited. For this reason the following choices have been made on the scope of the instrument:

▪ *Measure and compare IT benefits, not IT value.* The instrument measures and compares the organizational benefits obtained from IT. This means that the focus is on the organizational effectivity of all IT in use for the entire organization. How efficient the IT department is in providing this effect was not investigated. The measured benefits of IT resulting from the developed instrument could be combined with the costs of IT as measured in the M&I/Partners IT benchmarks in a future study.

▪ *Managing IT for maximum value has been omitted.* Since evaluating the value of IT in an organization directly is a complex task, an often taken approach is to measure aspects of how IT is managed (see for example Luftman et al. 2002 and Teubner 2005). Literature of how organizations should manage IT is readily available (see for example Parker et al. 1988, Remeyni and Sherwood-Smith 1997, Ward and Daniel 2006, Thorp 1998, Gartner 2006, and the IT Governance Institute 2005). Although a very important topic, measuring and comparing how IT is or should be managed for maximum value was left for a future study. Management of IT is present in a rudimentary form in the current M&I/Partners IT benchmarks by measuring aspects of a number of CobiT processes and in the research of Derwort (2007) and Nijland (1999), see paragraph 1.1.

4.1.3   Defining the type of benchmark

In paragraph 3.5.3 a number of dimensions were described for characterising various types of benchmarks. This paragraph uses these dimensions and defines the IT benefits benchmark instrument, based on the previously stated preconditions and scope:

▪ *Goal of the benchmark.* The goal of the benchmark is to find explanations for variations in IT costs levels from the M&I/Partners IT benchmarks, by measuring and comparing the organizational benefits of IT. These explanations can then be used for illumination and learning (formative evaluation, see paragraph 3.4.1) to incrementally and systematically improve the benefits and value obtained from IT (operational, competitive benchmark, see paragraph 3.5.2).

- *Object of measurement.* With regard to the stages of full life cycle management (see paragraph 3.3.4) the objects of evaluation are the IT systems and infrastructure in operation. This evaluation could then result in abandoning or improving existing systems, or in identifying and justifying new projects. To allow for an easy comparison between participants the objects should be measured (quantitative) instead of only described (qualitative). Furthermore, the performance of the objects is measured, not the process that created them.
- *Standard or tailor-made.* The IT benefits benchmark instrument is tailor-made, as it is based on a specific request from some of the M&I/Partners IT benchmark participants, but could become a standard benchmark.
- *Benchmarking partners.* The partners for the benchmark are organizations inside an industry. This means that the potential to find radical improvements is limited (see paragraph 3.5.2 and 3.5.3).
- *Profit or non-profit.* One of the preconditions was to develop a benchmark instrument that could be used for both profit and non-profit (not-for-profit) organizations and industries.
- *Organizational level.* The benchmark is used to compare the IT benefits of entire organizations.
- *Anonymity.* Just as with the M&I/Partners IT benchmarks, the results of the benchmark are presented anonymously, but participants are known to each other. In a joined session and if all participants would agree, the anonymity could be temporarily removed to increase the learning effect.
- *Passive or interactive.* The goal of M&I/Partners will be to apply the benchmark interactively, comparable to the M&I/Partners IT benchmarks. In this way participants can interact with each other and M&I/Partners can assist in interpretation of the results.

4.2   Typology of ex post IT benefits

The organizational benefits of IT come in many ways and are influenced by many organizational, situational and environmental factors. For this reason a typology of IT benefits was needed, covering the entire spectrum of IT benefits and applicable for all organizations and industries. This typology could then used as a framework for selecting existing methods usable in the benchmark instrument (see paragraph 4.3). However, a comprehensive typology of IT benefits for ex post evaluation was not found in existing literature. Instead, a typology was created from the literature discussed in paragraph 3.3.3. In order to serve its purpose, the typology was to adhere to the following criteria:
- The typology should cover the full spectrum of IT benefits, identified types should not overlap each other and they should be applicable for all organizations.
- The identified IT benefit types should provide for a discussion within an organization and between participants of the benchmark.
- The IT benefit types should be measurable in a "snap-shot" benchmark instrument.

Summarizing from the classifications of IT benefits as given in paragraph 3.3.3, the following typology was created:
- *Operational Support.* IT's effectiveness in supporting current business processes and operations.
- *Competitive Advantage.* The advantage an organization has in its industry that can be attributed to the use of IT.
- *Strategic Match.* The way IT supports the long-term strategic goals of an organization.
- Keeping Up in the Industry. The way IT supports productivity improvements and other effectivity gains that are needed for the organization to keep up in its industry.

These IT benefit types can be characterized by two dimensions: competitive position (strategic or operational) and time (long or short term). This results in the following figure:
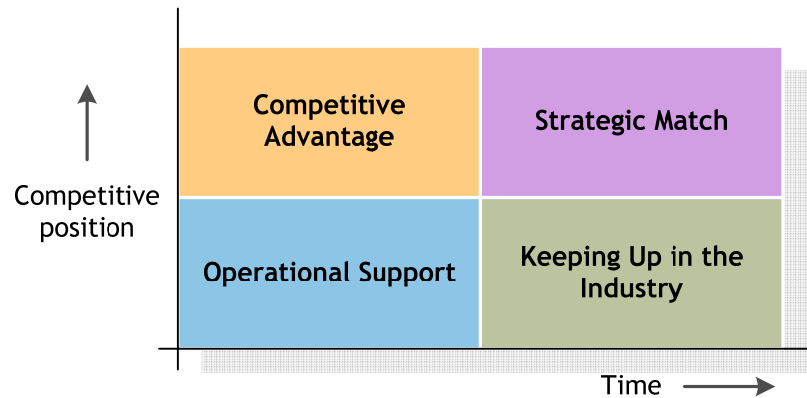
Figure 4.1: Typology of IT benefits

Each IT benefit type is described in the following paragraphs.

It should be noted that the IT benefits to be measured by the instrument should span more than direct and quantified (financial and non-financial) benefits only. As described in paragraph 3.3.3 an organization also benefits from IT in many indirect, non-financial and often not (easily) quantifiable ways. This contrasts the use of quantified IT benefits in investment proposal evaluation. These quantified IT benefits may include for example: an improvement in turnaround time, a reduction of employee headcount, a reduction of property costs or increased sales from better quality products (see paragraph 3.3.3). A focus of the IT benefits benchmark instrument on quantified IT benefits is troublesome for the following reasons:

- *The benefits of IT are often diluted by many other factors.* See paragraph 3.3.2 for a description of the IT productivity paradox, including the causal ambiguity of IT benefits. In a benchmarking context this dilution is even more troublesome for measurement, since each organization will have varying diluting factors. When for example measuring reduced headcount one organization may focus on cost reduction, for which reducing headcount is an important factor, while another organization may focus on market expansion, for which increased headcount is needed to increase output.

- *Establishing a base of reference is not possible.* What would be the base of reference to measure for example a reduced headcount against? Each participant in a benchmark will have implemented different information systems at different times, expecting varying outcomes based on diverging strategic choices from other organizational and environmental situations. Even if two organizations would decide to implement the same information system at the same time, the outcome may not be comparable. One organization may have chosen to implement the system for different reasons and expecting different outcomes than the other. Moreover, it is questionable that the resulting benefits can be compared over time, as measurement of non-financial benefits often lacks (see paragraph 3.3.2).

- *Benefits that cannot be quantified are excluded from evaluation.* A lot of IT benefits are non-financial or at least not or very difficult to quantify. Some of these benefits include for example: support for the organization's strategy, permit new business models, market expansion or increased agility (see paragraph 3.3.3). Focusing on quantified IT benefits would mean excluding these benefits from evaluation.

4.2.1 Operational Support

Information systems can be seen as a means to support current business or current operations. In this situation the benefit of IT is determined by the level of effectiveness for supporting those operations. A perspective that is often used in this case is the perspective of the process organization: an organization is defined as a set of structured business processes that consists of a number of activities. During each activity in the business process information needs to be retrieved, processed and/or stored. Often information also needs to be shared between activities across business processes.

The "Operational Support" benefit of IT can be evaluated by investigating how well each existing business process (or activity in the process) is served by the information system (or multiple information systems) in use. However, it should be noted that this investigation may become rather complex. Nowadays a lot of information systems are integrated, resulting in Enterprise Resource Planning Systems (ERP Systems), Business Process Management (BPM), Groupware like e-mail messaging, calendar management, document management and the like (see also paragraph 3.2.2). These systems support (parts of) many explicit and implicit business processes throughout the organization. These systems can be regarded as part of the organization's IT Infrastructure, but this Infrastructure also includes the underlying communication networks, servers, workstations and other hardware and software, including IT staff keeping the systems running, secure and up-to-date and providing assistance to users. The effectiveness of this IT Infrastructure, being less direct than information systems supporting specific business processes, should also be taken into account when investigating the Operational Support benefit of IT.

In conclusion the following two dimensions are important for analyzing the operational support of IT in an organization:
▪ Information systems' effective support of business processes.
▪ IT Infrastructure's effectivity in supporting the information systems, but also in providing generic functionality for all business processes.

Since each organization has different organizational goals and a different strategy, the business processes and importance of those processes will be different. This has to be taken into account when measuring and comparing the benefit of IT for supporting operations. However, since the benchmark is aimed at comparing organizations in the same industry, the processes in place and importance of these processes might not be all that different.

4.2.2 Competitive Advantage

Before elaborating on the "Competitive Advantage" benefit of IT a definition of the term "competitive advantage" will be presented in relationship to the term "strategic advantage", since these terms are often used interchangeably lacking a proper definition.

In everyday use the term "strategy" may refer to:
▪ The long-term goals of an organization.
▪ The way in which an organization will create or has created a unique position in its industry.
▪ A business synonym for "important".

Parker et al. (1988) distinguish between "strategic match" and "competitive advantage" in two of their indicators for estimating the value of IT investment proposals (see paragraph 3.6.2). The Strategic Match indicator refers to the long-term strategic goals of the organization and the Competitive Advantage indicator refers to the influence on the competitive forces in the organization's industry.

Porter (1979) and Porter and Miller (1985) refer to strategy as the internal and internal choices senior management makes for creating a unique position in the industry, resulting in a competitive advantage over competitors that leads to higher financial performance. In this research the term "Competitive Advantage" has been used to refer to the advantageous position an organization has obtained for itself in its industry at present day. The term "strategy" has been used to refer to the choices senior management has made for the long-term, or the direction in which the organization is actively going for the long-term, in order to obtain or sustain an advantageous position in its industry. This means that the term "Strategic Advantage" refers to the resulting "Competitive Advantage" an organization hopes to achieve by the organizational choices it has made for the long-term. However, the term "Strategic Advantage" will not be used in this research. Consequently the "Strategic Match" refers to how well a certain organizational aspect (in this case: IT) is aligned with the long-term organizational choices to obtain or sustain an advantageous position in the industry.

The Competitive Advantage benefit of IT refers to an advantageous position in the industry that can be attributed to the use of IT. The position in the industry relates to how the organization has influenced the forces in its industry, as described by the 5-forces model of Porter (1979). This 5-forces model concerns the following industry forces:
- *Customers.* Does an organization have a unique relationship with customers by using IT?
- *Entrants.* Does an organization create new entry-barriers or exploit existing entry-barriers by using IT?
- *Suppliers.* Does an organization use IT to leverage bargaining power with suppliers?
- *Competitors.* Does an organization use IT to reduce rivalry among its competitors?
- *Substitute products.* Is an organization able to create a niche market by differentiating their product by using IT?

This research has not been concerned with how an organization positions itself in an industry and how a strategy is created by addressing the five industry forces and internal strengths and weaknesses. It was therefore assumed that an organization has formed a strategy and knows its position in an industry. Measuring Competitive Advantage as an IT benefit indicates to what extent IT has been essential in creating a position in an industry.

Measuring and comparing Competitive Advantage will be an opportunity for participants of the benchmark to discuss the role of IT in the competitive position.
This discussion may indicate weaknesses or blind spots, provide insight for new opportunities or provide confirmation of choices made in the past.

4.2.3   Strategic Match

Since information systems are often in operation for many years, an organization should not only consider the benefit to current business, but also to future business. The resulting question therefore is: do the information systems benefit the strategy of the organization? Do they support the long term organizational goals, or do they hinder these advancements? It should be noted that the focus of the Strategic Match benefit of IT is on the strategy as it exists today, not as it was when the information system was devised.

Besides an organization's information systems, its IT infrastructure also influences strategic benefit from IT. Aspects like flexibility, scalability and controllability are important for increased use of existing information systems and for support of new information systems.

Again, as mentioned in the previous paragraph, it should be noted that the instrument is not meant for devising or determining an organization's strategy.

Instead the organizational goals and strategy are considered as given and the instrument measures if IT benefits these goals and strategy.

Measuring and comparing Strategic Match will be a means for benchmark participants to discuss how well their IT is able to provide benefit in the future. Since the measurements relate to strategy, a discussion on strategic themes can also emerge.

4.2.4 Keeping Up in the Industry

An often identified application of IT is to keep up with competitors (see paragraph 3.3.3). When, for example, an organization applies IT to increase productivity, improve its products or increase customer satisfaction and loyalty, competitors often copy the application in order to avoid losing market share or revenue. In this case the source of IT benefit is avoiding the negative consequences of not investing. The question is: what happens to the companies' strategic position, revenue stream and cost structure if the IT investment is not made? Investing in IT has become a "must do", simply to keep up in an industry.

For measuring the IT benefit from keeping up in the industry, an approach would be to compare an organization's IT with some set of industry averages and best practices. If a negative deviation is found between what a company has accomplished and what the average or best practice is in an industry, the company does not keep up and additional IT benefit can be obtained by investing more. If a positive deviation is found the organization has found IT benefit in the form of Competitive Advantage (see paragraph 4.2.2).

However, this approach is not used in this study for the following reasons:
- Though useful as a concept an "industry" is often not clearly defined, making it hard to identify and measure averages and best practices.
- The literature reviewed for this research does not provide a clear set of averages or best practices to be used per industry. This means that these should be developed, resulting in an enormous amount of work. Furthermore, the developed averages and best practices should then be maintained as they will probably change over time in an unpredictable way.
- Each organization is different. This also goes for organizations within the same industry. This means that no organization will meet industry averages or best practices, since no organization is the "industry average". Each organization has its internal and environmental characteristics, making it unique and providing good reasons not to follow averages and best practices.

Instead of determining the value of "Keeping Up in the Industry" by using a reference to industrial averages and best practices, this study takes the approach that participants will compare their benchmark results to those of other participants. This comparison will allow participants to conclude if they keep up with generic advancements in the industry, or that they are behind and need to improve benefit in specific areas.

4.3 Selection of methods

For designing the instrument existing methods have been investigated for use (see paragraph 3.6). Using existing methods improves re-use of the knowledge contained in those methods and gives the instrument a level of recognisability and credibility.

To investigate what methods could potentially be used in the benchmark instrument, the methods described in paragraph 3.6 were scored on seven criteria.

These criteria include the preconditions for the instrument as stated by M&I/Partners (see paragraph 4.1.1), the IT benefit typology (see paragraph 4.2) and the IT costs (TCO) categories of the M&I/Partners IT benchmarks (see paragraph 4.1.1). This resulted in the following criteria:

- *Interpretation.* Since the goal of the benchmark is to find explanations for variations in IT costs levels by providing insight into the benefits of IT and since the results should be more than a number, this criterion relates to the insightfulness and the interpretability of the method results.
- *Generic applicability.* Since the benchmark should be applicable across industries, this criterion indicates if the method can be applied in all industries.
- *Effort.* Since the effort to gather data for each participant should be limited to a couple of days, this criterion relates to the effort needed to gather data.
- *Data reliance.* This criterion relates to the fact if a method relies on specifically defined measures to be recorded in administrative systems of an organization.
- *Readiness.* In order to use existing methods properly, documentation on the process of data gathering, processing, analysing and reporting should be clear. This criterion relates to the completeness and readiness of the method to be used in a benchmarking context.
- *IT benefits typology.* This criterion indicates if the method includes evaluation of the Operational Support, Competitive Advantage and Strategic Match benefits of IT. The Keeping Up in the Industry benefit of IT is not included (see paragraph 4.2.4).
- *TCO categories.* This criterion indicates if the benefits of all IT costs categories as measured in the TCO section of the M&I/Partners IT benchmarks are included (see paragraph 3.6.8): IT management, work environment, LAN, WAN, applications and data processing and speech applications.

For each existing method contained in paragraph 3.6 these criteria are scored as "high" (coded as green), "medium" (coded as orange) or "low" (coded as red). "High" means that the method meets that criterion, "medium" means that the method could be adapted to meet the criterion and "low" means that the method is not fit for use, or that a large amount of effort is needed to adapt the method for use in the context of this research.

The result of the investigation is shown in the following figure:

| Method	Interpretation	Generic applicability	Effort	Data reliance	Readyness	IT benefit typology	TCO categories
Method of Bedell	high	high	medium	high	medium	medium	low
Information Economics	high	medium	medium	high	medium	low	low
Return On Management	low	low	low	low	low	low	low
IT Business Value	medium	medium	medium	low	medium	low	low
Quality of Information	high	high	low	high	low	high	medium
Benchmarking Organizational Performance	medium	low	medium	low	low	low	low
BtripleE	high	high	medium	medium	low	high	high

● high ● medium ● low

Figure 4.2: Result of investigation on criteria

See appendix A for the details of how each method has scored on each criterion. The remainder of this paragraph presents the most important notions and conclusions from the investigation, resulting in a selection of methods for use in the benchmark instrument.

At first glance no method suffices to be used in the instrument: they all have at least one "Low" score, meaning that the method is not fit for use or that a too large amount of effort will be needed to adapt the method for use in the benchmark.

However, when considering only the first five criteria (which relate to the stated preconditions by M&I/Partners), the method of Bedell and the Information Economics method seem usable. But these methods do not measure the IT benefit types over all TCO categories sufficiently: they lack measurement of the Strategic Match and Operational Support benefit of IT Infrastructure. The methods do supplement each other as the method of Bedell has a focus on Operational Support and the Information Economics-method has a focus on Competitive Advantage, while they both measure aspects of Strategic Match. They also rely on the same data gathering process: a qualitative approach of communication and consensus building between top managers, which are transcribed into quantitative indicators for measurement and comparison. Concerning the readiness of the methods to be applied in a benchmarking context there is also a commonality: an addition to the method of Bedell would be to devise a common business process categories model and list of information systems per industry for comparability between participants, while the Information Economics-method also needs a common list of information systems for comparability between participants. In conclusion, the method of Bedell and the Information Economics method seem to be usable together, fulfilling the stated criteria and goals and covering a broader scope of the IT benefit typology than they would when used individually. However, as already mentioned, they both lack sufficient measurement of the benefit of the IT Infrastructure.

When considering the other methods regarding the first five criteria, the following conclusions are drawn. The Return On Management method scores low on all criteria. The primary shortfall of this method is the problematic interpretation of the indicators and the fact that the method relies on profit data, rendering it unsuitable for not-for-profit industries (see paragraph 3.6.3). This method is therefore discarded for use in the instrument. The IT Business Value method relies on specifically defined measures to be present in the administrative systems of each participant (see paragraph 3.6.4). Since the method should be applicable for all organizations and industries and since the rest of the criteria only have a medium score, this method is discarded for use in the instrument. The Quality of Information scores high on Interpretation, Generic Applicability and Data Reliance, while also measuring all types of IT benefits. However, for a complete application this method would take far too much effort for each participant. Also, since the results of the method are primarily qualitative, a large amount of effort will be needed to adapt the method for comparing organizations in a systematic way (see paragraph 3.6.5). It should be noted that the Quality of Information method includes an adapted form of the method of Bedell. Since the method of Bedell is candidate for use in the benchmark instrument, the application of this method in the Quality of Information method was investigated. The Benchmarking Organizational Performance method is discarded for use in the instrument, since it relies on profit as the overall dependent bottom-line indicator, rendering it useless in not-for-profit industries. Also, IT is only one of many aspects the method takes into account, so the method lacks proper measurement of the IT benefit types (see paragraph 3.6.6). The BtripleE method is the only method scoring high on Interpretation and Generic Applicability, while also measuring all IT benefit types over all TCO categories. However, BtripleE is a framework that should be implemented for use in a given context: it does not include a clear-cut process to follow and result indicators to calculate. Applying the

framework in its entirety would take far too much effort for each participant, but it could be possible to implement parts of the method.

Concluding from the above the method of Bedell and the Information Economics method can both be adapted for use in the instrument. Since these methods lack proper measurement of the benefit of the IT Infrastructure, part of the BtripleE framework could be added for that use. However, BtripleE measures the benefit of IT Infrastructure (included in the "Effectiveness and Efficiency of IT Supply"), using 20 scorecards. This effort, together with the effort to complete questions of the method of Bedell and Information Economics method, is too much regarding the preconditions for the instrument. For this reason a newly designed and relatively simple method was added to the instrument for measuring the benefit of the IT Infrastructure. This method was based on insights from existing literature. Just as the method of Bedell and the Information Economics method, data gathering will be based on discussion and building of consensus.

The following paragraphs elaborate on the use of the method of Bedell and the Information Economics method in the instrument and the design of a method for measuring the benefit of the IT Infrastructure.

4.4   Transforming the methods into an instrument

This paragraph describes how the selected methods were transformed into an instrument. Appendix B is devoted to the details of how the methods are used in the benchmark instrument. Since this information is confidential, it may be omitted from this version of the document.

4.4.1   Method of Bedell

Introduction

A general description of the method of Bedell is given in paragraph 3.6.1. The method of Bedell is not just useful as a portfolio method for the selection of IT investment proposals. In this regard Van Der Pijl (1993) has used and adapted the method of Bedell in the development of a tool to measure quality of existing information infrastructure from a teleological point of view. This teleological point of view is described as a way to look at information quality from organizational goals linked to primary and secondary activities. The quality of information is defined as the contribution of information systems to organizational goals and lower level process targets. This research also uses this perception and therefore the method of Bedell will be used much in the same way as done by Van Der Pijl (1993).

How the method is used

For benchmarking the benefits of IT using Bedell's method the results of the method should be comparable between organizations. Since Bedell's method is specifically aimed at doing the exercise for a single organization, this limitation should be overcome. A solution was found in the following ways:
- Only the first two questions of Bedell's method are answered by the instrument; quantifying the IS support to functions and activities, without going into detail about company-specific IS and proposals.
- An investigation was made to identify common business process categories or activities for organizations in an industry. As Treacy and Wiersema (1993) suggest each company should have a value proposition that strategically focuses the attention a company pays to its goals and processes.

This would mean that in essence common business process categories or activities can be found in each company in an industry, but that the form, importance and quality depends (amongst others) on the strategy of the organization. The method of Bedell provides an "importance" indicator for the business process categories, so participants can express their organizational characteristics and focus.

▪ Some room was left in the instrument to indicate specific organizational process categories and IS support. During analysis of the benchmark results these can then be grouped and possibly taken as standard in next year's benchmark (evaluation and learning effect).

For each industry a Value Chain Analysis could be performed, based on existing documentation and input from participants for determining common business process categories or activities present in each organization in an industry, on such a level of detail that a link between IS and (sub) processes can be made. This is analogous to the way Van Der Pijl (1993) uses the method of Bedell for analyzing a single organization. Then an analysis can be made for determining common information systems present in each organization in the industry. Such an analysis has already been done for industries participating in the M&I/Partners IT benchmarks.

Details on the questions for data gathering, benchmarking process and result indicators for the method were taken from the work of Bedell (1985), Van Reeken (1992) and Delahaye and Van Reeken (1992). An adaptation to the result indicators was made for comparing organizations.

Results of the method

The resulting figures used in the method of Bedell for gaining insight into the effectiveness and potential of IT and the focus of IT investments per business process category will also be used in the benchmark instrument. To allow comparison between organizations, all participating organizations will be plotted into these figures. The format for calculating and creating the figures will be detailed out during the empirical study, using data gathered from interviewed organizations (see chapter 5).

The method of Bedell provides measurement and comparability between organizations by answering the questions:
▪ How does the strategic importance of IS in relationship with the effectiveness of IS compare between participants?
▪ For what process categories do participants identify improvements for IS and how do these compare between participants?

The following IT benefit types (see paragraph 4.2) are measured by the method:
▪ *Operational Support.* The result of the method of Bedell indicates the effectiveness of IT support for current business activities.
▪ *Strategic Match.* The method indicates for what strategically important activities IT support is inadequate and what new developments in the potential use of IT are important with regard to strategy.
▪ *Keeping Up in the Industry.* Measuring and comparing the effectiveness of IT for business activities and the organization's perception of the potential use of IT will allow participants to analyze how they are doing compared to other participating organizations.

Introduction

A general description of the Information Economics method is given in paragraph 3.6.2. The method is meant for prioritizing IT investment proposals: it is an ex ante evaluation instrument for possible information systems. However, a number of the indicators in the method can also be used for an ex post evaluation of the benefit of information systems that are in operation. These indicators are: Strategic Match, Competitive Advantage, Management Information and Strategic IS Architecture. The indicators for risk estimation are not useful, since these are not applicable for a system already in operation. The Enhanced ROI indicator would be a very useful indicator to measure the financial benefit of an information system. However, obtaining and validating the needed data for each information system would take too much effort as it is very likely that participants will not have this data ready to retrieve from their administrative systems.

How the method is used

Just as with the method of Bedell, the results of the Information Economics method should be comparable between organizations. Since the Information Economics method is aimed at a single organization, an adaptation should be made: the list of common information systems found in organizations in an industry as is needed for the method of Bedell will also be used for the Information Economics method. The instrument will also allow participants to add some IS.

Results of the method

By measuring and comparing the above mentioned indicators, insight is gained by answering the following questions:
- What information systems are currently in operation that directly contribute to obtaining the strategic goals of the organization (Strategic Match indicator)?
- What competitive advantage does the organization get from the information systems in use and what organizations seem to get the most advantage from their systems (Competitive Advantage indicator)?
- What information systems are important for obtaining management information and how does this compare between organizations (Management Information indicator)?
- How well do the currently operational information systems fit in the overall information systems architecture? How complex is the current systems landscape and how well is it ready for future developments? And how does this compare between organizations (Strategic IS Architecture indicator)?

The format for calculating and creating the result indicators were detailed out during the empirical study using data gathered from interviewed organizations (see chapter 5).

The following IT benefit types are measured by the method:
- *Competitive Advantage.* Measuring the competitive advantage that is obtained from information systems lacks in the method of Bedell, so the Information Economics method complements that method.
- *Strategic Match.* The Information Economics method measures the strategic benefit of IT directly by using an indicator for each IS. The measurement of Strategic Match in the method of Bedell does this indirectly and more elaborate through the business process categories. This means that the Strategic Match indicator of the Information Economics method could be used as a simple "check indicator" for the result of Bedell's method. Also, the Strategic IS Architecture indicator of the Information Economics method will indicate if the information system fits in the long-term information blueprint.

- *Operational Support.* The Management Information indicator indicates what information systems contribute to the gathering of management information in general and Key Performance Indicators in particular. This information is important for controlling the operational activities, but also to measure if the strategic direction that is set out is being achieved.
- *Keeping Up in the Industry.* By measuring and comparing the indicators of the Information Economics method participants will gain insight into their relative position in how their IT contributes to gaining a competitive advantage and how well their information systems fit in the architecture blueprint compared to other organizations.

4.4.3   IT Infrastructure method

Introduction

When using only the method of Bedell and the Information Economics method in the benchmark instrument a part of the benefits of IT are under evaluated: the benefit of the IT Infrastructure. For this reason a simple method for evaluating and comparing the IT Infrastructure benefit is designed and added to the instrument.

How the method is designed

The method for evaluating the benefit of the IT Infrastructure is designed by analysing existing literature on the effectiveness, benefit and value of IT Infrastructure and deducting a simple method from that literature (Renkema 2000, Weill and Broadbent 1998, Lucas 1999, Ward and Daniel 2006). The conclusion from literature is that the benefit of IT Infrastructure is obtained in two ways:
- *Support of current operations.* Keeping information systems operational and providing generic functionality.
- *Support of strategy.* Providing flexibility for new information systems and allowing for new ways of working.

The method will focus on the part of IT that is not already evaluated by the other two methods. This means that it will focus on how the infrastructural part performs, apart from the information systems identified for the method of Bedell and the Information Economics method. Regarding the TCO categories of the M&I/Partners IT benchmarks, the IT Infrastructure method will focus on benefit evaluation of: LAN, WAN, data processing capabilities and speech applications.

Results of the method

The result of the IT Infrastructure method is an evaluation and comparison of the importance and the performance of a number of IT Infrastructure components. The gained insight can be used for determining how well an organization has organized its IT infrastructure supporting its information systems and how well it has prepared its IT infrastructure for the strategic necessities to come.

The following IT benefit types are measured by the method:
- *Operational Support.* An important aspect of an IT Infrastructure is to support current business throughout an organization.
- *Strategic Match.* IT Infrastructure investments are long-term and expensive. This means that an existing IT Infrastructure should provide strategic support for future business, both in flexibility for new products, services or processes as for expansion of the business volume.

▪ *Keeping up with competitors.* At present day Information Technology used in organizations becomes more mature and standardized, which means that an organization depends increasingly on its infrastructure and that this infrastructure becomes more complex and sophisticated. By measuring the operational support and strategic match of IT Infrastructure between organizations, participants can find indications how they are doing compared to competitors.

4.4.4   Complementarity and overlap of the selected methods

The IT benefits benchmark instrument consists of three methods, each providing insight into the IT benefits of an organization. This paragraph compares the three methods and analyzes their complementing characteristics and overlap.

The method of Bedell can be seen as the core of the instrument, as it covers most of the sections of the data gathering model, has the most data gathering questions (see Appendix B) and has the most elaborate calculation format and result set (see paragraph 3.6.1 and 4.4.1). In this method the quality of each information system is linked to the organizational importance of their respective business processes, which is combined with the organizational potential for using information technology.

The four quality indicators for each information system can be seen as two "demand side" indicators (effectiveness and user satisfaction) and two "supply side" indicators (efficiency and up-to-date).

The Information Economics method complements and overlaps the method of Bedell in several ways. The Strategic Match indicator can be seen as a summary of the ISO indicators of an IS as it is used for more than one sub-process: an indicator of the strategic importance of the IS. The Competitive Advantage indicator adds to a missing element in the method of Bedell, namely the contribution of IT to the organization's current value proposition. As providing comprehensive and timely management information is an important aspect of IS in order to control everyday operations and to serve as a source for strategy formation, the Management Information indicator emphasizes this aspect. This indicator is indirectly measured in the method of Bedell: as the quality indicator "effectiveness" for information systems that provide management information functionality or support sub-processes that need management information. Depending on the designed business process categories model and list of information systems, it may also be present as a separate management process and/or information system (like for example a Data Warehouse). The Strategic IS Architecture expresses the value of the IS for the IT domain instead of the business domain, and is complementary to the method of Bedell.

As the focus of the method of Bedell and the Information Economics method are primarily on the business benefits of the IS in place (the "demand side"), the IT Infrastructure method focuses on the benefits of the foundation that supports the IS (the "supply side"). The quality of the IT Infrastructure is important for reliability of the IS currently in operation and the flexibility that is needed given the organizational ambitions for the future. The IT Infrastructure also provides generic functionality to the organization like e-mail and telephony, which cannot be exclusively linked to business processes. It should be noted that the distinction between information systems and IT Infrastructure is not always very clear: with most investments in information systems a new part of IT Infrastructure is also introduced, like: a new database platform that can be used for several information systems, a new set of procedures to deal with the new information system, but that can also be used for other systems, or new personnel or skills that can also benefit other parts of the IT organization. For the method of Bedell an indication of the IT Infrastructure benefit can be found in the Efficiency and Up-to-date quality indicators.

This notion becomes apparent when considering the following: if an organization would have many inefficient information systems in place, meaning that these information systems could be replaced with cheaper ones providing the same level of effectivity, it can be concluded that the underlying IT Infrastructure is outdated and in need of renewal. And also: if an organization has many information systems that are not up-to-date, this would mean that the organizational IT Infrastructure lacks structure and procedures to keep the IS under control. For the Information Economics method an indication of the IT Infrastructure benefit can be found in the Strategic IS Architecture indicator: if a lot of information systems lack integration into the architectural IS plan, this would mean a burden and lack of future flexibility in the IT Infrastructure.

In conclusion the three methods overlap in some areas, but mostly complement each other. Ideally the three methods should be integrated into a single method, consisting of one set of data gathering questions and calculation format and presentation of result indicators. This integration was considered out-of-scope for this research, but is discussed in chapter 6.

4.4.5 The benchmarking process

Since M&I/Partners has requested that the IT benefits benchmark instrument to be an addition to the already existing M&I/Partners IT benchmarks (see paragraph 1.2 and 3.6.8), the benchmarking process should preferably fit in or complement the process of those benchmarks. The M&I/Partners IT benchmarks follow the planning and control cycle of the involved participants. For the housing associations this means the following process:
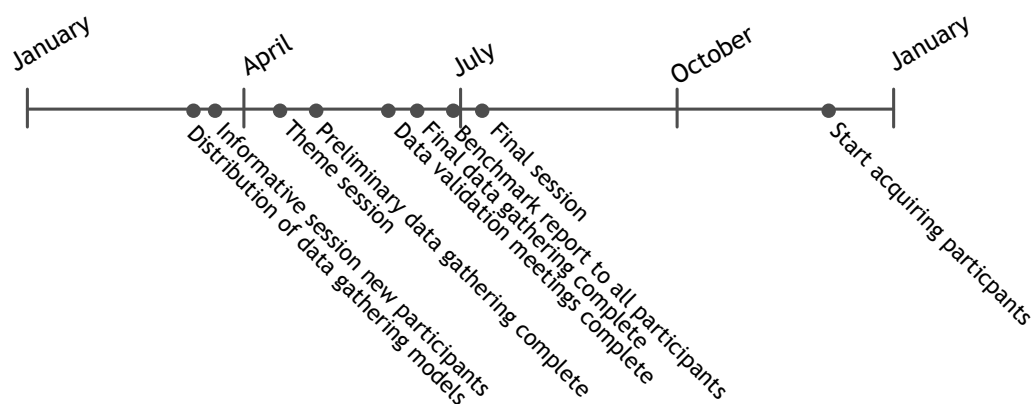
Figure 4.3: M&I/Partners benchmark process for housing associations

The IT benefits benchmark process could very well fit in the existing process:
- *Acquiring participants.* New participants are acquired and participants from the previous year are invited to participate again. This activity is done from December until the end of February of the next year.
- *Distributing the data gathering model.* All participants receive the data gathering model by e-mail, including instructions on how to gather the data and complete the model.
- *Informative session for new participants.* New participants of the benchmark attend a joined session in which they receive verbal instructions for the benchmark model and process.
- *Preliminary data gathering.* Each participant completes the data gathering model according to instructions and returns the model.

- *Data validation meetings.* For each participant an expert of M&I/Partners checks the completed model on completeness and consistency, followed by a one-to-one meeting to answer any questions the participant may have and to discuss the issues found in the completed model.
- *Final data gathering.* Following the validation meeting each participant completes or improves the gathered data.
- *Benchmarking report.* Based on the validated data an anonymized benchmark report is sent to all participants.
- *Final session.* Since the benchmark has a formative nature, a joined session is organized to let participants learn from each other's insights and exchange ideas on the analyzed results. During this session anonymity is temporarily removed.

The feasibility for integrating the IT benefits benchmark process into the M&I/Partners IT benchmark was tested in the empirical study (see Chapter 5), along with the question what effort each participant and M&I/Partners will need to put in the benchmark. The question if the data gathering model and results of the IT benefits benchmark could be integrated into the M&I/Partners IT benchmark was considered out of scope for this study (see paragraph 1.2).

Criteria for employees completing the data gathering model

The data gathered for the M&I/Partners IT benchmark in the housing association industry rest primarily at the IT department: IT costs are incurred by or are under control of the IT department. For the M&I/Partners IT benchmark at municipalities and health care information managers are also involved, since for those organizations information systems' budgets (apart from the IT infrastructure) are often under the control of each department. Furthermore, budgets, expenses, depreciation and the like are in euros, which make them fairly objective. For the IT benefits benchmark these notions do not apply: benefits are typically obtained throughout the entire organization, and the data of the methods used in the benchmark is based on communication and consensus forming between stakeholders. This means that the data gathered for the instrument cannot rely on insights of the IT department or information managers alone: business managers will have to be actively involved in the data gathering activity.

The employees completing the data gathering model are:
- *IT Manager:* has knowledge of all main information systems of the organization, their current performance and how users perceive the system in general. General knowledge is also required for the IT Infrastructure in place, the long-term direction of the company, its strategic goals and the organization's competitive position in the industry.
- *Business Manager:* has in-depth knowledge of the long-term direction and strategic goals of the company, competitive position in the industry in relationship to customers, competitors, suppliers, substitute products and possible new entrants, current performance of business activities and knows how these are supported by Information Systems.

Each manager can consult other managers, users or IT-specialists for information, but should complete the data gathering model by themselves. This is because that the data is mostly of a qualitative nature and depends on the knowledge, experience and judgement of high level managers. The feasibility of these criteria will be tested during the empirical study.

4.4.6 Limitations of the instrument

The goal of the instrument as presented in the previous paragraphs is to provide insight and comparison of the benefits of IT between organizations. However, the constructed instrument has a number of limitations:

- *Measurement of IT benefits, not IT value.* As described in paragraph 3.3.1 this research develops an instrument for the benefits of IT, without looking into the cost side. This means that the "value" question is left open.
- *Role of the consultant.* As the instrument is designed for a consultancy firm, the risk as described in paragraph 3.5.5 emerges: the role of consultants in the benchmark design and process may be too large, resulting in low commitment to the results in the participating organizations.
- *Use of separate methods in the instrument.* The instrument consists of three separate methods for benefit measurement: the method of Bedell, the Information Economics method and the IT Infrastructure method. Ideally these methods are integrated into one method, consisting of a single data gathering model, calculation format and result indicator set.
- *Data gathering based on subjective data.* Although the distinction between "subjective" and "objective" data is not always clear cut, it can be said that the data gathered for the IT benefits benchmark instrument is based much more on the perception and experience of the data gatherers than is the case for the existing M&I/Partners IT benchmarks. This poses a problem since benchmarks are typically understood to give objective, numeric results for comparing between organizations; it is not seen as a comparison of opinions. This subjective approach could result in a low reliability of the results. Some notes on this limitation:
  - *Intersubjectivity.* Since the data is gathered through communication and consensus between stakeholders, this intersubjective approach should improve the reliability of the data. Stakeholders in the participating organization should agree on the data, so they are committed to the results.
  - *Validation by an external expert.* A validation activity of the gathered data by an external expert, as is also done in the current M&I/Partners IT benchmarks, is a good way to improve the quality of the gathered data. .
  - *Focus on learning.* The results of a benchmark can easily be used (or misused) for marketing purposes, an excuse for wage increase or other deviant goals. In order to let participants focus on analyzing and learning from the benchmark results for improving IT value instead of manipulating the input data for a better position in the result report, the focus should be on organizational learning. .
- *Strategy as a given.* The designed instrument takes organizational goals and strategy as a given, or at least as already determined and agreed upon between members of an organization. However, this is often not the case: different organizational parts have divergent or even contradicting perceptions of the organization's goals and strategy (see for example Van Der Pijl 1993).
- *Untested scales.* As the instrument incorporates the strengths of two existing methods, also their weaknesses are incorporated. This goes in particular for the indicator scales of the method of Bedell (see paragraph 3.6.1): these are based on the experience of the author and are not validated in other research.
- *Industry leaders may not participate and radical improvements not found.* The weakness of the M&I/Partners IT benchmarks as mentioned in paragraph 3.6.8 is also a weakness of the IT benefits benchmark: participants are not selected based on best of breed or industry leadership and since all participants are from the same industry radical improvements typically found outside an industry will not be found.

4.5 Aspects for empirical study

The design of the benchmark instrument is presented in the previous paragraphs of this chapter. The next step in the research project was to test the validity of the designed instrument in an empirical study consisting of a number of interviews (see paragraph 2.3). Concluding the design of the IT benefits benchmark instrument, the following aspects have been identified for investigation in the empirical study:

- *Testing adherence to stated criteria and goals.* The empirical study should reveal if the instrument can be used for formative evaluation, if it is usable across industries and if the effort needed from each participant is limited (see paragraph 4.1).
- *Creating a calculation and presentation format for resulting indicators.* The instrument contains two existing methods including calculation and presentation of results for a single organization and one newly created method. By letting interviewees complete parts of the data gathering model a complete set of data can be used for developing a calculation and presentation format for the result indicators, distilling what indicators are most useful for the intended goals of the benchmark.
- *Testing the practicality of used methods.* The empirical study should reveal if the methods, which are adapted or constructed from theory, prove to be useful in a benchmarking practice as intended. Considering the details of each method separately, this means:
    - *Method of Bedell.* Are the four quality indicators per IS practical and how will the resulting ESA be calculated? Should the scale of the indicators be adapted?
    - *Information Economics method.* Is the limited set of indicators recognized by the interviewees and is the description of the scores understood? Are indicators missing?
    - *IT Infrastructure method.* To what extend is an investigation of the IT Infrastructure useful? What components are of interest? Are the scores recognized?
- *Creating a business process categories model and list of information systems.* During the empirical study the assumption that a high-level process model and common list of information system for an industry can be created, will be tested.
- *Testing the use of subjective data for comparing organizations.* The empirical study should reveal if subjectively gathered information is fit for comparing organizations. It should also reveal in what ways objectivity can be improved, both in the questions for data gathering as in the conditions of the benchmarking process.
- *Testing the fit with the M&I/Partners IT benchmarking process.* Since the IT benefits benchmark is meant as an addition to the M&I/Partners IT benchmarks, the empirical study should reveal if the benchmarking processes are complementary. This includes the activities needed for data gathering for each participant.

5 Empirical study

This chapter presents the results of the empirical study of this research. The goal of the empirical study is to test the validity of the IT benefits benchmark instrument as designed in chapter 4.

Paragraph 5.1 introduces the empirical study and includes the goals of the validation test and a description of the study process. Then paragraph 5.2 presents the results of the investigation for creating industry-specific business process categories and information systems models, as needed for the benchmark instrument. Paragraph 5.3 elaborates on the results for the data gathering process, followed by paragraph 5.4 describing if the gathered data for the instrument will be valid and reliable. Paragraph 5.5 contains the benchmark result calculation and presentation format and an investigation of the interpretation of these benchmark results. Finally paragraph 5.6 highlights the results of an investigation for various applications of the IT benefits benchmark instrument.

5.1 Introduction

As described in paragraph 2.3 the setup of the empirical study was to interview both an IT manager and a business manager in a number of organizations from various industries. However, due to the upcoming Summer Holiday period and the busy schedules of the managers in the selected organizations, most interviews took place with just the manager of the IT department. In two cases the manager of the IT department was accompanied by an employee of the IT department, being an information analyst and one responsible for creating IT policy and planning. It should be noted that the IT managers often did have direct accountability to top management and were therefore knowledgeable of business goals and processes.

During the one to two hour interviews with IT managers it soon became clear that gathering a complete set of data for the benchmark instrument was impossible. Even in draft form completing the data gathering questions simply took too much time. A lot of this time was consumed by discussing terminology of the indicators and scores. Therefore during each interview the instrument was discussed in its total form and then interviewees were instructed to complete a predefined part of the data gathering questions. In this way an elaborated investigation of the validity and reliability for data gathering was possible, without requiring all interviewees to complete all data gathering questions.

The interviews with the IT Economics experts took place as planned. The IT Economics experts were asked for their expert opinion on the (external) validity of the instrument. They were not instructed to complete a part of the data gathering questions. However, parts of the data gathering questions were discussed, depending on the expertise of the expert. One of the IT Economics experts, Dick IJpelaar, also assisted in developing the business process categories and IS model for housing associations.

During the initial empirical study period it was not possible to fully test the IT benefits benchmark instrument within a small group of organizations. The time needed for such a field test was available for neither the organizations nor the researcher. This meant that gathering full sets of data and designing a result calculation and presentation format would become problematic. However, since the researcher was employed by M&I/Partners and the company wanted to continue investigation of the benchmark instrument, a field test was conducted after the Summer Holiday period. The results of this field test are included in this chapter and are an integral part of the empirical study.

The rest of this paragraph is structured as follows: paragraph 5.1.1 presents the goals of the empirical study. Then paragraph 5.1.2 describes the research objects and process for both the interviews and field test.

5.1.1 Goals of the empirical study

The goal of the empirical study is to test the validity of the designed IT benefits benchmark instrument. The result of this validity test should answer if the instrument can be used as intended and should indicate improvements for the instrument. This includes testing it for the goals and conditions as stated in paragraph 4.1, but also testing if the data gathered as input for the instrument will be valid and reliable. Another important aspect is the development of a calculation and presentation format for the results of the benchmark. This was, as described in chapter 4, not included in the design of the instrument. Summarizing, the goals of the empirical study are:

1. *Testing the possibility for creating industry-specific business process categories and information systems models.* As described in chapter 4 a generic model of business process categories and list of information systems ("business process and IS model") is needed for each industry the benchmark instrument is applied to. This business process and IS model is needed to use the method of Bedell and Information Economics method in a benchmarking context.
2. *Investigating the form of the data gathering process.* In chapter 4 an assumption was made that both a business and IT manager should be involved in data gathering. This assumption is tested and an investigation is made what organizational departments and employees should be involved in data gathering and how these should be involved. The goal of the resulting data gathering process should be to get valid and reliable data and to get support for the instrument's results.
3. *Testing the validity and reliability of gathered data for the instrument.* For each of the three methods included in the IT benefits benchmark instrument an investigation was made if the questions for data gathering allow for a valid and reliable answer.
4. *Creation of a result calculation and presentation format.* Using data gathered during the field test a calculation and presentation format for the benchmark instrument results was created. This calculation and presentation format defines how the gathered input data can be transformed into a set of result indicators and figures. The calculation and presentation format of the method of Bedell and Information Economics method were used as a starting point.
5. *Testing the interpretation and usefulness of the instrument results.* The result figures from the field test and example figures shown during the interviews revealed how the instrument's results can be interpreted and if they are useful for participant of the benchmark.
6. *Investigating possible applications for the instrument.* The results of a benchmark can be used for many purposes. An investigation was made indicating what possible applications the benchmark instrument may have.

5.1.2 Research objects and process

5.1.2.1 Interviews

To test if the IT benefits benchmark instrument would be useful for more than one industry, organizations from various industries, both not-for-profit and for-profit, were interviewed. Using the customer relationship network from M&I/Partners the following industries were investigated: housing associations, municipalities, financial service providers and international real estate companies. The housing association industry was selected for an in-depth investigation and field test, since this industry has had a lot experience in the M&I/Partners IT benchmark.

Currently 40 housing associations participate in this M&I/Partners IT benchmark and the benchmark has been carried out for six consecutive years. Also, the housing association and municipality participants of the M&I/Partners IT benchmark have stressed the need for an IT benefits instrument, so testing the instrument in those industries was logical. The customer relationship network from M&I/Partners was also used to interview a number of IT Economics experts. The following table shows an overview of the research objects for the interviews:

Table 5.1: Interviewed organizations and IT Economics experts		
Organization name	Interviewees	Size
Housing Associations		
Housing Association A	Finance Manager Information Analyst	Approx. 9,000 rentable units
Housing Association B	Department head I&A	Approx. 10,000 rentable units
Housing Association C	Coordinator I&A	Approx. 8,000 rentable units
Housing Association D	Manager IT department Planning and policy employee	Approx. 31,000 rentable units
Housing Association E	IT manager	Approx. 58,000 rentable units
Housing Association F	Managing director of I&A, facilities, administration and control	Approx. 29,000 rentable units
Municipalities		
Municipality A	Manager IT department	Approx. 141,000 inhabitants
Municipality B	Information manager	Approx. 170,000 inhabitants
For-profit organizations		
Financial Service Provider	Marketing manager private banking	Approx. 9 million private and corporate clients
International Real Estate Company	Managing director IT	Approx. 11,000 houses sold in 2006; approx. € 4 billion assets under management
IT Economics experts		
Expert name	Expertise	Employed at
Dick IJpelaar	Information science and business administration PhD in information strategy development	IJpelaar Consulting
Ton van Reeken	Former professor Business Economics at the Maastricht University Published several articles on the Method of Bedell	Retired in 2000
Rob Poels	Consultant in IT architecture and IT-related management problems PhD in added value of IT	Twynstra Gudde

An overview of the interview structure and questions can be found in Appendix C. All interviews were recorded and a full transcription of each interview was sent to the interviewees for approval of the contents. For confidentiality reasons the interview results have been anonymized, except for the IT Economics expert interviews. These experts have approved the inclusion of their name with the results.

5.1.2.2 Field test

After the interviews were completed, Housing Association A, C and D agreed to participate in the field test. Using the results from the interviews a number of minor improvements and refinements to the data gathering questions were made. The field test consisted of the following activities:

- *Sending data gathering model and instructions.* The Excel file and instructions manual for data gathering was sent to the participants.
- *Completing the data gathering model.* The participants indicated in advance that the time available to gather the data would be limited. They were instructed to at least involve one business manager for reaching consensus on the strategy and business process related questions.
- *Validating the data.* The researcher analysed the completed data model and discussed the model with each participant, including any encountered difficulties in the data gathering process or questions.
- *Transforming the gathered data into a set of result indicators and figures.* The gathered data was used to develop a calculation and presentation format. This was then used to transform the data into a set of results. Each participant received a report of all result figures and indicators in the form of a printed set of PowerPoint slides.
- *Discussing and evaluating the results.* In a joined session with all participants, the researcher and two M&I/Partners employees discussed and evaluated the result figures and indicators included in the benchmark report. A sub set of the benchmark report is presented in appendix E.

It was noticeable that all participants had completed the entire data gathering model in time and well before the data validation took place. No participant needed additional assistance during the completion activity. However, unfortunately not all participants had time available to discuss the strategy and business process related questions with a business manager.

5.2   Business process categories and information systems model

In order to use the method of Bedell and the Information Economics method for comparing organizations in an industry, a generic model of business process categories and list of information systems (from now on: "business process and IS model") is needed. The first goal of the empirical study was to test if the creation of such a business process and IS model would be possible for various industries. Since business processes can be defined in many ways and on many levels of aggregation, important features of the model are: it is recognizable for participants, it covers the scope of activities performed by each organization and it provides a consistent view of the information systems supporting the processes.

This paragraph describes the results of the investigation for creating a business process and IS model. These results are described for each industry in which organizations were interviewed, followed by remarks from the IT Economics experts and a summarizing conclusion.

Housing associations

Since the housing association industry was investigated in-depth, this is the only industry for which a business process and IS model was actually created. For the other industries the possibility for creating such a model was only discussed during the interviews. Using existing documentation and input from Dick IJpelaar, Housing Association A and Housing Association F, a business process categories model was designed. Using Porter's Value Chain as a starting point, the following business process categories model resulted for housing associations (sub processes are omitted):
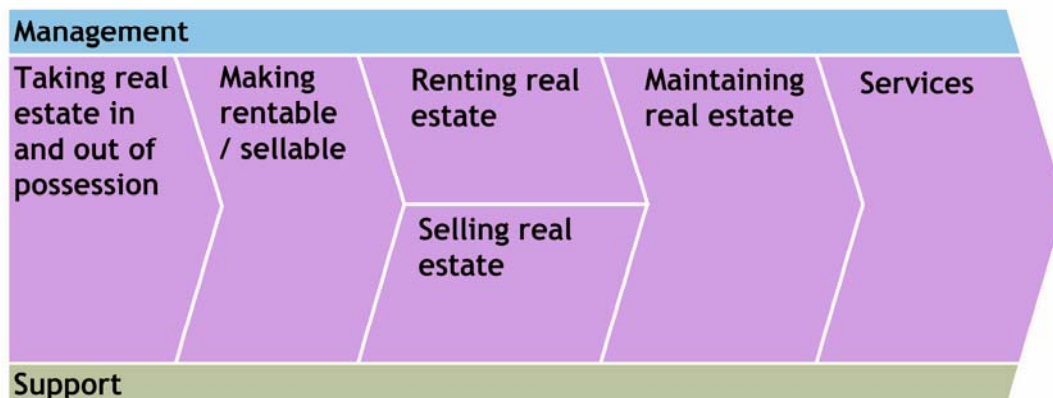
Figure 5.1: Business process categories model for housing associations

See appendix D for the complete process and IS model (may be omitted for confidentiality reasons). It should be noted that this is not a value chain in its purest form, as was intended by Porter for production companies. The processes do not necessarily all follow the input to output arrows in the figure. For example, making real estate sellable may be done after it has been rented for a period of time. Also, for some real estate taken into possession (developed or purchased) it may not be necessary to make them rentable of sellable, because they already are. Furthermore, maintaining real estate and services will take place while real estate is being rented.

After the business process categories model was created, a list of information systems was taken from the M&I/Partners IT benchmarks for housing associations. This list has been used for several years and has proven to be stable in use. The resulting business process and IS model was then tested in the other interviews and field test.

The following table contains some of the remarks that were made by the housing associations during the interviews:

Table 5.2: Interviewees' remarks on the business process and IS model creation					
Association A	Association B	Association C	Association D	Association E	Association F
▪ Grouping of processes can be debated ▪ Terminology is organization specific ▪ Use generic names and add short descriptions from a common source	▪ Small variations in names can lead to entirely different interpretations	▪ Definitions of IS are difficult and leads to discussion	▪ The process categories are valid for all associations ▪ Is each ERP module an IS, or is ERP one large IS? ▪ For IS it all depends on how it is defined	▪ A translation to our own model is no problem, except for a few details ▪ Our process model better connects to the IS ▪ Our process model is constructed in cooperation with a large software supplier and will be made public	▪ 90% coincides with our process manual ▪ Connecting processes to IS will for the most part be possible

In order to assist in the creation of a business process and IS model for other industries, the remarks were analysed for general suggestions on creating such a model:

- Start from existing material, preferably from a common source that many (potential) participants have knowledge of. This improves recognisability and interpretability of terminology. The housing associations' interviewees referred to: KWH (quality centre for housing associations), Aedes (industry organization for housing associations), INK (Dutch institute of quality) and Databalk (software supplier).
- Include a short definition of each process category and information system, so participants can check if they interpret terms as they are supposed to. The definitions can also be used in a validation activity for the gathered data.
- Determine how to include ERP systems or other enterprise (administrative) information systems: as a single information system, or as a set of modules that are regarded as separate information systems.

Using a refined and slightly improved business process and IS model during the field test, none of the three participants had any problems completing the questions regarding the business process categories, information systems, or relating the information systems to the business process categories. Analysis of the field test data revealed however that for some sub process categories different information systems were selected.

It is not clear if these differences can be explained by misinterpretation or if the information systems have varying functionality in each organization. Additional investigation is necessary.

Municipalities

The interviewees of the two municipalities were asked if they saw a possibility for creating a business process and IS model for the municipality industry, given the purpose and conditions for the IT benefits benchmark instrument.

Municipality A indicated that the VNG (Association of Netherlands Municipalities) has created a generic list of organizational processes on the level of the administrative organization. This list could be used as a starting point for identifying business process categories. The list of information systems used in the M&I/Partners IT benchmark for municipalities was said not to cover all information systems, but proved to be acceptable for use. Linking the resulting business process categories to the information systems in a consistent way was believed to be possible, with the remark that some information systems support multiple process categories and some processes will be supported by more than one information system.

Municipality B indicated that a municipality organization is too complex to create a single generic business process category model, since each municipality has over 450 products and services. Also, apart from the legally obligated activities, the activities that are outsourced vary greatly between municipalities. The interviewee suggested creating separate models for each legally obligated activity, amongst others: public affairs, civilian contacts and waste disposal. The list of information systems used in the M&I/Partners IT benchmark for municipalities was regarded as useful, since every municipality has these information systems in some form. The interviewee then suggested using this list of information systems as a starting point, identifying and grouping business process categories from those. This would then naturally lead to a consistent view of the business processes supported by the information systems. The interviewee also suggested using the organizational chart and departmental structure as a starting point for identifying business process categories.

For profit organizations

The interviewees of the organizations in the for-profit industries (financial service providers and international real estate) were also asked if they saw a possibility for creating a business process and IS model, given the purpose and conditions for the IT benefits benchmark instrument.

The Financial Service Provider indicated that creating a business process category model of a typical financial service provider is possible. The organization's process architecture would be a good starting point for that.

The International Real Estate Company indicated that a business process and IS model should be created for each business unit separately. The Real Estate Development unit could then, for example, be benchmarked with a housing association. The interviewee pointed out that creating the list of information systems would be a point of attention, since the scope of information systems can vary greatly between organizations and industries, even when the terminology is the same.

IT Economics experts

Each IT Economics expert was also asked if they saw possibilities for creating a business process and IS model, with regard to their specific expertise and experience.

As mentioned above Dick IJpelaar helped in constructing the initial model of business process categories, using an existing model that was previously created for six housing associations. He indicated that, as housing associations all have the same legal task, most organizational processes and strategic goals will be comparable. The interviewee made the following suggestions for creating a business process and IS model:

- Avoid technical terms: in the business process categories, but also in the names and definitions of information systems, since non-IT personnel should also be able to understand the questions.
- Take into account that some business processes will be outsourced or not present for some housing associations.
- Try to cluster information systems based on their organizational function, e.g. primary and supportive.

Ton van Reeken indicated that regarding the method of Bedell, the number of aggregation levels in the business process categories is free to choose, as long as a consistent view of the information systems is reached. Furthermore, he mentioned that a list of existing information systems is a good starting point for identifying and grouping business processes. This is in line with the suggestion of Municipality B and the process model under construction at Housing Association E.

Rob Poels indicated that the feasibility for creating a business process and IS model depends on the industry. For the housing association industry and municipalities it will probably be possible since the organizations in those industries are largely the same. But for hospitals and financial service providers it will be much more complex. Hospitals increasingly operate in a network structure, outsourcing activities and cooperating with other organizations in many different ways. For financial service providers the products and services vary greatly: cure, banking, private banking, mortgages, insurance and many more. Even when comparing single business units, many differences exist, for example insurance: large insurances or not, care insurance, agreements with all kinds of third parties and many other aspects. Depending on the organization's strategy some products or processes may be outsourced completely. The condition for the instrument that processes between participants are uniform, can in that case not be met. So when comparing differences in the benchmark results, the question that will arise, is: are these real differences, or are they caused by unreliable measurement?

Conclusion

The following conclusions are drawn, based on the results of the investigation for creating a business process and IS model for various industries.

For housing associations a business process and IS model has been created, that adheres to the purpose and conditions for use in the IT benefits benchmark instrument. Interviewees found the model very recognizable and useful, and participants of the field test had no problem applying the model when gathering data. Refinement and improvement of the model is necessary in order to prevent misinterpretation of terminology. Analysis of the interviews also resulted in a number of suggestions to take into account when creating a business process and IS model for an industry.

For municipalities the interviewees made suggestions on how to construct a business process and IS model, although they did not agree if such a model can be created for municipalities in its entirety. At the least it can be made for a number of typical (legally obligated) activities, allowing comparison of those in a benchmarking context.

Regarding internal real estate the creation of a model to benchmark business units is believed to be possible. For financial service providers the result of the investigation is inconclusive: the Financial Service Provider has indicated a starting point for creating a business process category model, but Rob Poels stated that financial service providers and even single business units are too diverse for comparison as is done in the IT benefits benchmark instrument. Additional investigation is therefore necessary.

5.3 Instrument data gathering process

This paragraph explores the results for the second goal of the empirical study. These results regard the investigation of the data gathering process: which departments and employees to involve (paragraph 5.3.1), how to involve them (paragraph 5.3.2) and the estimated effort needed to gather the data (paragraph 5.3.3).

5.3.1 Who to involve in the benchmark process

During the interviews each interviewee was asked which organizational departments or employee roles or functions should be involved in the benchmarking process. This paragraph presents their remarks: for each industry in which organizations were interviewed, followed by remarks from the IT Economics experts and a summarizing conclusion.

Housing Associations

The following table contains some of the remarks that were made by the housing associations during the interviews:

Table 5.3: Interviewees' remarks on the involvement of departments and employees					
Association A	Association B	Association C	Association D	Association E	Association F
▪ Involve top management and employees in day-to-day operations.	▪ Involve various roles as a validation mechanism. ▪ IS quality should be scored by users.	▪ Involve users of the IS.	▪ The support of the results depends on involvement of the entire organization. ▪ Invite people from the entire organization for which you just know they are knowledgeable on the subject. ▪ Different parts of the instrument require different employees to reach consensus: strategic, users, IT people.	▪ Involve a process manager, a board member and also a general manager, except that we have 5 of those.	▪ Three groups: IT department, users of the IS and managers. ▪ Pragmatically involve a representative group from: 11 line managers, 3 branch managers and 400 users. ▪ Result: 6 IT people, 4 managers and 30 users.

Municipalities

Municipality B indicated that each department head and the managing directors should be involved in data gathering. But first, in order to create the willingness to participate in the data gathering process and to get support for the benchmark results, top management should be convinced of the organizational need to participate in the benchmark.
In this way employees will be able to free time and will also support the benchmark. The interviewee indicated that his organization has nine departments and over 500 users. When involving all department heads and a representative group of the users, he estimated that in total approximately 20 to 25 employees would be involved in the benchmarking process.

For-profit organizations

The International Real Estate Company stressed that for each organization participating in the benchmark the questions should be completed by employees having the same function. If that would not be the case, the benchmark results would not be comparable.

IT Economics experts

Regarding the method of Bedell, Ton van Reeken stressed the importance for a group of employees discussing and reaching consensus on the answers. The answers should not, as was done by Bedell, be completed by an "all knowing" consultant. This will diminish the validity and reliability of the gathered data and also the organizational support for the benchmark results.

Conclusion

The following conclusions are drawn, based on the results of the investigation which departments or employees to involve in the benchmarking process.

Each interviewee has stressed the need to involve multiple organizational roles into the benchmarking process. Especially regarding the data gathering activity, it was believed that both the IT department, users of the information systems and line or top business management should be involved. This involvement contrasts the current M&I/Partners IT benchmarks, for which the IT department is capable of gathering the data, sometimes with some assistance of information managers and the financial department. The cause of this difference is, as put forward by the interviewees that the benefits of IT are achieved by the employees and departments using the information systems and that managers should be involved in determining the organizational importance of that use of IT.

The results of the investigation do not conclude on how many employees in what roles or functions should exactly be selected. This selection may vary, since each organization is structured differently and the level of expertise and knowledge regarding the benchmark topics does not necessarily follow the hierarchy in the organizational charts. This organization dependent selection of employees was also indicated by Housing Association D and F.

5.3.2   How to complete data gathering

When a selection of employees has been made to involve in the benchmarking process, the next question is: how should the process for data gathering be carried out? This paragraph highlights the results of the investigation regarding this question.

Housing associations

Housing Association A indicated that not every employee would be able to complete all of the questions. Some of the questions are too detailed to be answered by top management, while users of the information systems would not be knowledgeable of the organization's strategy. The interviewees therefore suggested dividing the data gathering model into a part answered by top management, a part answered by users and a part answered by the IT department.

Housing Association B also indicated to let each group of employees complete the questions relevant for their knowledge and expertise. The interviewee suggested to also involve an outside expert who would be able to validate the given answers by asking additional questions in a number of interviews. Another suggestion regarding the validity was to let participants include a brief explanation or argumentation for each answer given.

Housing Association C stated that, regarding the method of Bedell, the users of the information systems should indicate what information systems support which business processes. This will provide more valid and reliable answers than if the IT department would complete these questions.

Housing Association D indicated that business managers should be involved for answering the question's related to the organization's strategy. The interviewees also stressed the importance of discussing and reaching consensus on the gathered data among the group of selected users. In order to guarantee the quality of the gathered data for each participant and during consecutive benchmark rounds, the interviewees suggested adding (written) instructions for the data gathering process.

During the evaluation of the field test, the participants (Housing Association A, C and D) indicated that the benchmarking instrument should include a number of simple rules on how the data has to be gathered. This will guarantee a level of quality and objectivity of the given answers, leading to an increased confidence of the benchmark results and organizational support of those results. The housing associations suggested M&I/Partners to offer various options for support in the data gathering process, since each housing association has a different organizational structure and will therefore gather data in a different way. These options could include: organizing a workshop with managing directors, acting as a moderator during workshops organized by the participants, or acting as an independent "auditor" for validating the given answers in a number of interviews.

Municipalities

Municipality A suggested letting the selection of employees complete the questions individually. Then, in a joined session, the differences could be discusses, leading to consensus on the final answers.

Municipality B made a similar suggestion regarding individual completion and a joined session for discussion and refinement. The interviewee also indicated that part of the data gathering could be incorporated into existing regular meetings of information managers, making the involvement of those employees easier.

IT Economics experts

Rob Poels told of his use of a Group Decision Support System (GDSS) for his PhD research. Business and IT employees would complete the questions for his instrument individually, while the researcher walked around answering questions about the instrument when needed. Then the answers were automatically gathered and presented, allowing for a discussion of the major variations. An important aspect of the discussion was to determine if the variation in answers came from variation in interpretation or from disagreement on the matters. The interviewee stated that sending out a questionnaire instead of using the GDSS would lead to a lower reliability and validity of the answers. By sending out a questionnaire the researcher has no control over who completed the questions and how they were completed. As most employees and especially managers have busy schedules, they may ask another employee to complete the questions for them, or they may not accurately read instructions and descriptions, leading to misinterpretations.

Conclusion

The following conclusions are drawn, based on the results of the investigation of how the data for the benchmark should be gathered.

The answers for the data gathering questions may be prepared individually, but they should be discussed in a joined session or workshop with the selected employees. This discussion will then lead to consensus on the final answers. A good way of supporting a joined session or workshop is the use of a GDSS.

Since the organizational structure of each benchmark participant is different, the exact process for data gathering will have to be determined for each organization individually. By adding a set of verifiable rules or instructions to the instrument, a level of quality of the gathered data can be guaranteed.

External consultants can assist in the data gathering process, for example by organizing workshops or by validating the data. This data validation could be done by checking if the rules or instructions for data gathering have been followed and by verifying that each answer can be motivated and is interpreted correctly.

5.3.3 Effort needed for data gathering

After the interviewees were asked who to involve in data gathering and what process to follow, they were asked to estimate what effort would be needed for data gathering.

Housing Associations

Housing Association B indicated that it would take the IT department about half a day to prepare the relevant answers. Then additional time would be needed for the other employees.

Housing Association F made a calculation for the needed effort, when a questionnaire would be sent out, containing relevant questions based on each employee's expertise. The interviewee stated that it would take each user about 30 minutes to complete the questions, each manager about an hour and each employee of the IT department about two hours. This would mean an investment of about 30 hours for the entire organization. However, it should be noted that a conclusion in the previous paragraph is that gathering data based solely on sending out questionnaires is not the best way to guarantee the quality of that data.

During the evaluation of the field test the participants indicated that the time effort needed from managing directors should be limited to two hours at the most, in order to get their cooperation and participation. This is because those employees always have very busy schedules.

Municipalities

Municipality B stressed the need to inform participants of the IT benefits benchmark who also participate in the M&I/Partners IT benchmark of the extra time needed for data gathering, since other departments than the IT department will have to be involved in the data gathering process.

Conclusion

The following conclusions are drawn, based on the investigation of how much effort is needed for the data gathering process.
Since the process for data gathering will vary for each participant, as concluded in the previous paragraph, so will the effort needed for data gathering. The time needed for each employee also depends on their role: it will be different for a user, manager of employee of the IT department. The time needed from managers should be limited to two hours at the most, to ensure their participation.

The results of the interviews do not allow for exact numbers on time effort needed, for neither the participating organization, nor the consulting company initiating the benchmark and supporting the benchmarking process. As mentioned in paragraph 5.1.2.2 the field test did not include a full data gathering process. Additional investigation is needed.

5.4 Validity and reliability of gathered data

This paragraph describes the results for the third goal of the empirical study: investigating if the data gathered for the instrument will be valid and reliable. Each interviewee was asked if the questions in the data gathering model could be answered for their organization. If time would allow, some of the interviewees completed a part of the data gathering model during the interview. During the field test all of the participants completed the entire data gathering model.

These following paragraphs contain the results for the method of Bedell (paragraph 5.4.1), the Information Economics method (paragraph 5.4.2) and the IT Infrastructure method (paragraph 5.4.3).

5.4.1 The method of Bedell

This paragraph elaborates on the results of the investigation for valid and reliable data gathering for the method of Bedell. Each sub paragraph presents the results of a different section of the method, organized by the organization's industries, followed by the remarks of the IT Economics experts. The final sub paragraph concludes the investigation.

5.4.1.1 Scoring the organizational importance of business processes

Housing Associations

Housing Association C and D had difficulty distinguishing between the strategic and operational importance of their business processes. Since the method integrates these concepts into one indicator, a lot of discussion emerged on what processes are most important for the organization.

Housing Association D suggested using the 5-year business plan, which virtually every housing association has, as a starting point for scoring. This suggestion also makes the use of the term "long-term" in the score descriptions more concrete and objective, as it will relate to 5 years into the future. Housing Association A also made this suggestion.

Housing Association F had difficulty distinguishing between the importance of a sub process for the higher level business process and the importance of a business process for the organization. This confusion had much to do with the terminology used in the scores: both have the term "strategic", which is automatically related to the strategic importance for the organization.

Since the organizational activities among benchmarking participants may vary, the instrument allowed participants to indicate which business process categories they had and which not. An organization may choose to purchase products or services from the market, or to outsource a certain process. The interviewees indicated that for some processes it is difficult to distinguish if it is performed inside the organization or not. Housing Association C, D and F indicated that different forms of outsourcing exist: a process may be outsourced completely, leaving only a rudimentary part in the organization, or only outsourced in part. Also, a process may be part of the internal organization, but the information systems used may be purchased as a service from another organization.

A process may also be (partly) outsourced, while the organization is still accountable for the results. The organization then wants to remain in control and considers the process a part of its core activities. Housing Association F suggested a pragmatic approach to this problem: each organization should decide for itself what processes and information systems are considered as part of the organization. Measurement of these should then be included in the benchmark. Ton van Reeken also suggested this approach.

Municipalities

Municipality suggested adapting the terminology of the indicators and scores to the industry the benchmark is carried out for. For example, the term "strategic" may be replaced by "political interest" or "political priority", better relating to terminology used for municipalities.

For-profit organizations

The Financial Service Provider wondered if a supporting process could ever have strategic importance and suggested using different scores for primary, supportive and management processes. The International Real Estate Company had difficulty distinguishing between the scores "capacity enhancing" and "planning and control".

IT Economics experts

Dick IJpelaar suggested a simplification for the indicators and scores, so each would be directly recognizable by participants. This would lower the complexity and avoid possible misinterpretation. He indicated that a simplification could be accomplished by having an indicator "strategic goals" for each business process category, with a score ranging from "very important" to "not important".

Ton van Reeken indicated that the scores as defined by Bedell have a bias towards overstating the importance of primary processes and understating the importance of management and supportive processes. This bias stems from the time the method of Bedell was created, when financial departments had the largest IT budgets. He added that this bias could be overcome by allowing the indicators to be completed in a group process, reflecting the shared opinion of the group. This as opposed to the completion by a single "expert" or manager, as was suggested by Bedell.

5.4.1.2 Selecting the IS supporting process categories

Housing Associations and municipalities

Housing Association B and D indicated that the primary information system (ERP or enterprise information system) supports multiple business processes, as it is an integrated information system consisting of many functional modules. Depending on the organization, a lot of the information systems from the IS list may therefore be a part of the enterprise information system.
The problem is then: should each functional module be scored separately, since other participants may have separate information systems for this functionality, or should the enterprise information system be scored in its entirety, since it is a single information system?

Housing Association C and D indicated that some information systems integrate data or functionality from other information systems. Municipality B made a similar remark. A lot of municipalities are implementing so-called "mid office" information systems, which integrate data and functionality from "back office" systems.

These data and functionality are then offered to the users by "front office" information systems. The issue that arises is: information systems are increasingly integrated and layered on top of each other, making it difficult to isolate which information systems support which business processes.

For-profit organizations

The International Real Estate Company also indicated the problem with regard to scoring the enterprise information system: the organization has one information system in operation, supporting the entire organization.

IT Economics experts

Regarding the problem that information systems may support multiple business processes, Dick IJpelaar indicated that for housing associations it will be sufficient to let participants select a single information system that provides the primary support for each business process category. This will also help in keeping the instrument practical and sufficiently simple for use. He also suggested another simplification of the instrument: selecting one or more sub process categories per information system, instead of forcing participants to choose an information system for each sub process. This allows scoring the quality indicators for each information system, instead of for each sub process.

Ton van Reeken indicated that an important shortcoming of the method of Bedell is the precondition that each department has separate business processes and information systems. This precondition stems from the time the instrument was created. Nowadays information systems from different departments are integrated, in effect becoming part of the organization's IT infrastructure. An information system like SAP is therefore difficult to include in the instrument. For this reason Ton van Reeken believes the method cannot be used anymore in its original form and has abandoned use of the method altogether. However, the core notion of the method, in that the most important business processes should be supported by the best information systems, still holds. But the way this notion has taken shape in the method is not useful anymore for contemporary organizations. The method may be found useful for some organizations or industries, but it will become increasingly difficult to use the method in its original form.

5.4.1.3 Scoring the quality of IS

This paragraph presents general remarks on the scoring of the quality indicators, followed by the remarks made for each quality indicator: effectiveness, efficiency, up-to-date and user satisfaction.

A general suggestion regarding scoring of the quality indicators was made by Housing Association D: let participants include the internally used name for each information system in the generic list. Instead of seeing only the generic name as given when the business process and IS model was created, participants will see the name of the information system for their organization, improving recognisability and therefore reducing mistakes.

Housing Association D also indicated a fundamental problem when users would be scoring the quality indicators for each IS in the years to come. The interviewees indicated that the organization is currently implementing a so-called "process portal system", to be used by each employee for their day-to-day activities. This means that in the nearby future users will only be familiar with that information system, which will in effect be a "skin" covering the other information systems. The problem with scoring the quality indicators for this situation is related to the continuing integration and layering of information systems, as was described in the previous paragraph (5.4.1.2).

Effectiveness

Regarding the effectiveness of an information system, Housing Association B indicated that the scores given by the users will depend on their level of education and therefore be subjective in comparison to other associations. Housing Association C made a similar remark on the subjective nature of the users' scores: users often have a lot to complain about an information system, but when an investigation is made for implementing a new information system, the old system suddenly is found not all that ineffective.

Dick IJpelaar suggested to use a percentage score for the effectiveness indicator, instead of the "Yes" or "No" score. This will force the participant to consider the effectiveness and efficiency of the information system's support for the business process.

Efficiency

Housing Association B misinterpreted the "efficient" indicator as: the information system provides the means for an efficient business process. It was not clear to the interviewee that this indicator relates to the supply-side quality of the information system.

For Housing Association E it was not clear if efficiency is also related to the effort of employees to keep the system in operation, or only the cost of the software itself.

Up-to-date

Housing Association B indicated that the interpretation for the "up-to-date" indicator is very subjective and suggested adding additional indicators to make it more objective.

Housing Association C and E did not intuitively relate the term "up-to-date" to the terms "reliable", "maintainable" and "extendable" as given in the description of the indicator. Housing Association E suggested changing the name of the indicator to "in control" or a similar term, since the name is now interpreted as: is the software updated with the latest patches.

User satisfaction

For the "user satisfaction" indicator Housing Association B and C made similar remarks regarding the subjective nature of the answers as for the "effectiveness" indicator.

Municipality A indicated that the term "user satisfaction" is intuitively only related to the first part of its description: if the information system can be intuitively used by the users. The term is not intuitively related to the second part: if users understand are able to use all of the information system's capabilities.

5.4.1.4 Scoring the potential importance of information

Housing Association C and E indicated that use of the term "strategic" in combination with "IT" is not appropriate for housing associations: the belief is that IT can by definition not be strategic, but only supporting the demands of the business. Instead, Housing Association E suggested changing the terminology of the scores to "high", "medium" or "low", indicating how important IT will be in achieving strategic goals.

Housing Association B and D confused this indicator with the indicator for scoring the organizational importance of business processes: the difference between the potential importance of IT for each business process and the importance of each business process for the organization required a lot of explanation.

It was suggested to change the name of the indicator to something like "IT trends and developments" to emphasize the inside-out focus of this indicator.

Municipality B confirmed the increased importance of IT for some of the organization's main activities, but suggested distinguishing between the inside and outside focus a contribution of IT may have.

Ton van Reeken explained the differentiating characteristics for each score of this indicator: the potential importance of IT is "operational" if it will just support the business process, the potential importance if IT is "tactical" if it makes the business process possible and the potential importance of IT is "strategic" if a competitive advantage may be achieved by using IT.

5.4.1.5 Conclusion

The following conclusions are drawn, based on the investigation for valid and reliable data gathering for the method of Bedell.

The interviewees and the participants in the field test are able to gather the needed data and complete the data gathering model. However, a lot of explanation is needed for each indicator, the scores and the relationship between the indicators: the method is regarded complex in practice. The terminology and descriptions of the indicators will need refinement to reduce room for interpretation and make the given answers more precise and objective. The interviewees provided a lot of suggestions for this refinement.

When applied for contemporary organizations and use of IT the method contains a fundamental weakness however, which cannot be easily overcome. This weakness has its origin in the way information systems are nowadays integrated and are layered more and more on top of each other. This as opposed to the situation at the time the method was created, when each department had its own processes and information systems. As Ton van Reeken indicated, the method may still prove to be useful for some organizations and industries at the moment, but will be increasingly difficult to apply in the future. Ton van Reeken also indicated that the core notion of the method, referred to by Van Der Pijl (1993) as the teleological point of view for quality (see paragraph 3.6.5), is still valid, but that method needs to be redesigned for the contemporary use of IT in organizations.

5.4.2 The Information Economics method

This paragraph explores the results of the investigation for valid and reliable data gathering for the method Information Economics method. Each sub paragraph contains the results of a different indicator of the method, organized by the organization's industries, followed by the remarks of the IT Economics experts. The final sub paragraph concludes the investigation.

5.4.2.1 Strategic Match

Housing Association A and C had difficulty interpreting the term "strategic" and were therefore not confident of the scores given for this indicator. The interviewees also had difficulty in determining if the scores should be given for the information systems as they are currently in use, or as they could ideally be used when the information system would be improved as they saw possible.

Housing Association C stressed that the scores given will depend greatly on the distribution model of choice for a particular housing association.

Municipality A responded that the organizational strategic themes are very difficult to relate to individual information systems: the score will depends greatly on how these themes are interpreted. A suggestion was made to add check questions to make the scores more objective.

Dick IJpelaar made a similar remark in that the strategic match indicator is not useful for an information system, but is related to the business process that is supported by the information system. He did add that an estimation of an information system's strategic importance can be obtained by investigating what business processes are supported by the system.

5.4.2.2 Competitive Advantage

Housing Association A and E put forward that the term "competitive" is not applicable for housing associations. The interviewees believed that these organizations to not have any competition. The indicator is therefore not useful. A suggestion was made to change the terminology, since it would be useful to indicate if an organization has implemented a unique information system that would be interesting for other organizations to learn about. Therefore in other interviews the term was changed to "unique proposition", relating to the fact if the organization uses the information system to create a unique position in relation to its customers, suppliers or other outside stakeholders.

Just as with the Strategic Match indicator, Housing Association C indicated that the scores given will depend greatly on the distribution model of choice for a particular housing association.

Municipality A remarked that the scores are open for interpretation and will be very subjective. They will depend on how participants will estimate their own unique characteristics compared to other organizations that they know of. The indicator is therefore very difficult to quantify.

Just as with the Strategic Match indicator, Dick IJpelaar objected to the use of Unique Proposition relating to information systems, since it will again be the business process that is supported by the information system that will provide the unique position, not the information system itself.

5.4.2.3 Management Information

Housing Association C indicated a difficulty when scoring the Management Information indicator for each information system individually, since typically a number of information systems are closely related and integrated to deliver management information. Dick IJpelaar made a similar remark, but added that an indication of management information in general is useful to have.

The Financial Service Provider indicated that the Strategic Match, Competitive Advantage and Strategic IS Architecture indicators are applicable for all information systems, whereas the Management Information indicator is not. This makes the use of that indicator questionable.

5.4.2.4 Strategic IS Architecture

Housing Association A indicated that scores for this indicator could not be given, since the organization did not have an information plan or blueprint.

Housing Association B, E and F had difficulty interpreting the description of the scores. Association A questioned if a low score meant that the information system would soon be replaced by a new system. Association E stated that the scores should be interpreted as: is the information system "stand alone", can it be integrated with other systems, or is it already integrated. The interviewee stated that having a lot of "stand alone" systems poses a threat, but added that on the other hand an organization may have the strategy of using loosely coupled modules as information systems. This will result in low scores for this indicator, but will not mean lower benefit in the same regard. Association F interpreted the indicator as: is the information system a prohibitor of change, or does it offer possibilities for change?

Housing Association C again indicated that the scores given by each organization will depend on the distribution model chosen.

5.4.2.5 General remarks and conclusion

The interviewees made a number of general remarks on the use and interpretation of the Information Economics method. Housing Association A, E and the International Real Estate Company indicated that the scores for each indicator are difficult to understand and differences in scale are often minimal and are open for interpretation. Especially terms like "in part" and "indirect" are open for debate and will be interpreted differently by participants. Rob Poels indicated that the usability depends very much on if the participating organizations will be comparable. The Financial Service Provider suggested distinguishing between client, internal and transactional systems and use appropriate scores for each of these categories.

Housing Association F made a practical suggestion to group the information systems by relating them to the business processes. That would improve recognisability by participants when completing the model.

Based on the interviewees' responses, the following conclusions are drawn for the valid and reliable data gathering for the Information Economics method.

The Strategic Match indicator, but also the other indicators, is found to be difficult to interpret. Given this difficulty the given answers will vary depending on the interpretation used by each participant. The Competitive Advantage indicator, or at least the terminology used in that indicator, is less applicable for not-for-profit organizations. The terminology should therefore be changed, or even other indicators should be introduced.

An indication was found that the results for the Strategic Match, Competitive Advantage and Strategic IS Architecture may only be comparable for housing associations having the same distribution model for rentable units. This distribution model determines what information systems in the business process and IS model may provide benefit in a strategic match, unique proposition or information systems architecture.

The Management Information indicator was not found applicable for all information systems in the business process and IS model. Grouping information systems of the same type may be helpful. For the Strategic IS Architecture an indication was found that the results may only be comparable for associations having the same strategic choice for IT, e.g. a strategy for stand alone systems, loosely coupled systems or highly integrated information systems.

This paragraph presents the results of the investigation for valid and reliable data gathering for the IT Infrastructure method. As described in chapter 4, this also includes if the method provides a useful addition to the previous two methods and what IT infrastructure components would be interesting to include in measurement. Paragraph 5.4.3.1 describes the results for the investigation of the "type" indicator, paragraph 5.4.3.2 contains the results for the IT infrastructure components, paragraph 5.4.3.3 is devoted to the results for the used indicators and scores for each IT infrastructure component and finally paragraph 5.4.3.4 concludes the investigation.

5.4.3.1 Type

Housing Association A suggested adding a score distinguishing between a standard software package and a module of the primary information system. Housing Association C and E indicated that this distinction is sometimes difficult to make, since a module or application from a certain vendor may be part of the primary information system for one organization and may be only a standard software package for the other. A suggestion was made to include examples to help participants in completing the questions. Municipality A also had difficult in distinguishing between standard software packages and parts of the primary information system.

Housing Association C indicated that the term "ERP" is not considered identical to the term "primary information system": what an organization considers its primary information system, may not be an ERP-system.

5.4.3.2 IT Infrastructure components

The interviewees responded that adding questions for IT Infrastructure in addition to the other two methods would be useful for getting a complete overview of the information systems in use. They were not very specific on what questions or components should be included for that overview. Elements like security, network, communication, data storage and data processing were found to be useful (Housing Association F). Municipality B stressed that a limited set of components will be sufficient to get a viable image of the organization. The number of elements should not become too large, as this would diminish accuracy from participants when completing the data gathering model.

Since the interviewees did not provide very specific remarks on what components to include in the instrument, for the field test a pragmatic choice was made to use and adapt the list of components identified by Truijens et al (1990): data, generic applications, configurations, communication and organization.

5.4.3.3 Indicators and scores

The interviewees found the distinction between "importance" and "performance" indicators useful. However, Housing Association E commented on the use of a performance indicator only relating to the current situation. The performance of a component as it is today will not indicate the need for performance in the future.
A suggestion was made to relate performance to being "in control", meaning: is the component maintainable, extendable and scalable? Another suggestion was to add an additional indicator, so each component would be scored on importance today, performance today, importance in the future and in-control for the future.

Municipality A questioned how the performance indicator could be objectively validated. A suggestion was to add additional questions to could be validated by an outside observer, or to let participants add a brief argumentation for each score. Also, since all of the IT infrastructure components will be regarded as important, a suggestion was made to let the participants order the components according to their relative importance instead of scoring each component individually.

5.4.3.4 Conclusion

Based on the investigation for valid and reliable data gathering, the following conclusions are drawn for the IT infrastructure method.

Most of the interviewees found an addition for measuring the IT infrastructure of an organization useful, but stressed that the effort for data gathering should be limited. This since the other two methods already require quite some effort. The effort for data gathering can be limited by using only a limited number of IT infrastructure components for gathering data.

Regarding the used indicators and scores, the "type" indicator needs refinement for more reliable results. For the IT infrastructure components the indicators differentiating between current and future importance and performance seems useful, but needs refinement or additional questions for more reliable data gathering.

5.5 Instrument results

This paragraph presents the results for the fourth and fifth goal of the empirical study: the creation of a result calculation and presentation format and an investigation of the interpretation and usefulness of the instrument results. Sub paragraph 5.5.1 describes the result calculation and presentation format, as created during the field test. Sub paragraph 5.5.2 explores the results of investigating the usefulness of the instrument results, as was done during the interviews and field test.

5.5.1 Result calculation and presentation format

As mentioned in chapter 4, the creation of a calculation and presentation format was left to the empirical study. It was assumed that creating such a calculation and presentation format would be easier when gathered data was available for calculation and analysis. However, as mentioned in paragraph 5.1, gathering complete sets of data proved not to be possible during the interviews. Since the interviewer was employed at M&I/Partners and this company wanted to continue investigating the use of the IT benefit benchmark instrument, it was possible to conduct a field test with three of the housing associations that also participated in the interviews. The data gathering model used for the field test was refined and improved on several details as a result from the responses during the interviews.

Appendix E is devoted to the calculation and presentation format that was created for the results of the field test (this appendix may be omitted for confidentiality reasons). This calculation and presentation format shows how the gathered input data can be transformed into a set of result indicators and figures. The existing calculation and presentation format of the method of Bedell and Information Economics method were used as a starting point.

5.5.2 Result interpretation

This paragraph presents the results of the investigation for interpretation and usefulness of the benchmark results. During the interviews this investigation was based on several example result figures, while during the field test the investigation was based on the created presentation format as described in the previous paragraph. The investigation for interpretation and usefulness revealed how participants of the benchmark would interpret the results and if they would find the results useful.

Sub paragraph 5.5.2.1 describes the results for the method of Bedell, sub paragraph 5.5.2.2 elaborates on the results for the Information Economics method and sub paragraph 5.5.2.3 addresses the results for the IT Infrastructure method.

5.5.2.1 Method of Bedell

Both the interviews and the field test revealed that the results of the method of Bedell are complex and are found difficult to interpret. Just as the indicators and scores during data gathering, the result figures and calculations that led to these results need a lot of explanation. As opposed to result indicators in euros for the M&I/Partners IT benchmarks, indicators like EIA and IIO are not self-explanatory, and are often obtained through several calculations using indicators the interviewee and participants are also not familiar with.

During evaluation of the field test the participants stressed the need for including a brief explanation for each result figure. This explanation should answer one or more of the following questions:
- What general conclusion can be drawn for all participants?
- What conclusion can a participant draw when comparing his indicators with those of other participants?
- What conclusions can a participant draw when looking into his indicators in more detail?

The method of Bedell also includes a number of conclusions that can be drawn from the result figures (see paragraph 3.6.1). The participants of the field test found these conclusions not very clear and intuitive. This remark was also put forward during the interview with Housing Association B.

Municipality A suggested that since the indicators and calculations are very complex, the intermediate results and indicators should also be included. In that way participants can understand how their completed data model resulted in the final indicators. This could avoid an elaborate discussion on that subject during a joined session.

The International Real Estate Company suggested that instead of comparing various organizations, the method could also be used for comparing business units of a large enterprise. By comparing the effectiveness of information systems and importance of IT for each business unit, a conclusion can be drawn on how to manage organization wide infrastructure: a focus on standardization or flexibility.

During the interviews Housing Association C and F suggested to integrate the TCO measurement of the M&I/Partners IT benchmark into the results of the method. This integration was again stressed by the participants of the field test.

Housing Association C indicated that relating information systems to business processes is a strong feature of the results, as it makes explicit what the effects of information systems are in the organization.

A number of limitations of the Bedell results were put forward during the interviews and field test. The Financial Service Provider indicated that a limitation of the method is that it focuses on automation of existing processes. New applications and new processes that are made possible using IT are not included. It is therefore a diagnostic method of the existing systems, not useful for finding indications for business process redesign. Van Reeken made a similar remark in that the method is useful on an operational level, but valuable investments on a tactical or strategic level will not be found.

Ton van Reeken also stressed the limitation of the exclusion of IT infrastructure in the method, since the IT infrastructure is nowadays becoming more and more important. This means that based on the results of the method no indication will be found for valuable investments in IT infrastructure. Van Reeken added that the method could still be useful for contemporary organizations, but since measurement of the IT infrastructure is missing an increasing number of workarounds will have to be used to keep the method practical. However, Van Reeken added the remark that the central idea of the method, being that the most important business processes should be supported by the highest quality information systems (the teleological point of view on quality), is still valid. A new approach is needed to overcome the limitations of the method.

Since the data gathered for the method is mostly based on discussion and consensus forming and not so much on objective data, Rob Poels wondered to what extent differences in the results for each participant are a matter of unreliable measurement or real differences. During the field test Housing Association D made a similar remark, in that it would like to the data gathering process in the form of an audit, performed by an external objective auditor. This would ensure some control over the quality of the data gathered.

5.5.2.2 Information Economics method

As opposed to the method of Bedell the result calculation and presentation format contained in the Information Economics method proved not to be very useful in a benchmarking context, as this would only result in an ordered list of the most valuable to the least valuable information systems in an organization. Instead a different result calculation and presentation format was created (see appendix E).

Just as with the results of the method of Bedell, the participants of the field test found the results difficult to interpret. A suggestion was also put forward to include a brief explanation for each result figure, answering one or more of the questions as contained in the previous paragraph. The participants also suggested combining the gathered data in various other ways, which would result in more useful and insightful figures.

5.5.2.3 IT Infrastructure method

The IT infrastructure method was added to the IT benefit benchmark instrument to complement the method of Bedell and the Information Economics method with a focus on IT infrastructure.

Since the inclusion of this IT infrastructure method and the components that should comprise this method were left open for discussion during the interviews, this paragraph also includes remarks in that regard. During the field test and based on the results of the interviews, a choice was made to include a simple measurement of the IT infrastructure based on five general infrastructure components and four related indicators (see paragraph E). The calculation and presentation format created was based on this choice.

Regarding the question if IT infrastructure should be included at all, Housing Association F and Municipality B responded that it should. Housing Association F had the simple remark that since the IT cost of the IT infrastructure is included in the M&I/Partners IT benchmark, so should the benefits. These benefits allow for an investigation of the differences in cost between organizations. Municipality B remarked that as long as IT infrastructure is under the influence of the organization and is not obtained like a utility service as electricity, it will be important to include into the instrument. These remarks are contrary to the response of Dick IJpelaar, stressing that the IT infrastructure is not useful to include, since the added value is very limited. He regarded it as not interesting, since management of the IT infrastructure is cost based only.

In response to what aspects of the IT infrastructure would be important to measure, the following remarks were made. Housing Association E suggested using a layered model: IT infrastructure at the bottom, information systems on top of that and then business processes that are supported by information systems. The measurement of the IT infrastructure should then focus on how well the information systems are supported.

The Financial Service Provider indicated that the results of the measurement should focus on how well complexity has been reduced and is in control, since the most important value feature in managing IT infrastructure is reducing complexity. Housing Association E made a similar remark, although adding that less complexity is not always better: the IT infrastructure may under certain conditions be complex, as long as it is under control. Municipality B mentioned that standardization is an important aspect of the IT infrastructure. The focus of this standardization should not be on technology, but on the organization itself: working in a standardized way.

Both Housing Association E and Municipality B stressed the importance of including IT architecture into the instrument, since that is an essential part of the organization of the IT infrastructure. Municipality B referenced to Service Oriented Architecture (SOA) and the Dutch Government Reference Architecture (NORA).

Furthermore Municipality B stated that since communication and integration of information with other organizations is becoming more and more important, especially for municipalities, including those aspects are also important.

The International Real Estate Company stated that the characteristics to measure of the IT Infrastructure depend on the chosen organizational strategy: if the organization's focus is not on differentiation, the measurement should focus on cost. If the organization's focus is on quality, measurement should focus on innovation. Also, the organizational context determines how much benefit is obtained from a certain quality level; this is not an objective measure. The Financial Service Provider made a similar remark in that the value characteristics of the IT infrastructure depend on the type of industry and strategic course of the organization.

Dick IJpelaar mentioned that the systems' capacity for providing flexibility for future demands is an important benefit aspect, but this capacity should be embedded into the information systems, not so much into the IT infrastructure.

During the evaluation of the field test the participants stated that the current method and results are primarily of use for the internal organization, since the results focus on points of attention for improvement. The results are not very useful in a benchmarking context.

5.5.3 Conclusions

Based on the interviews and the field test, the following conclusions are drawn regarding the interpretation and usefulness of the results of the IT benefit benchmark instrument.

For the method of Bedell the most important conclusion is that a new approach is needed for including IT infrastructure, integrating it as an integral part of the method. Without this integration it will be increasingly difficult to use the method in contemporary organizations. Besides this conclusion the following notions are important:
- Since much of the data gathered is more or less subjective, a set of rules or an external audit would be useful for more objective and reliable data gathering.
- The results of the method are very complex and the participants are unfamiliar with the multitude of used indicators. Adding explanations and reducing complexity of the results is useful.
- Integrating the results with the IT cost (TCO) from the M&I/Partners IT benchmarks will increase the usefulness.
- The results are seen as diagnostic in nature; indications for new IT applications on a tactical or strategic level are not found without further investigation and analysis.
- The method could also be used for comparing business units in a single organization.

For the Information Economics method the most important conclusion is that the result calculation and presentation needs further attention in order to produce useful and insightful results. The participants of the field test found the current results to be complex and difficult to interpret. Several suggestions were made for improvement.

For the IT infrastructure method the most important conclusion is that in its current form the results are more useful for internal organizational use, instead of in a benchmarking context. Besides this conclusion the following notions are important:
- During the interviews many aspects were stressed as being important to include in measurement: degree of support for information systems, reducing complexity, being in control, organizational and technical standardization, architecture and communication and integration with outside parties.
- The benefit characteristics to include in measurement may depend on the organization's strategy and competitive focus.
- The interviewees were contradictory on if the IT infrastructure should be included in measurement at all. Arguments for inclusion were: the IT infrastructure is under the influence of the organization and the IT cost is measured in the M&I/Partners IT benchmark. The argument for exclusion was: the management's focus is primarily on reducing cost.

5.6 Applications for the instrument

Since the current M&I/Partners IT benchmarks are used for many purposes, the empirical study also included an investigation of the possible applications for the IT benefit benchmark instrument. The result of this investigation is included in this paragraph.

The interviewees and the participants of the field test saw applications of the instrument for both the internal organizational use and for comparison with other organizations.

Regarding internal use the following remarks were made. Housing Association B found the instrument useful in that it forces the organization to investigate the total scope of information systems in use, evaluating their operation and use. The need for such an investigation is often recognized, but is not carried out due to lack of priority in day-to-day activities. Applying the instrument makes the investigation explicit and serves as a tool to support the investigation. Housing Association C made a similar remark in that the instrument provides a means to evaluate what IT managers are doing, report on the findings and draw conclusions to take action.

Housing Association C also indicated that the results of the instrument could be used as a basis to make the benefits of project proposals more tangible, since the benefits are often difficult to measure. Municipality B made a similar remark in that the results could be used as a foundation for creating plans, but in order to do that the results should be related to IT cost first.

Housing Association E remarked that the instrument could be used as a discussion model for internal use. This discussion could be improved by adding a trend analysis for the results.

Housing Association F suggested using the benchmark results for making the strategic importance of IT explicit to top management. This importance is not yet sufficiently understood and therefore not present on the agenda of housing associations. Dick IJpelaar made a similar remark: using the instrument for creating awareness of the strategic importance of IT with top managers. He indicated that the instrument will improve discussion on the topic and will be a means to create action.

Municipality A indicated the benchmark results could be used to inform the organization about the benefit delivered by IT. At present time the organization tends to stress the high cost of IT, without taking the benefit into consideration. The instrument results could make a discussion on this benefit more objective and the results of IT more tangible.

Regarding comparison between organizations, Housing Association C indicated that it is vital for organizations to look outside the organizational boundaries. This allows for learning from other organizations in how they are creating benefit from IT. Organizing joined session for discussing the benchmark results is vital for this learning to take place. Only then will participants be able to investigate the reasons behind the benchmark results. In contrast, the Financial Service Provider indicated that for the financial service provider industry and other highly competitive industries, participants will be reluctant to share sensitive information and discuss results in joined sessions. Instead the interviewee suggested comparing a financial service provider with a large governmental agency, like the Central Fine Collection Agency (CJIB). These organizations have similar business processes and therefore probably also similar information systems, making a comparison useful. The Financial Service Provider also suggested the use of the IT benefit benchmark instrument for evaluating the IS portfolio of merger and acquisition candidates.

Interviewees and participants of the field test also indicated a number of limitations to the IT benefit benchmark instrument in its current form.

Housing Association B indicated that it will be difficult to compare organizations based in the gathered data, since that data is very context dependent, subjective and open for interpretation. Therefore the added value of the instrument is primarily inside the organization, not for comparison between organizations.

The International Real Estate Company, Dick IJpelaar and Ton van Reeken commented that the focus of the instrument is internal and only takes the current organizational situation and strategy into consideration. External trends, threats and opportunities, industry developments and changes in for example law and legislation are not taken into account. Since the goal benchmarking is to measure and compare a current or past situational context (see also paragraph 3.5.1), it is evident that future situations are not evaluated. It is important however to recognize this focus, since an important benefit aspect of IT is how it will be able to be flexible for unexpected outside changes. Naturally the benchmark results allow for a discussion and investigation of trends, developments, strategies and other relevant aspects.

Also a number of suggestions were made for improving the instrument, apart from the detailed refinements which will not be mentioned here.

Housing Association A commented that it will take a lot of time to complete data gathering and that a lot of people from the organization will have to be involved. The interviewees suggested starting out with a simplified instrument and adding details in a later stage when needed. A similar comment was made by Dick IJpelaar. The current instrument is very detailed and complex in terminology. It should be simplified in order to work in practice.

Regarding the limitations already mentioned above, the International Real Estate Company suggested the following improvements: include market developments in measurement, so organizations can also compare to those developments instead of just other organizations that may also be falling behind. By including market developments an investigation can be made if existing information systems are "future proof" or that they will be obsolete in three to five years. This also includes how employees see and use information technology: when an organization's use of IT is too far behind consumer and society standards, this in itself will be a disadvantage for hiring and keeping employees. Gartner refers to this trend as "Consumerization".

Municipality A stressed that the relationship of the IT benefits to the IT costs is vital for a joined discussion, so this should be added to the instrument.

6 Conclusions and recommendations

This chapter discusses the most important conclusions drawn from the research performed and a number of recommendations for application of the benchmark instrument and for future study. The chapter is structured as follows: paragraph 6.1 presents the conclusions drawn from the empirical study (see chapter 5). Then paragraph 6.2 reflects on the theoretical and practical findings by consideration of the research objective and research questions (see paragraph 1.2 and 1.4). Finally paragraph 6.3 addresses recommendations for applying the developed instrument in practice and for future study of the instrument.

6.1 Conclusions from empirical study

During this research project a model and practical instrument for benchmarking the organizational benefits of IT between organizations in a single industry has been created. This benchmark instrument was created from existing theory and methods and was tested in a number of organizations in the municipality, international real estate and financial service provider industries in the form of interviews with IT managers. The instrument was also validated by a number of IT Economics experts and was implemented for the housing association industry. This implementation was tested in the form of interviews with IT managers in a number of housing associations, complemented by a field test. This field test consisted of a complete test run of the benchmark within three of the interviewed housing associations.

The developed instrument has proven to be useful for housing associations, although a number of improvements can be made (see paragraph 6.3 for recommendations). The results of the empirical study are inconclusive on the application of the instrument for municipalities: since municipalities are typically larger and more complex than housing associations, the question remains if the needed generic business process and information systems model can be created for these organizations (see paragraph 5.2). Indications are found that the model can at least be created for activities as required by law. The benefit of information systems for these activities could then be benchmarked for municipalities. The results of the empirical study indicate that the benchmark instrument will not be applicable for international real estate companies, since these organizations typically consist of several profit responsible business units, each having different activities and operating relatively independent from the central organization. However, it may be possible to consider each business unit as a separate organization and benchmark the business units with comparable business units in other international real estate companies, or even organizations outside the industry (for example: the real estate departments of housing associations). Financial service providers typically also consist of several profit responsible business units having different activities. At first sight this means that the same limitation applies for these organizations as for international real estate organizations. However, the results of the empirical study indicated that the activities for business units in these organizations may be too diverse to even allow for a comparison on the business unit level.

The interviewed IT managers saw many applications for the benchmark instrument (see paragraph 5.6). The most important applications mentioned, are:
- Evaluating the accomplishments of IT management in order to take action for improvement.
- Providing a foundation for creating plans and to make the benefits of (IT) project proposals more tangible.

- Creating awareness of the strategic importance of IT with top management. The data gathering activity and instrument results provide a means for discussing of this topic and creating action.
- Proving the results and benefits of IT to the rest of the organization in a more objective way than before.
- Learning from other organizations by using the results of the benchmark as a means for discussion. It was noted that a joined session for discussion should then be organized as part of the benchmark. This application may be less feasible for organizations in highly competitive industries.
- Investigation of the total scope of information systems in use. The importance of such an investigation is often recognized and the instrument provides a practical means to perform it.

It is remarkable that many of these applications do not require the instrument to be carried out in a benchmarking context: the instrument could also be used by a single organization for obtaining the intended result. The organizations emphasized that the usefulness of the instrument would be much improved if the results would be integrated with the IT costs results of the M&I/Partners IT benchmark (TCO). The organizations also indicated some limitations for application and use of the instrument. The instrument evaluates the benefit of IT for the current organizational strategy, organizational structure and business processes. This means that, without further analysis, the results will not indicate how the organization could apply IT for increased benefit from new or improved products or services, new business or IT strategies, a new organizational structure or redesign of existing business processes.

When looking into the three methods contained in the benchmark instrument, the method of Bedell has proven to be most useful in a benchmarking context. The organizations found the results of this method the most interesting for comparison and discussion and the approach of the method the most fundamental, since it links organizational goals and activities to information systems. The method did need a lot of explanation during data gathering and the indicators and scores left much room for interpretation and subjectivity. The results of the method also needed a lot of explanation and were found to be complex to interpret. The empirical study also revealed a fundamental shortcoming in the method of Bedell, which should be solved for the method to remain useful in the housing association industry and for application of the instrument in other industries. This shortcoming has its origin in the way IT was used in organizations when the method was created. At that time departments had their own information systems. For each business process an information system was implemented, so business processes and information systems had a one-to-one link. Evaluating the benefit of each information systems was then a fairly straight forward exercise. In contemporary organizations however, information systems are increasingly integrated, coupled and layered on top of each other. This means that the traditional one-to-one link between a business process and its information system is not that straight forward anymore. When regarding an organization's IT infrastructure to include information systems used by more than one department or for more than one business process, more and more information systems are becoming part of that IT infrastructure in today's organizations. The method of Bedell is not fit for including information systems used by multiple departments and business processes, or for information systems indirectly supporting a business process through integration or coupling of information systems directly used in a business process. See also paragraph 5.4.1 and 5.5.

The Information Economics method proved to be less useful in a benchmarking context. The organizations indicated that the calculation and presentation format needs refinement for more meaningful comparison of results. The method also appeared to have a number of shortcomings when applied for benchmarking. Just as the method of Bedell, the indicators and scores for data gathering needed a lot of explanation and left much room for interpretation. A more fundamental weakness appeared in the use of the Strategic Match and Competitive Advantage indicators. For housing associations, the scores given for these indicators vary depending on the organization's rentable unit distribution model. This means that the indicators in part reflect the organization's strategic choices and priorities and in part reflect the perceived benefit obtained from each information system. The results of the method will then only be comparable for organization's having similar distribution models. A similar weakness was found for the Strategic IS Architecture indicator. The scores given for this indicator in part reflect the chosen IT strategy of the organization. For housing associations: a focus on increased integration of information systems, or a focus on loosely coupled information systems. The Competitive Advantage indicator appeared to be less useful for not-for-profit organizations. The terminology used in the indicator's description and scores led to much objections from the housing associations interviewed and a tendency to assign all information systems the lowest score. For the field test the name of this indicator was changed to "Unique Proposition" and the descriptions of the scores were also changed accordingly. The Management Information indicator was regarded as applicable for only a sub set of the information systems. See also paragraph 5.4.2 and 5.5.

The IT Infrastructure method, added to complement the previous two methods, proved to be more useful in an internal organizational context, than in a benchmarking context (see paragraph 5.5.2.3). The results of the empirical study are inconclusive if the method should be included in its current form at all. Some organizations indicated that it is important to include aspects of the IT infrastructure in measurement, while others indicated an evaluation of information systems as contained in the other two methods to be sufficient. Also, organizations indicated many additional infrastructural aspects to be included in the method. These aspects seem to depend on the organizational and industrial context (see paragraph 5.4.3). Since the usefulness of the method seems limited and the previous two methods already require much effort from each participant in data gathering, the inclusion of the method in the instrument is questionable.

The interviewed organizations were consistent in stressing the need to involve line or top management, key users and the IT department. By involving these groups of employees the validity and reliability of the gathered data would improve and the results of the benchmark would have better support in the organization. The selection of a representative group of employees will have to be made by each organization individually. This selection is based on the employee's level of expertise and knowledge of the organizational context, goals, processes and information systems. Organizations indicated that the employee's formal function or organizational responsibility is not decisive in the selection. For the data gathering activity, the organizations emphasized the need for internal discussion in joined sessions and reaching consensus on the final answers in the selected group.

Since each benchmark participant will individually select a representative group of employees and implement the data gathering activity in a different way, the interviewed organizations stressed the need for adding a set of rules or guidelines to guarantee the quality of the gathered data. The organizations indicated that adherence to these rules or guidelines should be validated by an external expert. This external expert could also (randomly) validate if answers given in the data gathering model can be motivated and if terminology has been interpreted correctly.

The effort needed from each participant to complete data gathering will vary, but the field test participants indicated that for the involvement of line or top management the maximum time available will be about two hours. To involve line or top management as effectively and efficiently as possible, the field test participants suggested including a workshop organized and led by an external consultant. See also paragraph 5.3.

From a scientific point of view this research has investigated the application of two existing IT evaluation methods, originally portfolio methods for selection of IS investment proposals, in a benchmarking context. The method of Bedell has proven to be useful for benchmarking with the given preconditions and could well be developed further for this purpose (see also the recommendations for future study in paragraph 6.3.2). The Information Economics has proven to be less useful, amongst others since the measured results are influenced by the organization's business priorities and strategies (see previous text in this paragraph).

6.2 Research questions and objective

This paragraph reflects on the theoretical and practical findings of the research by considering the stated research questions and research objective. Paragraph 6.2.1 reflects on the research questions, and then paragraph 6.2.2 reflects on the research objective.

6.2.1 Reflection on research questions

This paragraph explores the theoretical and practical findings of the research project, by answering each of the research questions from paragraph 1.4.

1. What IT benefit aspects are interesting for measurement and comparison in a benchmark instrument?

1.1 What is a benchmark instrument, who uses it and what are its goals?

This question is answered in chapter 3: the theoretical framework. In paragraph 3.5 the use of IT benchmarking is put into context within the use IT evaluation, as IT benchmarking is a special form of IT evaluation. Then existing theory is investigated for a definition of benchmarking and how benchmarking has evolved over time, followed by an investigation of the many types and characteristics a benchmark may have, including its goals and the process that is typically followed. Finally a number of conditions are described that should be met for benchmarking to work in practice.

1.2 What are the uses, goals and limitations of the already existing M&I/Partners IT benchmarks?

The M&I/Partners IT benchmark is one of several IT evaluation and benchmarking methods investigated in the theoretical framework. Paragraph 3.6.8 describes the M&I/Partners IT benchmark, including various uses and goals.

1.3 What aspects of the benefits of IT in an organization are identified in literature and of interest to be used in a benchmark instrument?

An investigation of existing literature has revealed many types of IT benefits and also many typologies used to categorize these benefits. However, the focus in literature is primarily on evaluating the benefits of a single project or investment proposal, or to indicate the many ways IT might be put to valuable use in organizations. Very little was found on how to identify and evaluate IT benefits in a given organizational context. For this reason a simple typology was created, consisting of four high-level IT benefit categories (see paragraph 4.2).

2. How can these aspects be measured, compared and translated into a practical benchmark instrument?

2.1 What existing methods and models can be used to measure IT benefit aspects?

Based on the created IT benefit typology, a number of criteria related to the stated goals of the benchmark and the categories of IT assets measured in the M&I/Partners IT benchmark, two existing methods were selected for use in the benchmark instrument: the method of Bedell and the Information Economics method (see paragraph 4.3). Since these methods were found to lack measurement of the IT infrastructure, a simple method was created to complement the two methods.

2.2 How can the selected methods and models be translated and complemented into a usable instrument?

The selected methods have been used in the instrument as straight forward as possible, containing as much of the method in its original form. The addition of an industry-specific business process and information systems model was necessary in order to produce results that would be comparable between organizations (see paragraph 4.4). The empirical study revealed the usability and practicality of the created instrument and included methods (see chapter 5). The business process and information systems model was created for the housing association industry and a field test was conducted for that industry. The instrument has proven to be useful for housing associations. Indications were found that the instrument is also useful for municipalities and for separate business units of an international real estate company. The use of the instrument in the financial service industry is questionable. The method of Bedell seems most promising for further investigation and development, since this method produced the most interesting results and discussions in the interviews and field test. However, the method does contain a fundamental shortcoming for use in contemporary organizations that should be overcome if the method is to be applied for other industries and for the housing association industry in the future.

6.2.2 Reflection on research objective

The objective of the research was to develop a prototype of a practical benchmark instrument to complement the existing M&I/Partners IT benchmarks. This instrument should measure and compare the organizational benefits of IT for providing insight into the different IT cost levels of each participant.

This research has resulted in such a prototype instrument. This instrument has been implemented and tested for the housing association industry, an industry that has had experience with the M&I/Partners IT benchmark since 2002 and currently includes over 40 participants. The practical requirements contained in the research objective have been met (see the bullet list in paragraph 1.2):
- Appendix B details out the data gathering model, including all of the questions to be answered by each participant. Chapter 5 investigates what employees to involve in the benchmark and how the data gathering process should take place.
- Appendix E describes the result calculation format, including how the data gathered can be transformed into benefit indicators.
- Appendix E also addresses the result presentation format, showing how the indicators can be presented for comparison. With regard to the insight gained from each result a number of improvements could be made: see paragraph 5.5 and 6.3.

Regarding the required ease of use of the instrument, the results of the empirical study show that the instrument is complex in terminology for the data gathering model. The created results are also very complex and need a lot of explanation before they can be interpreted and used by the participants. The empirical study revealed a number of suggestions for simplifying the instrument and overcoming this limitation. See paragraph 6.3 for recommendations.

Another objective was to limit the required effort to carry out the benchmark: a few days for each participant. The empirical study shows that the required effort will vary depending on the selection of employees and the implementation of the data gathering process. For some participants the benchmark instrument may require more effort than the M&I/Partners IT benchmark, primarily due to the need to involve employees from various departments for discussion at time of data gathering.

The research objective also stated that the instrument should be generally applicable across industries. This objective has not been fully met: the instrument is applicable for housing associations, but seems limited in its application for municipalities, international real estate companies and financial service providers (see paragraph 5.4 and 6.1). Other industries have not been investigated.

Just as the M&I/Partners IT benchmarks, the results from the benchmark instrument allow for comparison and discussion within and between participating organizations. However, this does not mean the benchmark instrument can also be integrated with the M&I/Partners IT benchmarks. Regarding the benchmarking process, the instruments are similar: the model distribution, data gathering, validation meetings and other activities could be carried out in parallel. The result indicators of the benefit benchmark have not been integrated into the M&I/Partners IT benchmark results. The empirical study revealed that participants see this integration as an important condition for future application and use of the instrument. See also paragraph 6.3.2.

6.3 Recommendations

This paragraph presents a number of recommendations for applying the developed instrument in practice for housing associations and other industries (paragraph 6.3.1) and for improving the instrument in future studies (paragraph 6.3.2).

6.3.1 Applying the instrument in practice

The created business process and information systems model for housing associations has proven to be useful in practice (see appendix D). However, the interviews and field test indicated a possible misinterpretation of the names of the business processes or information systems (see paragraph 5.2). It is therefore recommended to add a definition for each process and information system and refine the used terminology to minimize room for interpretation, followed by a validation of the definitions and terminology with one or several housing associations. Common sources such as KWH (quality centre for housing associations) and Aedes (industry organization for housing associations) can be used for creating definitions and refining and improving terminology.

If the instrument is to be applied for other industries, additional business process and information systems models have to be created. The following guidelines should be taken into account when creating such a model (see also paragraph 5.2):
▪ Start from existing material, preferably from a common source that many (potential) participants have knowledge of. This improves recognisability and interpretability of terminology.

- Include a short definition of each process category and information system, so participants can check if they interpret terms as they are supposed to. The definitions can also be used in a validation activity for the gathered data.
- Determine how to include ERP systems or other enterprise (administrative) information systems: as a single information system, or as a set of modules that are regarded as separate information systems.
- Avoid technical terms: in the business process categories, but also in the names and definitions of information systems, since non-IT personnel should also be able to understand the model.
- Take into account that some business processes will be outsourced or not present for some organizations. Allow flexibility for this in the model.
- Try to cluster or categorize information systems based on their organizational function for improved recognisability.
- The number of aggregation levels in the business process categories is free to choose, as long as a consistent view of the information systems is reached. For large or complex organizations a balance between accuracy and detail and practicality of the model should be made.
- An alternative for using a top-down approach when identifying and categorizing business processes is to start from the information systems and identify and group business processes from these.

For industries containing very large organizations consisting of multiple, relatively independent business units, additional study is needed for the feasibility of creating a business process and information systems model. See also paragraph 6.2.

It is recommended to improve the existing instrument by simplifying terminology in the indicators and scores for data gathering (aside from the process and IS model as mentioned above). This simplification should allow terms to be intuitively understood as much as possible by the target group of participants, increasing reliability of answers. Important and more complex terms should be explained in advance to avoid misinterpretation. This includes for example the difference between strategic and operational importance and the meaning of "strategic" in the organizational context. See also paragraph 5.4.

Since the selection of employees and the implementation of the data gathering process will be different for each participant (see paragraph 5.3.1 and 5.3.2), a number of rules and instructions should be added to guarantee the quality of the gathered data. In this way each participant in the benchmark can be confident the data of other participants is agreed upon by key employees in the organization. These rules and instructions could include: reporting how the data was gathered, what employees were involved (function, responsibilities, department, experience and expertise), the number and duration of joined sessions, the most important issues of discussion and a brief motivation of each answer given. Using a validation interview, an external consultant should validate if the rules and instructions have been adequately followed. During this interview the external consultant could also randomly check the motivation of the answers given and recognize and verify oddities by comparing the gathered data to that of other participants.

Regarding the result calculation and presentation format, the Information Economics method and the IT Infrastructure method need additional analysis and improvement for the results to be useful in comparison between organizations (see paragraph 5.5). Since the number of result figures from the instrument is extensive, it is recommended to select a limited number of results for inclusion in the benchmark report and for presentation and discussion in joined sessions. The results from the method of Bedell have proven to be most promising in this regard.

An explanation should be added for each result, helping participants use and interpret the complex result figures. One or more of the following questions should be answered in this explanation (see paragraph 5.5.2.1):

- What general conclusion can be drawn for all participants?
- What conclusion can a participant draw when comparing his indicators with those of other participants?
- What conclusions can a participant draw when looking into his indicators in more detail?

Furthermore, in order to help participants understand the result indicators for their organization and to avoid discussions of the calculation format, it is recommended to include intermediate calculations and figures in the result report (see paragraph 5.5.2.1).

M&I/Partners is investigating the feasibility for applying the benchmark instrument in the housing association industry. One of the results of this investigation has been an estimation of needed effort and cost for applying the instrument in a first-off benchmarking round. This estimation, based on the participation of eight housing associations, is included in appendix F (may be omitted for confidentiality).

6.3.2   Future study

This paragraph presents a number of recommendations for future study of the developed IT benefit benchmark instrument.

Of the three methods included in the benchmark instrument, the method of Bedell seems most promising for application in a benchmarking context (see paragraph 6.1 and 6.2). From a scientific point of view it is remarkable that this method, which was developed in 1985 and is at present over 20 years old, is in essence still useful for organizations today. However, additional investigation is needed to overcome a fundamental shortcoming for application in contemporary organizations (see paragraph 5.4.1.5). If this shortcoming can be overcome, it would mean an integration of the more generic information systems, contained in the organization's IT infrastructure. The IT infrastructure method as a complement is in that case not necessary anymore.

A direction for investigation could be: instead of qualifying the use of each information system for each business process, the quality of information systems could be scored separately from the business processes. Then for each information system one or more business processes could be selected, that are supported by the information system. For each business process selected a percentage of the amount used (based on functionality, data, load or a similar indicator) and a quality indicator for the system that is related to the process (effectiveness) are scored. Finally, for improving recognisability of the information systems, it is recommended to categorize and group the systems.

A number of shortcomings came forward in the Information Economics method; both in the applicability of the indicators in a benchmarking context and in the result presentation and calculation format (see paragraph 6.1, 5.4.2.5 and 5.5.2.2). Since each indicator of the Information Economics method indicates a level of benefit for each information system, it may be possible to integrate the method with the method of Bedell.

The Management Information and Strategic IS Architecture indicators can be seen as quality indicators, qualifying the benefit obtained for management information and for the technical possibilities or limitations of the information system. The Strategic Match indicator, qualifying the strategic importance of each information system, is effectively contained in the method of Bedell through scoring the strategic importance of each business process category, which is then linked to the information systems.

The Competitive Advantage indicator, indicating to what degree each information system accounts for a unique favourable position in the industry, cannot easily be seen as a quality indicator to be integrated into the method of Bedell.

Further investigation is necessary to conclude if integration into the method of Bedell is possible. The results from the empirical study also indicated that different types of information systems may need different quality indicators. It is recommended to investigate this differentiation of quality indicators for different types of information systems in a future study. See also paragraph 5.4.2.

The goal of this research project was limited to developing an instrument for benchmarking the benefit of IT in organizations, not benchmarking the value of IT (see paragraph 3.3.1). This means that the scope of the research did not include the integration of the results with the IT cost (TCO) results of the M&I/Partners IT benchmark. However, the empirical study indicated that integrating the results of the IT benefit benchmark instrument with those of the M&I/Partners IT benchmark is important for improving the usefulness and applicability of the instrument (see paragraph 6.1 and 5.5.3).

Besides the benchmark results, the benchmark processes could also be integrated. The M&I/Partners IT benchmark is carried out yearly in the planning and control cycle of each participating organization. For the developed benchmark instrument the usefulness for a yearly cycle should be investigated. It is probable that the benchmark instrument is only useful in a less frequent cycle, taking into account the average life cycle of information systems.

The empirical study revealed the instrument's complex terminology for indicators and scores and result calculation and presentation (see paragraph 5.4.1.5, 5.4.2.5 and 5.5.3). It is recommended to simplify the instrument. Used terminology should be adapted to common language used by participants, preferably also to terms commonly used in an industry benchmarked. For the method of Bedell, the scores for "organizational importance" could for example be simplified to range from "very important" to "not important" instead of the currently used complex scores. It is also recommended to investigate if this indicator could be divided into two indicators: one for "strategic importance" and "operational importance" for easier interpretation.

The instrument is currently insufficiently tested for industries other than housing associations, especially for those industries containing large and complex corporations. These corporations typically consist of multiple business units, which operate more or less independent of the central organization. It is recommended to investigate if the business units should be benchmarked individually, considering them as separate organizations, or if they can be benchmarked as one large organization. This investigation should primarily focus on the creation of the needed business process and information systems model: a balance should be found between practicality and usability of the model for all organizations in the industry, while still being detailed and precise enough to reflect the actual organizational situation for valid and reliable results.

7   List of figures and tables

Figures

Tables

Andresen J.L. (2001), "A Framework for Selecting an IT Evaluation Method - in the Context of Construction", BYG – DTU R-012, Danmarks Tekniske Universitet.

Bannister F., Berghout E., Griffiths P., Remenyi D. (2006), "Tracing the Eclectic (or maybe even chaotic) Nature of ICT Evaluation", Working paper, August 2006, submitted for review.

Bedell E. F. (1985), "The Computer Solution – Strategies for Success in the Information Age", Dow Jones-Irwin, Homewood Illinois.

Benson R.J., Bugnitz T.L., Walton W.B. (2004), "From Business Strategy to IT Action – Right Decisions for a Better Bottom Line", John Wiley & Sons, Hoboken, New Jersey.

Bergeron F., Buteau C., Raymond L. (1991), "Identification of Strategic Information Systems Opportunities: Applying and Comparing Two Methodologies", MIS Quarterly, Vol. 15, No. 1. (Mar., 1991), pp. 89 – 103.

Berghout E., Remenyi D. (2005), "The Eleven Years of the European Conference on IT Evaluation: Retrospectives and Perspectives for Possible Future Research", The Electronic Journal of Information Systems Evaluation, Vol. 8, Issue 2, pp. 81-98, available online at www.ejise.com.

Berghout E., Renkema T.J. (2005), "Investeringsbeoordeling van IT-projecten – Een methodische aanpak", derde herziene druk, Information Management Institute, Rotterdam.

Berghout E., Nijland M. (2002), "Full life-cycle management and the IT Management paradox", Chapter 5 in: IT Management, D. Remeyni and A. Brown, Butterworth-Heinemann.

Broadbent M., Weill P. (1993), "Improving business and information strategy alignment: Learning from the banking industry", IBM Systems Journal, Vol. 32, No. 1, pp. 162 – 179.

Brynjolfsson E., Hu Y., Smith M.D. (2003), "Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers", Management Science 2003 INFORMS, Vol. 49, No. 11, November 2003, pp. 1580 – 1596.

Butler Group (2005), "Measuring IT Costs and Value – Maximising the Effectiveness of IT Investment", Technology Management and Strategy Report, September 2005.

[CBS StatLine] (2008 Jan 28), "StatLine – Alle cijfers van het CBS binnen handbereik", <http://statline.cbs.nl/>. Acessed 2008 Jan 28.

Clarke R. (2005), "The Path of Development of Strategic Information Systems Theory",
Version of 14 July 1994, with an Erratum of 5 July 2005,
http://www.anu.edu.au/people/Roger.Clarke/SOS/StratISTh.html, Accessed on August 28, 2007.

Delahaye I., van Reeken T. (1992), "Waarom investeren in welke informatiesystemen? Een vergelijkende toepassing van Bedell en Parker/Benson/Trainor bij De Gazet", www.informatie.nl, Themanummer 1992.

Derwort S. (2007), "IT governance: de doelen en de middelen - Overzicht van IT governance in theorie en praktijk", Universiteit Twente.

Dijk P. van, Prins D., Vries A. de (2004), "Vergelijking van ICT-kosten in perspectief", IT beheer jaarboek 2004/2005, ten Hagen & Stam Uitgevers, Den Haag, pp. 75 – 82.

Eekeren P. van (2003), "Benchmarking: reflection in action", IT Management Select, Vol. 9, No. 3.

Eekeren P. van, Dijk P. van, Prins D. (2006), "Benchmarking van ict-kosten", Informatie juni 2006, pp. 40 – 45.

Futura (2006), "I&A-beleid 2006-2008", Futura, Tilburg.

Gartner (2006), "Express IT Project Value in Business Terms Using Gartner's Total Value of Opportunity Methodology", Gartner Research, January 11 2006.

Gongla P., Back-Hock G., Goldweic P. et al. (1989), "SPARK: A knowledge-based system for identifying competitive uses of information technology", IBM Systems Journal, Vol. 28, No 4.

Henderson J.C., Venkatraman N. (1993), "Strategic alignment: Leveraging information technology for transforming organizations", Reprinted from IBM Systems Journal, Vol. 32, No. 1, 1993 (IBM Systems Journal, Vol. 38, Nos 2&3, 1999).

Hilhorst C., Smits M., Heck E. van (2005), "Strategic Flexibility And It Infrastructure Investments - Empirical Evidence In Two Case Studies", Tilburg University, Tilburg, The Netherlands.

Hitt L.M., Brynjolfsson E. (1996), "Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value", MIS Quarterly, Vol. 20, No. 2 (Jun. 1996), pp. 121 – 142.

Hochheimer–Richheimer D.T. (2007), "wTCO6 Analysesheet", M&I/Partners, Amersfoort.

IT Governance Institute (2005), "CobiT 4.0", www.itgi.org.

Lucas H. (1999), "Information Technology and the Productivity Paradox: Assessing the Value of Investing in It", Oxford University Press, New York.

Maanen H. van, Berghout E. (2001), "Cost Management of IT beyond Cost of Ownership Models – A State of the Art Overview of the Dutch Financial Services Industry", Proceedings of the 8th European Conference on Information Technology Evaluation, 17 – 18 September 2001, Oriel College, U.K., pp. 29 – 36.

Mutsaers E.J., van der Zee H., Giertz H. (1998), "The evolution of information technology", Information Management & Computer Security, Vol. 6, No. 3, pp. 115 – 126.

Nelissen N.J.M., Goede P.J.M. de (1999), "Benchmarking: vergelijken en verbeteren", Blad Bestuurskunde, Jaargang 8, Nummer 2, pp. 54 – 70.

Nievelt M.C.A. van, Willcocks L.P. (1999), "Benchmarking Organizational & IT Performance", The Oxford Executive Research Briefings, Templeton College, University of Oxford, England.

Nijland M.H.J. (1999), "Grip op kosten en baten van informatietechnologie – Toetsing van een quickscan methode", Afstudeerverslag, Sectie Informatiestrategie en Beheer van Informatiesystemen, Vakgroep Informatiesystemen, Faculteit Informatietechnologie en Systemen, Technische Universiteit Delft.

Nijland M.H.J. (2004), "Understanding the Use of IT Evaluation Methods in Organisations", Department of Information Systems, London School of Economics and Political Science, London.

Pijl G.J. van der (1993), "Kwaliteit van informatie in theorie en praktijk", Proefschrift Katholieke Universiteit Brabant Tilburg, Limperg Instituut, Amsterdam.

Pijl G.J. van der (1994), "Quality of information and the goals and targets of the organization", Research paper, Tilburg University, Tilburg, The Netherlands.

Parker M.M., Benson R. J., Trainor H.E. (1988), "Information Economics: Linking Business Performance to Information Technology", Prentice Hall, 1st edition.

Poels R. (2006), "Beïnvloeden en meten van Business - IT alignment", Academisch proefschrift, faculteit der Economische Wetenschappen en Bedrijfskunde, Vrije Universiteit Amsterdam.

Porter M.E. (1979), "How competitive forces shape strategy", Harvard Business Review, March-April 1979, pp. 137 – 145.

Porter M.E., Millar V.E. (1985), "How information gives you competitive advantage", Harvard Business Review, July-August 1985, pp. 149 – 174.

Reeken A. J. van (1992), "Investeringsselectie van informatiesystemen: De methode van Eugene Bedell", Vakgroep Bedrijfseconomie RU Limburg.

Reeken A.J. van (2000), "Informatiemanagement: theorie voor de praktijk", Afscheidscollege gehouden op 26 mei 2000, Universiteit Maastricht, Maastricht.

Remeyni D., Sherwood-Smith M., White T. (1997), "Achieving Maximum Value from Information Systems: A Process Approach", John Wiley & Sons, New York.

Renkema T.J.W. (2000), "The IT Value Quest – How to Capture the Business Value of IT-Based Infrastructure", John Wiley & Sons Ltd, West Sussex, England.

Swatman P.M.C. (1993) "Integrating Electronic Data Interchange with Existing Organisational Structure and Internal Application Systems: the Australian Experience", PhD thesis published as: Curtin University Department of Computer Science Technical Report 19 - 1993, June.

Swinkels G.J.P. (2000), "Het managen van investeringen in informatie- en communicatietechnologie", PrimaVera Working Paper 2000-08, March 2000, Department of Accountancy & Information Management, Universiteit van Amsterdam.

Teubner R.A. (2005), "The IT21 Checkup for IT Fitness: Experiences and Empirical Evidence from 4 Years of Evaluation Practice", European Research Center fro Information Systems (ERCIS), Working Paper No. 2, Westfällische Wilhelms-Universität Münster.

Thorp J. (1998), "The Information Paradox", McGraw-Hill Ryerson, Canada.

[Twynstra Gudde] (2008 Jan 28), "Rob Poels", <http://www.twynstragudde.nl/tg.htm?id=689>. Accessed 2008 Jan 28.

[VNG] (2008 Jan 28), "VNG | Vereniging van Nederlandse Gemeenten", <http://www.vng.nl/smartsite.dws?id=41361>. Accessed 2008 Jan 28.

Waal V. van der, Aker P. (2003), "IT-evaluatiemethoden en de ICT-managementcyclus", PrimaVera Working Paper 2003-09 (new version), December 2003, Department of Information Management, Universiteit van Amsterdam.

Waalewijn P., Hendriks A., Verzijl R. (1996), "Benchmarking van het benchmarking-proces", Ribes rapport 9611/M, Erasmus Universiteit Rotterdam, ICSB Marketing en Strategie.

Ward J., Daniel E. (2006), "Benefits Management – Delivering Value from IS & IT Investments", John Wiley & Sons Ltd, West Sussex, England.

Weill P., Broadbent M. (1998), "Leveraging the new infrastructure: how market leaders capitalize on information technology", Harvard Business School Press, Boston, Massachusetts.

WonenBreburg (2007), "Primaire processen (volgens proceskaart WonenBreburg)", WonenBreburg, Tilburg.

Zee, J.T.M. van der (1996), "In Search of the Value of Information Technology. Tilburg University", Tilburg University Press, Tilburg.

Appendix A: Investigation of existing methods for use in the instrument

This appendix investigates existing methods for use in the IT benefits benchmark instrument. Each method is investigated and scored on seven criteria (see paragraph 4.3).

The method of Bedell

See paragraph 3.6.1 for a description of the method.

Criterion	Investigation	Score
Ease of interpretation	Quantitative result, providing a qualitative insight into: whether investing in IT is beneficial, how effective IS support business processes, what business processes to invest in and how important IT will become for the business.	High
Generic applicability	The method is applicable for organizations in all industries.	High
Effort	Effort to gather relevant data is limited, since the method uses a qualitative approach of communication and consensus building of senior management.	Medium
Data reliance	The method does not rely on specific quantitative data to be present in administrative systems.	High
Readiness	The available documentation on the use of the method, both in the process and calculation of the indicators is elaborate and discussed in various literature. However, the method was not designed for use in a benchmarking context, so effort should be invested in designing industry-specific business process models and identification of information systems and adapting the calculated results for comparing organizations.	Medium
IT benefit typology	Measurement of Operational Support is strong, since each information system in relationship to each business process is analyzed. Measurement of Strategic Match is also present, since the strategic importance of the business processes and future developments of IT are included. Measurement of Competitive Advantage is not present. The method lacks benefit measurement of the IT Infrastructure with regard to Operational Support and Strategic Match.	Medium
TCO categories	Benefit measurement relates to applications and part of the work environment.	Low

Information Economics

See paragraph 3.6.2 for a description of the method.

Criterion	Investigation	Score
Interpretation	The quantitative result provides a qualitative insight into the perceived value of an investment proposal (a proposed IS).	High
Generic applicability	The method is usable for organizations in all industries, although some of the indicators may be of less use in non-competitive industries.	Medium
Effort	Effort to gather relevant data is limited, since the method uses a qualitative approach of communication and consensus building of senior management.	Medium
Data reliance	The method does not rely on specific defined data in managerial information systems.	High
Readiness	The process and calculations are extensively described by the authors, but an adaptation should be made for applying the method for an ex post measurement and comparison of common information systems between participating organizations in an industry.	Medium
IT benefit typology	Measurement of Competitive Advantage is strong, since an investigation into the benefit of the IS with regard to the industry forces is needed. Measurement of Strategic Match and Operational Support are present, but is limited when compared to the method of Bedell. Benefit measurement of the IT Infrastructure is not present.	Low
TCO categories	Benefit measurement is limited to applications only.	Low

Return On Management

See paragraph 3.6.3 for a description of the method.

Criterion	Investigation	Score
Interpretation	The indicators rely on quantified financial data for which the qualitative interpretation is questionable.	Low
Generic applicability	The most important indicators of the method rely on profit measures, so the method cannot be applied for non-profit organizations.	Low
Effort	The effort needed to transform the available quantified data to the needed (unusual) indicators will be high.	Low
Data reliance	The method relies completely on availability of the data in the administrative systems of the organization.	Low
Readiness	Since the definitions used are problematic, effort should be put into creating definitions suitable for each industry, including an analysis of how the results can be interpreted.	Low
IT benefit typology	No qualitative insight into any of the IT benefit types is provided by the method.	Low
TCO categories	Benefit measurement is limited to IT management	Low

IT Business Value

See paragraph 3.6.4 for a description of the method.

Criterion	Investigation	Score
Interpretation	The method provides quantitative indicators with a description of how the indicators should be interpreted. However, the indicators are also influenced by factors other than IT.	Medium
Generic applicability	Some of the indicators rely on profit, so those cannot be applied for non-profit organizations. Also, several indicators are proven to be not useful for the banking industry.	Medium
Effort	A substantial amount of effort will be needed if the data available in administrative systems are not consistent with the defined variables needed for the method.	Medium
Data reliance	The method relies on specific data to be available in the administrative systems.	Low
Readiness	Documentation for using the method is extensive, but an investigation is needed on what indicators are usable for each industry and how these can be defined to fit the common administration found in those industries.	Medium
IT benefit typology	Operational Support and Strategic Match are measured for the IT Infrastructure. Insight into the IT benefit types is limited, since many factors other than IT influence the resulting indicators.	Low
TCO categories	The indicators only measure part the benefit of the LAN, WAN and work environment.	Low

Quality of Information

See paragraph 3.6.5 for a description of the method.

Criterion	Investigation	Score
Interpretation	Very comprehensive insight of information quality on various organizational aspects, resulting in a gap analysis of the current and ideal situation.	High
Generic applicability	Method can be applied for all organizations.	High
Effort	The effort needed for gathering data and analysis is very high.	Low
Data reliance	The method does not rely on defined indicators, but uses qualitative data from interviews with employees and documents.	High
Readiness	The method was designed for a qualitative investigation and analysis per organization, not for comparison in a benchmark. Note however that the method of Bedell is an important part of this method.	Low
IT benefit typology	Due to the in-depth investigation and analysis of the organization in relationship to the quality of information Strategic Match, Competitive Advantage and Operational Support are measured.	High
TCO categories	The work environment and applications are extensively investigated. IT management, LAN, WAN and speech applications are investigated less thoroughly.	Medium

Benchmarking Organizational Performance

See paragraph 3.6.6 for a description of the method.

Criterion	Investigation	Score
Interpretation	Insight into current situation based on quantitative analysis and best strategy to follow based on statistical database. However, the method measures the entire organizational performance; the focus is not primarily on IT.	Medium
Generic applicability	The dependent variable is profit, so the method cannot be applied for non-profit organizations.	Low
Effort	No clear information is given on the data gathering effort, although it is mentioned that managers should not put too much effort in data gathering, so there may be a risk of having to invest a lot of effort.	Medium
Data reliance	The method relies on specifically defined organizational variables used for statistical analysis.	Low
Readiness	The description of the calculation and process given is good, but the statistical database is not public. A new database should be built, which will take a lot of effort.	Low
IT benefit typology	The method uses IT spending as independent variable for IT.	Low
TCO categories	The focus is on cost, with only the overhead spending on IT used.	Low

BtripleE

See paragraph 3.6.7 for a description of the method.

Criterion	Investigation	Score
Interpretation	The benefits of IT are measured and interpreted at different organizational levels; many existing theories and measures are included; the framework can be used to create a method specific to a context.	High
Generic applicability	Depending on what indicators and measures from the framework are chosen, it can be applied for all organizations.	High
Effort	The effort depends indicators that have been chosen, although for measuring the effectiveness and effectivity of IT supply the method will take a lot of effort.	Medium
Data reliance	Depends on the indicators that have been chosen, although the indicators for the Business Value of IT rely on availability of specifically defined financial data.	Medium
Readiness	The framework should be implemented for a specific context, in this case: benchmarking IT benefits in a single industry.	Low
IT benefit typology	Measures Strategic Match and Competitive Advantage ("Business Value of IT") and Operational Support ("Effectiveness of IT"), including the benefit from IT Infrastructure.	High
TCO categories	Measurements for the benefit of all TCO categories are present in the framework.	High

Appendix B: Details of the designed instrument

This appendix has been omitted for confidentiality reasons. Please contact the author or M&I/Partners for a request of the contents.

Appendix C: Interview structure and topics

This appendix presents the interview structure and topics for the empirical study. Since the extended case method was used for the interviews, not all topics and questions have been used in each interview, but the researcher adapted the interview to each interviewee's expertise.

The following topics were included in the interviews:
1. Introduction of the interviewer, research subject and context.
2. Determination of available time for the interview.
3. Asking permission for recoding and transcribing the interview. Mentioning that the interview results will be confidential and the results anonymised in the final report.
4. Introduction of the interviewee: organization, function and relevant background information.
5. Exploration of the interviewee's ideas on IT benefits, IT value and the evaluation and benchmarking of those.
6. General introduction of the goals, conditions and conceptual model of the IT benefits benchmark instrument.
7. Depending on the situation: investigation or discussion of the business process and IS model.
8. Discussion of the data gathering model, by means of a Microsoft Excel file and printed manual. The focus of the discussion was depending on the situation.
9. Depending on the situation: completing a part of the data gathering model.
10. Depending on the situation: discussion of example result figures.
11. Evaluation: general impression of the instrument, strengths and weaknesses. Depending on the situation: departments and employees to involve in the benchmark and effort needed to gather data.

Appendix D: Business process and IS model

This appendix has been omitted for confidentiality reasons. Please contact the author or M&I/Partners for a request of the contents.

Appendix E: Result calculation and presentation format

This appendix has been omitted for confidentiality reasons. Please contact the author or M&I/Partners for a request of the contents.

Appendix F: Estimation of effort and cost

This appendix has been omitted for confidentiality reasons. Please contact the author or M&I/Partners for a request of the contents.

Expertise: Strategisch management van ICT, Sourcing en shared service centers, Risico- en kwaliteitsmanagement, Kosten en baten van ICT, Toepasbaarheidsonderzoek van nieuwe ICT, E-klantdossiers, Breedbandinfrastructuren en -diensten, ICT voor klantcontactcentra, mid- en backoffice, Documentmanagement-, workflowmanagement- en bedrijfsvoeringssystemen, Business process management en service-oriëntatie