

Planning and justifying investments in information technology : a framework with case study illustrations

Citation for published version (APA):

Deitz, R. M. H., & Renkema, T. J. W. (1995). Planning and justifying investments in information technology : a framework with case study illustrations. In A. Brown, & D. Remenyi (Eds.), *second European conference on information technology investment evaluation, Henley Management College, Greenlands, Henley-on-Thames, U.K., 11-12 July 1995* (pp. 28-41). Operational Research Society.

Document status and date:

Published: 01/01/1995

Document Version:

Publisher's PDF, also known as Version of Record (includes final page, issue and volume numbers)

Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
- The final author version and the galley proof are versions of the publication after peer review.
- The final published version features the final layout of the paper including the volume, issue and page numbers.

[Link to publication](#)

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal.

If the publication is distributed under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license above, please follow below link for the End User Agreement:

www.tue.nl/taverne

Take down policy

If you believe that this document breaches copyright please contact us at:

openaccess@tue.nl

providing details and we will investigate your claim.

Planning and justifying investments in information technology: A framework with case study illustrations

Rob M.H. Deitz and Theo J.W. Renkema

Graduate School of Industrial Engineering and Management Science,
Eindhoven University of Technology, PO Box 513, 5600 MB Eindhoven
The Netherlands

Despite the continuous attention for the planning and justification of investments in information technology (IT), IT investment decisions remain difficult in terms of assessing their associated costs, benefits and risks and effectively managing the underlying decision making process. The number of methods which aim to support these decisions is large and increasing. Empirical evidence shows, however, that in many organizations *ad-hoc* approaches towards IT investment decisions are most common. This paper examines two possible reasons for this gap between theory and practice. The first is that the prevailing methods almost exclusively take formal-rational arguments into account, without proper recognition of the complexity and diversity of IT investment decisions in a wider organizational context. A second reason lies in the lack of attention for the several layers of investment decision making and their interdependence. In response to this, a multi-perspective framework is presented which distinguishes between three layers and three dimensions of decision making. This framework is applied in an analysis of two case studies, which illustrates the current and potential role of methods for planning and justification. This analysis supports the arguments put forward earlier. Guidelines are provided for the design and adoption of methods for IT investment planning and justification.

1 Introduction

Organizations have become increasingly dependent on information technology (IT) and are confronted with many new and fast developments in this field. Over the past thirty years, IT investments have increased considerably. For example, IT investments account for about 3,7% of the gross national product in the Netherlands (1993 statistics, with computer-applications in manufacturing excluded). This share is expected to increase in the coming years. Dutch surveys indicate that there is agreement among practitioners on the strategic importance of IT for almost every company; nevertheless cost-control of the IT function is still perceived as critical currently (e.g. Mantz *et al.*, 1991; Price Waterhouse, 1993). It is claimed that many large organizations spend up to fifty percent of their annual capital expenditures on IT (see e.g. Earl, 1989; Willcocks, 1992). However, economic data give no conclusive answer as to the contribution of IT to organizational performance (for a review of this paradox see Brynjolfsson, 1993; Wilson, 1993). This has made senior management unreceptive towards 'act of faith' investment decisions and urged them to assure that proposed investments give value for money, which is proving difficult because of:

- the high, difficult to estimate and often hidden costs of IT investments;
- the problems with evaluating and measuring benefits of IT investments;

- the substantial risks (financial, technological and organizational) which are often involved with IT investments.

In spite of the prevailing call for methodic support, the apparent plethora of methods, techniques and guidelines for IT investment planning and justification does not seem to be employed in decision making practice. Current practice is still dominated by highly unstructured and *ad-hoc* approaches, as will be shown in the next section. The subsequent section gives an impression of the many methods which are available. It is suggested that two main reasons may account for the apparent discrepancy between theory and practice. The prevailing methods almost exclusively take formal-rational arguments into account, without recognition of the complexity and diversity of decision processes. Further, there appears to be little attention for the organizational context of decision making. In response to this, section four presents a framework which distinguishes three layers and three dimensions of decision making. This framework is applied in the in-depth analysis of two case studies on planning and justifying IT investments. This analysis provides support for the claims made earlier and guidelines for the design and adoption of methods which intend to support IT investment planning and justification in practice.

2 Empirical evidence of IT planning and justification

Several researchers have studied IT investment decision making practice. Some did so by using a survey approach (e.g. Bacon, 1992; Yan Tam, 1992; Willcocks & Lester, 1993; Ballantine *et al.*, 1994). Others tried to gain insight by case studies (e.g. Currie, 1989; Weill and Olsen, 1989; Symons, 1990; Farbey *et al.*, 1993). Both approaches are important to gain insight into the way these decisions are handled with in practice and the experienced problems. Whereas the first approach is mainly aimed at generating generalisable evidence on important aspects, the second approach is used to gain insight in the complexity which is encountered in practice.

The following studies illustrate the survey approach:

- Yan Tam (1992) found in a survey among 134 IT managers, that financial techniques for capital budgeting (like the net present value technique or the payback period) play a secondary role in decision making. It appears further, that simple techniques like the payback period are preferred over the more sophisticated techniques like net present value, although sophisticated techniques are theoretically preferable. The strategic contribution of projects was mentioned as the most important criterion in decision making. Estimating costs and benefits was found difficult. Finally, Yan Tam concluded that decision making power for selecting or terminating projects depends on the type of decisions and the relative importance of projects.
- Bacon (1992) interviewed managers from eighty large organizations and concluded that 'support of explicit company goals' was regarded as the most important criterion when deciding on IT investments. This criterion is followed by a financial criterion (Internal Rate of Return) and 'support of implicit business objectives'. Twelve other criteria were used, depending on the type of project.
- Willcocks and Lester (1993) found in a survey among British companies that a majority uses the same justification method for all investments. Most organizations use financial techniques for analysis only at the beginning of a project. The researchers further noticed that user involvement in decision making was very limited. They also found that the majority seemed to be satisfied with their evaluation practice.
- Ballantine *et al.* (1994) surveyed 97 British companies to gain deeper insight on the use of financial techniques in making IT investment decisions. They found that financial techniques (especially Cost Benefit Analysis and Payback) are widely used in IT investment decisions. The major problems which are encountered in practice are the identification and quantification of benefits. The majority of respondents seemed to be rather satisfied with the way in which decisions are evaluated using these financial techniques (far less than 20% reported not to be satisfied).

The following examples of the case-study approach are given:

- Weill and Olsen (1989) report on six mini-cases which were carried out in order to identify the factors which influence IT investment decisions and to address the relationship between IT investment and organizational performance. The most important findings concern aspects such as the definition and tracking of IT investments, IT performance and the relationship between firm goals and IT investments. Political considerations appear to be of major importance and the way investments are handled varies across companies. Integrated coordination of IT investments is regarded important, but the 'tracking' mechanisms used to achieve this are not yet optimal. This also holds for return calculations.
- Currie (1990) studied twenty decisions on investments in Computer Aided Design (CAD), showing that those who initiated the investment-proposals regarded the (quantitative) justification procedure largely as a 'ritual'. Responsible managers thought of a qualitative justification as unacceptable. This communication gap forms a rather unfavourable condition for systematic decisions. As a result, decisions in these twenty cases were being made in a rather ad-hoc way; 'rational' arguments played a very limited role.
- Symons (1990) concludes after an in-depth case study that information systems cannot be evaluated in isolation from the organization: "Evaluation is inextricably bound up with the content, context and process of organizational change".
- Farbey *et al.* (1993) studied sixteen IT investment projects in different

organizations. Less than half of the organizations said to have an IT strategy and half of them did not have a standard approach for justifying investments. In many cases, the role of the 'project champion' in justifying proposals was crucial; often there was no IT budget specified. Only half of the organizations attempted to quantify benefits. In twelve cases, the justification-approach was chosen in an ad-hoc manner.

These empirical studies lead us to the following conclusions:

- 1) The financial perspective seems to be of 'statistical' importance (as surveys indicate), but only of limited impact in practice; strategic arguments are perceived as critical.
- 2) Decision making in practice, as it is shown by the reviewed case-studies, is a rather unstructured exercise, where rational arguments are of limited importance and often serve a symbolic role.
- 3) The many IT specific methods for supporting decisions on IT investments are rarely used and it is even argued that the actually used justification procedures are mere rituals (Currie, 1990), do not meet analytical standards (Willcocks & Lester, 1993) and are often of an ad-hoc character (Farbey *et al.*, 1993).
- 4) Despite these deficiencies, as they are often reported, there is no clear evidence that practitioners are particularly dissatisfied with their current approach (e.g. Willcocks & Lester, 1993; Ballantine *et al.*, 1994).

Although a financial cost-benefit analysis is thus often carried out, it becomes clear that non-quantitative (e.g. strategic) and non-rational aspects (politics) are of major importance in IT investment decisions. The use of the available specific methods for supporting IT investment analysis is only occasionally reported. These findings are in many ways comparable to what is reported in research on capital budgeting in general. The complexity of investment decisions was described by Bower (1970) and more recently by Butler *et al.* (1993) and in this respect, IT investment decisions are not much different from many other types of investment decisions.

3 Methodologies for IT investment planning and justification

The findings from the previous section show a heavy contrast with the range of available methodologies. Traditional methods for the planning

and justification of investments are deeply rooted in the finance based investment analysis (e.g. Bierman & Smidt, 1988; Brealey and Myers, 1988). These methods most often focus on the cash flows resulting from an investment and surveys on capital budgeting practices show (e.g. Pike, 1988) that these methods have been widely adopted by organizations.

The pervasive and often strategic role of IT applications in modern organization has been challenging the relevance of the traditional financial methods. Nowadays, IT investments typically have many long-term and intangible effects on business performance (Parker *et al.*, 1988; Scott Morton, 1991; Powell, 1992) and influence the organization through wider organizational and human impacts (Hochstrasser, 1990; Willcocks & Lester, 1993). The limitations of the financial methods for the justification of these IT investments, are well expressed by Kaplan (1986) arguing that "conservative accountants who assign zero values to many intangible benefits prefer being precisely wrong to being vaguely right". This has resulted in the development of numerous IT specific methods. Overviews of these methods have been given in the literature (e.g. Meredith & Hill, 1987; Powell, 1992; Renkema & Berghout, 1994; Farbey *et al.*, 1994).

For our purposes, the available methods will be briefly summarised and assessed using a model which distinguishes three levels of investment decisions. In this model (see figure 1, adapted from Deitz 1994a), the planning and justification of investments provides the linkages between strategic thinking and organizational performance through decisions on investment budgets, investment portfolios and individual investments. The IT domain (right) and (at the left) the business domain (see Parker *et al.*, 1988) are highly intertwined through impact and alignment of strategy and resource allocation.

Level 1, Individual investment projects:

On this level, many 'traditional' financial methods are available such as the payback period, return on investment (ROI), the internal rate of return (IRR) and the net present value (NPV). Generally, the latter two methods (often referred to as 'discounted cash flow' (DCF)) are considered as theoretically superior as they take the time value of money into account. What these methods have in common, is the view of organizational goals as primarily financial, aimed

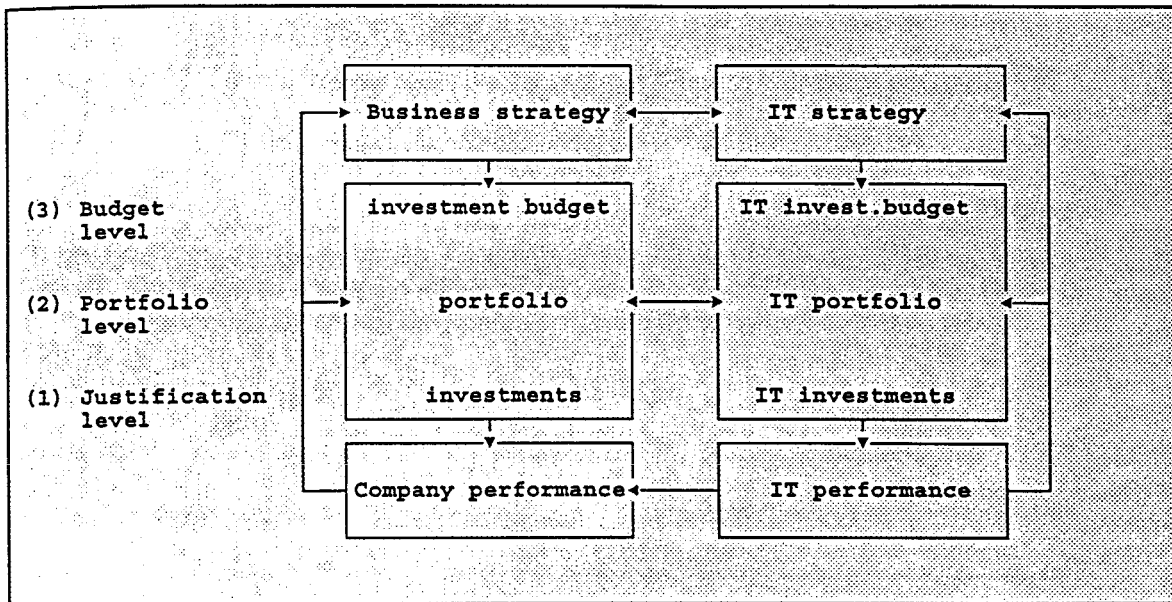


Figure 1. Levels of investment decision making within its organizational context

at increasing shareholder value. These methods can be appended with approaches which account for uncertainties, risks and flexibility like risk-adjusted discount rates, certainty equivalents and the use of an options-approach (e.g. Bierman & Smidt, 1988; Dos Santos, 1991). In addition to this, these methods can be used in a more dynamic way by using scenarios, perform sensitivity analyses and simulate the effects of different parameters.

As a complement or alternative to the financial methods, which can only limitedly contribute to the assessment of the intangible and difficult to measure costs, benefits and risks of IT investments, several IT specific methods have been proposed. Widely cited is the 'Information Economics' approach (Parker *et al.*, 1988) which assesses IT investments on a whole range of financial and non-financial criteria. In addition to this, many methods are available to support decisions on individual IT investments. It is beyond this paper to review them in its entirety, but table 1 is provided to illustrate some of them.

Level 2, The portfolio-level:

What characterises decision making on IT investments on this level, are the many interdependencies between individual investments and department (local) budgets within an organization. The available methods for planning at this level are generally 'ranking' or 'portfolio' methods. At this level, it is equally difficult to decide on the basis of strictly financial measures. Further problems with the financially advised

profitability index method (present value divided by size) concern analytical imperfections connected with e.g. comparing investments of unequal sizes and lifetimes.

Some methods which were discussed on level 1 can also be used on this level (e.g. the methods of Parker *et al.*, 1988 and Hochstrasser, 1993). Both methods assign a numerical value to projects which enable the determination of priorities. Buss (1983) developed a eight-step portfolio method for ranking 'computer projects'. After a financial ranking, a ranking of intangible benefits and a ranking according to technical objectives, priorities should be determined using a scoring-approach. Another method to be used on this level is the method of Bedell (1985). A central premise of Bedell's method is the balance between 'quality' and 'importance'. Portfolios are used to assess which projects and departments should be invested in.

An additional approach to plan and justify IT investments on the portfolio-level is the use of classifications of investment categories. Investments which are necessary or urgent (e.g. legally or for capacity requirements) can be excluded from the considered portfolio. Further, replacements and maintenance can be distinguished from more innovative projects.

Method (reference)	Approach
Benefit Valuation (Sassone, 1988)	Sassone describes several analytical methods for quantifying the economic benefits of IT investments, especially if cost-savings are concerned.
Information Economics (Parker <i>et al.</i> , 1988)	The use of a method encompassing 11 investment criteria (business and technology oriented) in order to determine and compare (ranking) the attractiveness of IT investment proposals.
Strategic investments and the use of decision trees (Clemons & Weber, 1990)	Clemons & Weber describe approaches for supporting the justification of strategic IT investments. They mention option-theory, the use of decision-trees and sensitivity-analysis.
The use of option-theory for IT investments (Dos Santos, 1991)	Calculate (financially) the option-value of an investment in order to be able to evaluate the benefits of flexibility and the contribution of the investment to future investment opportunities.
'X-Gap (Kaplan, 1986; Wilkes & Samuels, 1991)	Wilkes and Samuels' methodology (aimed towards Advanced Manufacturing Technology) starts with a strategic assessment. In case of a positive outcome, the NPV is calculated. If the NPV is negative (X-Gap), management should decide whether the non-quantifiable benefits sufficiently compensate for this. Kaplan's approach for justifying CIM is comparable to this approach.
Quality Engineering (Hochstrasser, 1993)	Methodology for justifying and prioritising investment proposals directed towards improving the quality of business processes.

Table 1. Some illustrative specific methods for the justification of individual IT investment projects

Consequently, the priorities of the residual investments can be set quicker and easier.

Furthermore, budgets are often assigned to business units or business functions after which priorities can be determined per function or business unit. This last point shows the close relationship between the budget level and the portfolio level.

Level 3, the budget-level

Planning and justifying IT investments at the budget level can be seen as a portfolio or prioritisation decision at a higher level, by prioritising budgets for different organizational functions (e.g. marketing, personnel or IT) or for business units. This decision depends highly upon the strategic goals and the available funding. The theoretical, financial view on determining capital budgets states that every investment earning a return which exceeds the cost of capital will attract funding, so the budget-problem would not exist in the light of adequate project justification. Practice, however, can be different. A so called 'capital rationing' situation may exist, which can be partly due to the difficulty of determining the financial consequences of investments and the related uncertainties for investors. For IT, two

types of budgets can often be distinguished. First there is the (IT) capital budget which determines the amount of capital which is available for capitalised (IT) investments (especially). Beside this, there can be a budget for in-house IS development and investment-related support. This budget is often not capitalised but expensed (Diebold, 1990) although it is essentially a capital investment since it is used to generate systems which should provide long-term benefit for the organization. Budget decisions are difficult to support methodically. In practice, many heuristic rules such as "last years budget + X%" (incremental budgeting) can be observed. The budget for systems development and the IT capital budget will often compete directly with non-IT alternatives, which makes the problem of deciding on this level even more problematic.

One IT specific method that can be used for supporting decisions on the budget level is given by Van der Zee and Koot (1989). Their 'IT Assessment' method uses several financial and non-financial ratios to compare organizational performance with industry averages (benchmarking). They mention budgeting as one of the activities which can be supported by benchmarking. Unfortunately, industry benchmarking

king-data are not always available. If they are, they can give some indications on the relative position in the use of IT of the company. In this approach, IT costs are expressed in ratios and compared with measures of competitors or of an industry. These ratios can also be used for an historic analysis of an individual organization. Relevant ratios are for example:

- IT costs against total number of employees;
- IT costs against turnover;
- IT cost components against each other.

Portfolio methods, discussed on level 2, can also be used on this level. Using portfolios, the relative importance of specific budgets within the entire IT budget can be assessed and decisions can be based on this. We have, however, not found methods enabling the weighing of functional budgets (e.g. the IT budget versus the marketing budget).

4 Building a Multi-Perspective Framework

The previous section has shown us that there are many different methods (general and IT specific) available for supporting decisions on IT investments on different levels. One of the 'raisons d'être' of IT-specific methods are the severe shortcomings of 'non specific' financial techniques. This myriad of methods contrasts with what we have concluded in section two, where surveys and case studies showed that practitioners extensively use financial techniques, decision making practice is often of an ad-hoc and unstructured character and seldomly seems to bother about IT specific techniques. Only very little (e.g. Alsen & Van der Linden, 1994) has been published on organizations reporting the use of IT specific instruments.

It is contended here that there appear to be two major reasons for the existence of this gap. The first reason is that all methods focus primarily on aspects of 'content'; i.e. they provide measures for estimating costs, benefits and risks; the 'rational' dimension of investment decisions. This is somewhat surprising, since it is well known that decision making practice is not a purely 'rational' exercise. This means that intuition and bargaining also play an important role in decision making processes which may have leadtimes of several years (e.g. Currie, 1989; Butler *et al.*, 1993). Decision making practice involves multiple phases of justification in which generally many stakeholders are involved. Ideally, each decision making phase will lead to increased

knowledge about the impacts of the investment and to more commitment among participants. In Deitz (1994b), insight into the complexity of IT investment decision making is provided by a primarily descriptive model. This model shares some characteristics with other models which have been used in studies of investment decisions in general (e.g. Butler, 1993) and IT investments in particular (e.g. Symons 1990; Renkema, 1995). The model describes the close interrelatedness of aspects of content, process (decision-phases, timing etc.) and organization (centralisation, formalisation etc.) as relevant dimensions of decision making. Decisions on IT investments are thus not only the result of an analysis of investment criteria but result from complex interactions between the content (what criteria are used), process (how is the decision process structured) and organization (who is involved and how) of decision making. A predominant role of the content dimension can thus lead to a unrealistic view on decision making practice. Only few methods (e.g. Bedell, 1985; Parker *et al.* 1988) cover some aspects other than the content of the investment justification.

A second characteristic of many methods is that most of them are limitedly 'context-sensitive'. They focus on the way by which IT investment decisions should be made, without consideration of the trade-offs which are made in practice between IT and non-IT proposals, without regarding the hierarchy of decision levels and without taking specific company-characteristics (like the strategy or culture) into account.

In order to achieve a structured and more realistic picture of IT investment planning and justification in practice, the hierarchy which was described in figure 1, is combined with the three dimensions mentioned earlier. This results in a framework which distinguishes interrelated levels and aspects of IT investment planning and justification (figure 2; adapted from Deitz, 1994a). The content-dimension (the left column) represents the possibilities for employing the methods available on the levels discussed in section 3, since these approaches focus on the content-dimension. The foregoing does not question the theoretical correctness of the methods, but argues that more aspects should be considered in order to apply them successfully in decision making practice.

design variables of systems for planning and justifying IT investments	content	process	organization
budget determination	criteria and restrictions for determining IT budgets	process of determining IT (capital) budgets	allocation of budget responsibilities
prioritisation	criteria for ranking IT investment proposals	characteristics of the prioritisation process	responsibilities and power for setting priorities
justification	investment evaluation criteria	process for evaluating and authorising IT investments	project evaluation responsibilities

Figure 2. Design variables of systems for planning and justifying IT investments

5 Case studies on planning and justifying IT investments

This section discusses two case studies in terms of the model which was presented in figure 2. The case study method seemed the preferable approach to generate detailed insight into the interaction between the decision-levels and dimensions. For each case, a structured description and analysis is given. Next, a comparison is made and it is shown how prior arguments are supported by the case findings. For reasons of confidentiality, the names of the companies had to be changed. Both cases resulted in detailed case-reports which were discussed with the organizations for possible corrections. In each case, interviews were held with key-persons (information management, financial management, business management, users, project managers) and many documents were studied on IT strategy, on investment projects, financial information and relevant correspondence. Data were collected on:

- the firm's strategy, structure and processes;
- the formal investment planning systems;
- information management practices;
- planning and justification of IT investment decisions (budgets, priorities and individual investments) and its effectiveness.

5.1 Internat. Consumer Goods (ICG)

Introduction and context:

ICG is an international producer of food, cosmetics and textiles. The strategy is directed towards global expansion and improved financial returns. The organizational structure is product- (first

level) and geographically oriented (second level). On both levels, the units operate as profit centres. The IT strategy is directed towards achieving effective management and operations support in a cost-efficient way. There is a central IT department (about 80 employees) reporting to the Vice-President Finance and coordinating local IT functions and the development, implementation and maintenance for the business units. IS planning at corporate-level is done regularly. The IT department is also regarded as a profit centre.

Financial planning and control is very important at ICG. Return on investment (ROI) is the major performance-indicator for managers and reported monthly. Annually, a three-year plan is made, including a capital budget in which larger investments are already foreseen. This plan serves as input for the annual plan, which specifies investments and budgets individually and is monitored closely (monthly reports) by topmanagement. For each investment (larger than \$ 2.500), a 'capital request' (CR) has to be sent to division controlling or corporate controlling (depending on the size of the investment), who control the approval procedures. Since business units are relatively independent, each one has its own way of structuring information management. For each unit, however, the corporate IT director has an important advisory role.

IT investment planning and justification at ICG:

Budget level: major IT investments for each business unit should be specified in the long term plan, or in the operating plan. Investments which are not specified in these plans prior to the CR require a more strict authorization procedure. The

information management department uses benchmarks (e.g. IT costs per employee) in order to monitor the budget development within business units. The total IT budget (maintenance, development, overheads, hardware) has to compete on the business unit level with other budgets of other functional departments (marketing, logistics). The IS-development budget is determined by the size of the available development staff, by the requests (as summarised in the information plan) and by a discussion (and some negotiation) of topmanagement and department managers. For the capital budget, IT hardware has to compete with other capital investments.

Portfolio level: IT management advises to set priorities for application-development by using a critical success factors approach. Budget determination and prioritisation are closely related. The total budget for IS-development is divided among several functional areas: marketing systems, administrative systems and production systems. Important criteria for prioritisation are: urgency, strategic importance and personal preferences. Priorities for IS-development are determined in a discussion as part of the (bi-annual) IT plan (with a 3-year horizon) by the IT department after consulting managers of all user-departments involved. Some negotiation is involved in this process. One of the interviewees stated "several years ago we tried a more quantitative and structured approach to prioritisation but this did not result in better solutions."

Project level: for each IT investments including hardware or purchased software, a CR is necessary. A CR formally contains at least a financial summary, a management summary letter (including ROI, other arguments for justification, a sensitivity-analysis on key-variables and alternatives considered) and an incremental financial analysis. Standard forms should be used. For larger IT investments (above \$25.000) the corporate IT director is expected to advise the corporate controller. Locally, it is the IT manager or the controller who prepares the request, possibly advised by the corporate IT department. Each IT investment should follow the CR-procedure after business unit management approval. Although there are very strict financial guidelines (every CR has to include ROI, NPV, IRR and a payback-period), CR's are said to be seldomly rejected on the basis of financial arguments. Each CR concerning an IS also has to be authorised by the central IS-department. It was formally stated in the controllers' guidelines that

post-evaluation should be carried out for larger investments. Internally developed IS do not require a CR. They are often justified qualitatively.

At ICG several smaller and larger IT investment proposals were studied, which showed that the IS-manager and the financial manager actually appeared to be using their authorization-power in order to have the proposals properly justified by the initiators. It was, however, said that proposals would be seldomly rejected in the CR-stage. By the time the CR-stage was reached, sufficient commitment had already been built. This was also due to the fact that, for larger investments, the IT department would be already involved as an advisor. Furthermore, a rejection would limit the business unit director's discretion which would be 'contrary' to the 'entrepreneurial' culture which was stimulated. Larger IT investment decisions which were studied, with a lead-time of several years, showed multiple stages of design and evaluation. Budget-limitations would sometimes mean that investments had to be postponed. The larger investments were closely related to specific organizational changes and strategic goals. System evaluations (in the pre-CR stage) would be made using a financial cost-benefit analysis and an analysis on qualitative measures which would result from strategic goals and performance measures and system characteristics. Smaller investments were justified mainly on qualitative grounds and had to compete within the available development-budget. Intuition and negotiation were often said to be important on several decision levels.

Most interviewees at ICG were rather satisfied with the way by which resources were currently allocated (on all levels). Smaller problems which are experienced at ICG are the formality, and the fact that costs are sometimes exceeded (with about 10%, due to additional training or changes). This was said to occur because users often show too little involvement during development. In most cases, the expectations of new IS would be largely realised.

5.2 First Dutch Insurance (FDI)

Introduction and context:

First Dutch Insurance is the Dutch branch of a financial services multinational, headquartered in the Netherlands. FDI employed about 3500 people in 1991 and owns six (semi-) autonomous business units (some are subsidiaries), offering a whole range of banking and insurance services.

In addition to the business units (product/market combinations) there are several central service units, including an IT service unit. Business units also have an IT department, mainly employing system development personnel. A strategic emphasis is being put on life insurance and related products, but FDI is also active in other financial services. FDI aims to preserve its identity as an insurance company, convinced of the advantages of specialisation within the insurance market. Information technology is seen as an important asset for the support of the business processes. This is manifested in the many information systems in both the production processes and the administrative processes. Furthermore, IT is being used for the redesign of its distribution channel with intermediaries and customers.

Yearly, each business unit of FDI states its business and IT strategy in a formal business plan and a formal IT plan. Both formal plans cover a period of three years. The formal business plans are consolidated by the financial controlling department, while the formal IT plans are consolidated by the IT department. Both departments will give their professional opinion with respect to the strategy. Decision authority rests with senior management, but business units have a large discretion in arguing that execution of the proposed plans is necessitated by their overall business goals in terms of costs, profits and customer service.

IT investment planning and justification at FDI:

Budget-level: Within the business and IT planning cycle of the business units described above, there is no separate decision on the size of the IT budget. The total IT budget is reflected in the total budget which is established for all business resources. The business units 'collect' their project proposals, which are summarised in the IT plan. A separate budget is established for the central IT service unit. This includes the shared basic equipment, hardware, software and several IT services (e.g. internal consultancy assignments). The realised costs (actual use) are based on a tariff and allocated to the different business units. External benchmarking is done (sharing data with competitors), but this has no formal role in the budgeting process.

Portfolio level: The projects which are proposed in the formal IT plans of the business units, are also analysed through the use of a portfolio technique. This portfolio is portrayed with two axes: one with the total 'benefits' of the projects and one with all 'risks' of the projects. These are

derived through the use of a variant of the Information Economics method (Parker *et al.*, 1988). Although it has been attempted to give this method a formal status, its use is not embedded within the ongoing decision processes. As such, the initial goals of the introduction of the method are not realised. These goals were to arrive at a more structured evaluation of IT investment initiatives and to reduce the political dys-functionalities.

Project level: All proposed projects of the IT plan are subject to a formal cost-benefit analysis, which is aimed at a statement of the expected incoming and outgoing cash flows. All projects are also evaluated in terms of the decision criteria of the variant of the Information Economics method. This seems to be working relatively well; business units are willing to use this method for a rough, internal screening of project impacts. Separate budgets can be given to initiatives which are considered of strategic importance (for instance in the case of business process re-engineering). This is to be decided by senior management.

FDI can be characterised as an organization in which a relatively strong formalisation of the planning and justification is strived for. This is realised through establishing procedures on all levels of decision making. There is no formal decision on the size of the total IT budget, but this is formalised through the general budgeting process. The tendency to formalise can be traced back to the financial discipline of this organization. The existing procedures for planning and justification very much reflect the need to coordinate and balance central needs and priorities against local goals and strategies of the business units. FDI has, however, been aware of the difficulties encountered when using a strictly financial method. The implementation of a method for decision making on the level of the portfolio and individual investments has been very difficult. Involved employees do not always see the use of devoting time and effort in a detailed examination of project impacts (especially on the portfolio level) and suggest that the method is too much open for manipulation of results. Consequently, the actual role of this method in decision making practices of FDI can be questioned. Existing decision making practice is still highly dependent on the role of financial justification and ad-hoc arguments and priorities.

A detailed analysis (Renkema, 1994) of two infrastructural IT investments (which were not subject to the introduced method) showed that

explicit investment arguments, in terms advantages, disadvantages and risks, were hardly used. Formal approval was however realised through a formal cost-benefit analysis. In these two cases, the investment decisions were largely controlled by the process and organization of the decision. Political elements, ensuing from different interest and priorities of the stakeholders also had their influence throughout the whole decision making process.

6 Case Study Analysis

The ICG case is an example of a situation where a non-sophisticated approach (i.e. without much use of IT specific techniques) appeared to be effective in a large and complex organization. The decentralisation of investment decisions, combined with a centralised IT functional expert influence and a centralised controlling influence, ensured that screening and some coordination on corporate level of IT investments is achieved. On a local level, the complexity and scale of decisions is thus reduced which reduces the need for sophisticated IT prioritisation and budgeting techniques. It was the responsibility of local management to ensure the strategic 'fitness' of a project, which would 'meet' the demands of 'entrepreneurial' management. Decentralisation was used as a means to reduce complexity of prioritisation and strategic project-considerations. Expert-involvement of the IT department and corporate controlling assured that certain standards (financial and technical analysis) were met by investment-proposals. The decision making process on larger IT investments, which would sometimes take several years, showed several stages of justification. The formal procedure did, however, not start before sufficient commitment had been realised. For smaller and sometimes for larger investments, prioritisation can lead to postponing projects and sometimes to their becoming irrelevant in the light of changes within the organization. Prioritisation and budget restrictions appeared often to be used as a way to avoid the implementation of systems, without having to argue on the justification level (individual projects) where qualitative benefits were an important decision criterion.

In the FDI case, IT investment planning and justification are still highly influenced by the role of the financial discipline and financial justifications. All projects are subject to a financial cost-benefit analysis and budgeting decisions are also largely made on the basis of general cost-minimisation and profit maximisation. If a project is considered

'strategic', a separate budget may be established. Investment plans are coordinated and consolidated by central financial and IT departments, in order to give their professional opinion and guarantee the overall goals of FDI. Within this organization, control of IT investment planning and justification is very much realised through its organization and process (in relation to the content dimension). This role of the financial discipline within the organization is strong, while the shared IT department has a supporting role. The largely financial content dimension is also open to ad-hoc arguments, although the notion 'strategic' seems to raise a common concern. This control through organization and process has lead to relatively flexible decision making practices on the content dimension, with a strong historical legitimacy. This is furthermore reinforced by the business unit structure, which contrasts with detailed prescription of relevant investment arguments by central departments. Difficulties with the use of the justification procedure on the level of the portfolio and individual investments seem to be influenced by the perceived need of large autonomy in the business units, and by the possible reduction of the historically financial and in fact highly ad-hoc character of the used evaluation criteria.

A cross case comparison (see also table 2) shows that the IT strategies of the firms are quite different. While ICG generally concentrates on effective and efficient management support, FDI is clearly also oriented towards innovation. Nevertheless, decision power on IT investments is very decentralised in both organizations. Centralised coordination of investment planning and justifications is also strived for in both cases. Further similarities between the organizations can be found in the business unit structure and the fact that financial control mechanisms are rather strict in both cases. However, strategic and qualitative arguments played an essential role. At FDI, however, serious attempts have been made to establish a more sophisticated formal system, which might be attributed to the clear strategic role of IT.

The cases offer interesting findings which provide additional support for the arguments put forward earlier, for instance:

- Investment decisions in both cases showed that the way in which investment decision making is shaped very much depends on e.g. who is involved, and on the stage in the whole process of decision making. Financial arguments are important in later (formal) stages, whereas qualitative arguments are

Context and design characteristics	ICG (consumer goods)	FDI (financial services)
IT strategy (context)	IT is seen as a support technology for operations and management.	IT is essential for business processes and its use is rather innovative. Strategic initiatives are encouraged, e.g. through separate budgets.
Structure (context)	Geographical and product-oriented business units. Centralised IT-department.	Product/market units. Federal structure of central and local IT departments.
Content (design)	Standard financial arguments with limited impact. Qualitative aspects and technological feasibility are also addressed.	Financial arguments are formally important, appended with 'strategic' arguments. Decision maker do not like to give their flexibility in using ad-hoc argumentations.
Process (design)	Smaller projects start formally with a project-call. Budgets and priorities also influence the investment decision. Formal authorization procedure for hardware-investments. Priorities are set within the information-planning process.	Formal 'sophisticated' system of budgeting and authorization. Actual processes very much of an unstructured character. IT project planning with project call, topmanagement only decides on the overall business plan.
Organization (design)	Decentralised to the business unit level with some influence of central IT and financial departments.	Decentralised to the business unit level with formal central coordination. Large autonomy in investment decision making on a local level.

Table 2. Cross case comparison

rather dominant. The IS-department is involved from the 'technical' point of view; at first advisory, later on they assist topmanagement in deciding;

- Several interrelationships between the levels can be found. Evaluation and prioritisation were found to be closely related (and partially substitute to each other). Projects which were included in prioritisation were actually justified but might be postponed or cancelled due to budget restrictions, especially at ICG. Decentralisation of the budgeting decision leads to reduced complexity on the business unit level in both cases. The business unit structure seems to contradict with a detailed formal procedure on the corporate level.

We have not elaborated further on the relationship between IT-strategy and investment decisions (see e.g. Deitz, 1994a) nor on the relationship between characteristics of decision making and the perceived quality. The cases have illustrated the complexity of practice which, we feel, should be reflected in methodologies. The

framework proved to be useful to describe and analyse situations in practice.

7 Conclusions, Discussion and Future Perspectives

It has been argued that the apparent gap between the many methods for IT investment planning and justification and decision making practice, can be traced back to at least two factors. The first is that the prevailing methods almost exclusively take formal-rational arguments into account, without proper recognition of the complexity and diversity of IT investment decisions in a wider organizational context. A second reason lies in the lack of attention for the several layers of investment decision making and their interdependencies which can be distinguished in practice.

A multi-perspective framework has been proposed to overcome these difficulties. This framework distinguishes between the budget, portfolio and justification level of decision making and takes on all three levels the content, process and organization of decision making into account. In

support of this, the discussed case studies have given additional insight into possible causes of the discrepancy between theory and practice in this field.

The in-depth case analysis has enabled a thorough investigation of relevant aspects of investment planning and justification. The external validity of this empirical research is rather limited, but we feel this is compensated by its theoretical and conceptual relevance. The use of case studies seems to be a very appropriate research strategy, since current methods for IT investment planning and justification are not yet able to encompass the complexity of practice. Given the available theory in related fields (especially business economics and decision-theory), it should be possible to do case studies with a descriptive or explanatory character, or even to do action research.

The multi-perspective framework offers further possibilities to be used as a basis for prescriptive guidelines. The design of planning and justification approaches in practice can be structured with the aid of the framework. Currently, the framework is being used at the Eindhoven University of Technology for diagnostic purposes. For effective prescription a contingency-approach seems to be adequate, since aspects of organization and content of investment decisions are highly dependent upon the strategy, structure and culture of organizations. Contingency aspects were however beyond the scope of this paper.

Additional case study research is needed, in order to increase further understanding of the factors that shape decision making practices of planning and justification of IT investments. This can be seen as an important prerequisite for the development of new methods and the improvement of existing ones. Future survey research (especially when interviews are used) can be very helpful in gaining generalisable insight between the quality of IT investment decisions (more in terms of 'perceived satisfaction' than in terms of financial or technical measures) and the way decisions are arrived at. For this, a firm theoretical basis is required in order to find causal relationships.

References

Alsen R H and Van der Linden P G (1994) Evaluation of investments in Information Technology: Policy and practice at PTT Telecom BV. In *Proceedings of The First European*

Conference on IT Investment Evaluation (Brown A and Remenyi D, Eds.), 117-128, Operational Research Society, Birmingham.

Bacon C J (1992) The Use of Decision Criteria in Selecting Information Systems/Technology Investments. *MIS Quarterly*, September, pp. 335-353.

Ballantine J A, Galliers R D and Stray S J (1994) Information Systems/Technology investment decisions: the use of capital investment appraisal techniques in organizations. In *Proceedings of The First European Conference on IT Investment Evaluation* (Brown A and Remenyi D, Eds.), 148-166, Operational Research Society, Birmingham.

Bedell E F (1985) *The computer solution*; Dow Jones-Irwin, Homewood.

Bierman Jr H and Smidt S (1988) *The Capital Budgeting Decision*. Macmillan Publishing Company, New York.

Bower J L (1970) *Managing the Resource Allocation Process*. Harvard University, Boston.

Brealey, R A and Myers, S C (1988) *Principles of Corporate Finance*, McGraw-Hill, New York.

Brynjolfsson E (1993) The Productivity Paradox of Information Technology *Communications of the ACM*. Vol. 39, 12.

Buss M D J (1983) How to Rank Computer Projects. *Harvard Business Review*, pp. 118-119.

Butler R, Davies L, Pike R and Sharp J (1993) *Strategic Investment Decisions*. Routledge, London/New York.

Clemons E K and Weber B W (1990) Strategic Information Technology Investments: Guidelines for Decision Making. *Journal of MIS* 2, pp. 9-28.

Currie W L (1989) The Art of Justifying New Technology to Top Management. *International Journal of Management Science*, 17/5, pp. 409-418.

Deitz R M H (1994a) IT Strategy and Resource Allocation. *Paper for the 2nd SISnet Conference*, 26-28 september, Barcelona.

Deitz R M H (1994b) Deciding on IT-investments: Multiple Case Description of Current Practice and Implications. In *Proceedings*

of *The First European Conference on IT Investment Evaluation* (Brown A and Remenyi D, Eds.), 79-89, Operational Research Society, Birmingham.

Diebold Group Inc. (1990) *Evaluating Information Technology Expenses and Investments: Summary of findings*, Economics series 246E.

Dos Santos B L (1991) Justifying Investments in New Information Technologies. *Journal of Management Information Systems*, 7(4), pp. 71-90.

Earl M J (1989) *Management Strategies for Information Technology*. Prentice Hall, New York.

Farbey B, Land, F and Targett D (1993) *How to Assess Your IT Investment: a Study of Methods and Practice*, Oxford:Butterworth-Heinemann.

Farbey B, Land F and Targett D (1994) A Taxonomy of Evaluation Methods. In *Proceedings of The First European Conference on IT Investment Evaluation* (Brown A and Remenyi D, Eds.), 79-80, Operational Research Society, Birmingham.

Hochstrasser B (1990) Evaluating IT investments - matching techniques to projects. *Journal of Information Technology*, 5, pp. 215-221.

Hochstrasser B (1993) Quality Engineering: a new framework applied to justifying and prioritising IT investments. *European Journal of Information Systems*, 3, pp. 211-223.

Kaplan R S (1986) Must CIM be Justified by Faith Alone? *Harvard Business Review*, March-April, pp. 87-93.

Mantz E A, Kleijne D and Zijden F A P van der (1991) Planning and Realisation of Information Systems are Still Far Apart (in Dutch), *Informatie*, pp. 847-856.

Meredith J R and Hill M M (1987) Justifying 40
New Manufacturing Systems: a managerial approach, *Sloan Management Review*, Summer, pp. 49-61.

Parker M M, Benson R J with Trainor H E (1988) *Information Economics*. Prentice-Hall, Englewood Cliffs, New Jersey.

Pike R H (1988) An Empirical Study of the Adoption of Sophisticated Capital Budgeting Practices and Decision making Effectiveness, *Accounting and Business Research*, 18(72), pp. 341-351.

Powell P (1992) Information Technology Evaluation: Is It Different? *Journal of the Operational Research Society*, 43(1), pp. 29-42.

Price Waterhouse (1993) IT Opinion Survey; the Netherlands, *Computable*, December 24th, pp. 17-18.

Renkema T J W (1994) Decision making on Investments in the Information Technology Infrastructure (in Dutch), *Informatie*, theme issue on IT infrastructures, pp. 814-823.

Renkema T J W and Berghout E W (1994) *Methodologies for information systems evaluation at the proposal stage: a comparative review*. Working paper, Eindhoven University of Technology.

Sassone P G (1988) A Survey of Cost-Benefit Methodologies for Information Systems. *Project Appraisal*, 2, 73-84.

Scott Morton M S, Ed. (1991) *The Corporation of the 1990s*. Oxford University Press, New York/Oxford.

Symons V (1990) Evaluation of Information Systems: IS development in the Processing Company. *Journal of Information Technology*, 5, pp. 194-204.

Weill P and Olsen M (1989) Managing Investment in Information Technology: Mini Case Examples and Implications. *MIS Quarterly*, March, pp. 3-17.

Wilkes F M and Samuels J M (1991) Financial Appraisal to Support Technological Investment. *Long Range Planning*, 6, pp. 60-66.

Willcocks L (1992) Evaluating Information Technology Investments, research findings and reappraisal, *Journal of Information Systems*, 2, pp. 243-268.

Willcocks L and Lester S (1993) How do Organizations Evaluate and Control Information Systems Investments? Recent UK Survey Evidence. In *Human, Organizational, and Social Dimensions of Information Systems Development*

(Avison D, Kendall J E and DeGross J G, Eds.),
15-40, North-Holland, Amsterdam.

Wilson D (1993) Assessing the Impact of
Information Technology on Organizational
Performance, in: Banker, R.D.; Kauffman, R.J.;
Mahmood, M.D. *Strategic Information
Technology Management*, Harrisburg, Idea
Group Publishing, 1993.

Yan Tam K (1992) Capital Budgeting in
Information Systems Development *Information &
Management*. 23, pp. 345-357.

Van der Zee H T and Koot W J D (1989) I/T-
assessment. *Informatie*, pp. 837-851.