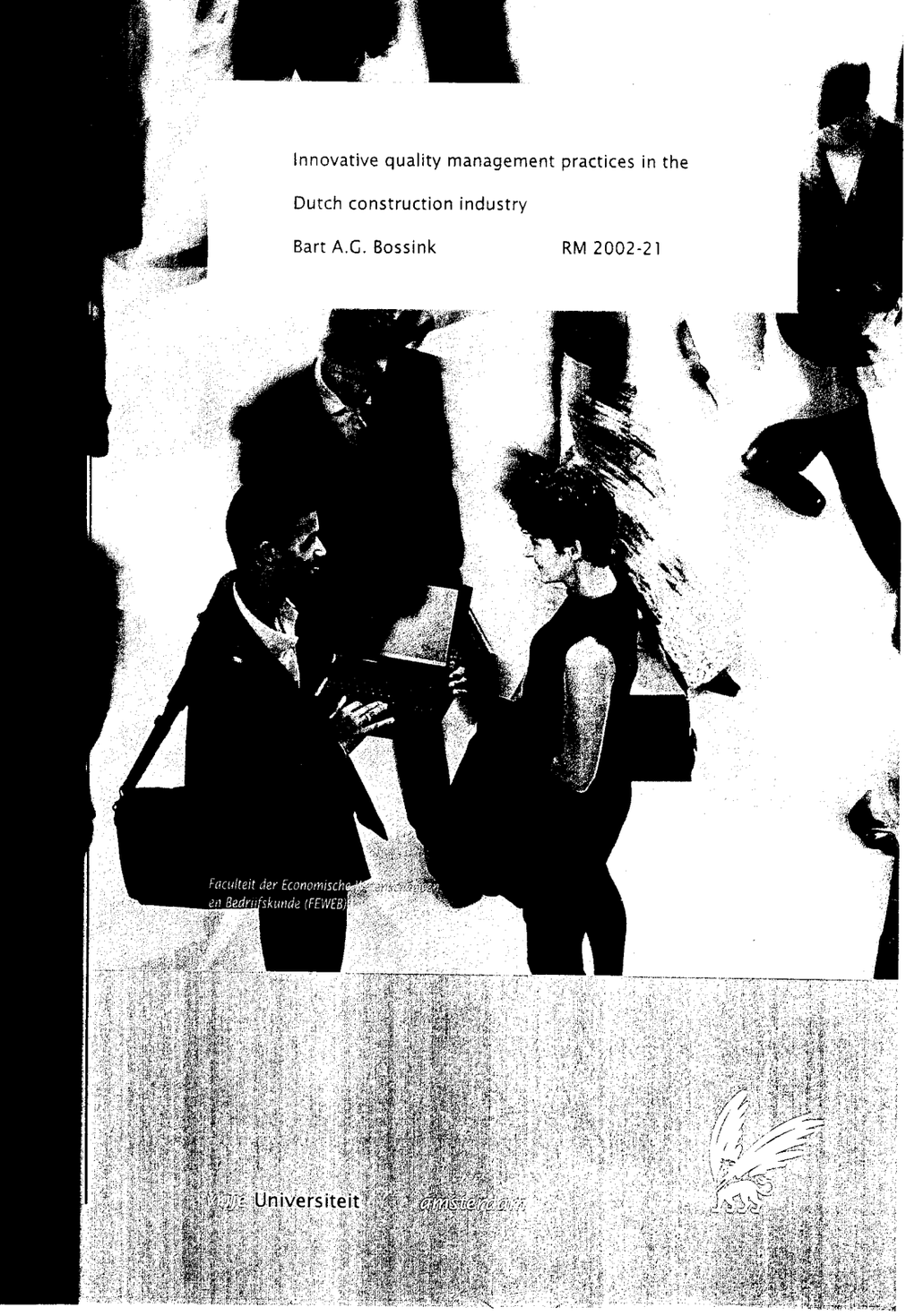

Innovative quality management practices in the Dutch construction industry

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Keywords *Quality, Innovation, Strategy, Management, Construction, The Netherlands*

Abstract *Quality management practices support the management of strategically important innovation processes. This conclusion is based on empirical research in the Dutch construction industry. A large-scale irmovative construction project is intensively studied during a three-year period. The quality management practices that are used in this project to support the management of strategically important innovation processes are described and analyzed. The description and analysis is based on an analytical framework that consists of six quality management practices: design, planning, systems, goal, positioning, and interaction practices. The analytical framework is based on a theoretical study in the field of strategic quality management. The empirical research points out that planning, positioning and interaction practices in quality management support the management of strategic innovation. It also indicates that systems and goal*

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practices in quality management can be supportive to the management of strategic innovation.

1. Introduction

Quality (Ansoff, 1965; Porter, 1980; Mintzberg *et al.* 1998) and innovation (Nam and Tatum, 1992; Roome, 1994; Berthon *et al.*, 1999) are seen as strategically important issues in the organization. Quality and innovation are aspects of strategy development and implementation (Keogh and Bower, 1997; Alkhafaji *et al.*, 1998; Berthon *et al.*, 1999). Research that is dedicated to the strategic function of quality and innovation can be divided into research focussing on the function of quality in the corporate strategy of organizations (Shetty, 1987; Belohlav, 1993; Van der Wiele *et al.*, 1993; Vinzant and Vinzant, 1996; Wilcox *et al.*, 1996; Ittner and Larcker, 1997; Brown *et al.*, 1999; Tan *et al.*, 2000) and research focussing on the function of innovation in the corporate strategy of organizations (Smith, 1994; Giget, 1997; Motohashi, 1998).

Research dealing with the strategic function of quality and innovation can be divided into research in which quality and innovation are mainly seen as two complementary aspects of strategic management (Juran, 1964; Imai, 1986; Garvin, 1988; Juran, 1989) and research in which quality is seen as a management aspect that supports the strategic management of innovation (Kanji, 1996; Chapman *et al.*, 1997; Kanji, 1999). This article concentrates on the supportive role of quality management to the management of innovation from a strategic point of view. The central research question is:

Which quality management practices support organizations in managing innovation processes that are of strategic importance?

The research question is split into three sub questions:

1. Which quality management practices can support organizations in managing strategically important innovation processes?

2. Which of these quality management practices are actually used by organizations in the management of strategically important innovation processes?

3. What are the innovation results of the use of these quality management practices?

To generate answers to these questions a research project is designed and canied out. The research design, data collection methods and data analysis, and the limitations of the research design, are described in section 2. A literature study is carried out to build an analytical framework. Theory on the strategic function of quality management is gathered, analyzed, and synthesized into an analytical framework. The framework consists of six different strategic quality management practices that can be used to describe and analyze innovation processes. The analytical framework is presented in

section 3. An empirical research project is carried out in the Dutch construction industry to describe and analyze innovation processes in practice. The Dutch construction industry is innovating in the field of 'sustainability' (environmental friendliness). The description and analysis are made with the use of the analytical framework. The innovation processes are described in section 4. The analysis is presented in section 5. The article is ended with a conclusion that is based on the research findings in section 6.

2. Research methodology

In this section the research design, data collection methods, data analysis method, and the limitations of the research design are described.

Research design

The empirical research is canied out in the sector 'house building' of the Dutch construction industry. The Dutch construction industry is confronted with govemmental demands to innovate in the field of 'sustainability'. Objects have to be designed and built in a sustainable way. A huge amount of the sustainability innovations in the Dutch construction industry have to be conceived and realized in large-scale house-'building projects with multiple participants (Schmid, 1978; Duijvestein, 1992; Kristinsson, 1995). The Dutch national govemment and provincial and municipal authorities intensively interact with professional clients, architects, contractors and pressure groups in the industry to develop and exploit these strategically important innovations (Report

Sustainable Construction, 1990; Scheme of Action Sustainable Construction, 1995; Second Scheme of Action Sustainable Construction, 1997). The empirical research is carried out in the Dutch construction industry because this industry is actively innovating in the field of sustainability (Silvester, 1996; Tjallingii, 1996; Van Hal, 2000). The case study method is used because the supportive role of quality management practices in the management of strategically important innovation processes has not been researched in-depth before, and the researched innovation processes can not be isolated from their contexts (Eisenhardt, 1989; Yin, 1994; Cunningham, 1997).

Data collection

A house building project named 'Oikos', situated in the municipality of Enschede in the Netherlands, is intensively studied during a three-year-period. In the Oikos project 40 private and public organizations are developing a sustainable housing estate with a market value of 50 million Dollar. Fifteen different disciplines, like: town and country planning, traffic affairs, architecture, and engineering, are integrated in the designs and ten different innovative sustainable designs for town planning and 600 mutually different innovative designs for sustainable houses are developed and realized.

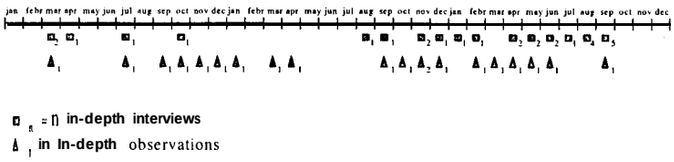
In this single-case study several research methods are used: study of documents, in-depth interviews with key informants, and in-depth observations in meetings between representatives of co-innovating organizations (Brewer and Hunter, 1989; Kumar *et al.*, 1993; Yin, 1994). In a three-year petiod more than 160 documents are gathered and studied, 28 interviews are taken, and almost 70 hours are spent on observations (see table I).

I. Data collection methods

Research method	Case study
Period	3 years
Study of documents	160 documents: . 40 agreements . 33 design documents . 18 decision supportive reports . 15 contracts . 14 brochures . 12 meeting agenda's and minutes . 10 letters . 7 project plans . 6 evaluation reports . 5 planning procedures/schedules
In-depth interviews	28 interviews with key informants in the studied case: . 14 interviews with project managers. local authority . 4 interviews with managing directors, architect's firm . 4 interviews with managers, construction company . 2 interviews with managers, public housing local authority . 2 interviews with managing directors, real estate agency . 1 interview with managing director, consultant's firm . 1 interview with managing director, housing corporation
In-depth observations	69 ½ hours of observation of meetings: . 43 ½ hours in meetings of representatives of local authorities, consultants' firms, energy companies, and pressure groups . 14 hours in meetings of representatives of local authorities, architects' firms, contractors, real estate agents, and consulants' firms . 12 hours in meetings of representatives of local authorities, architects' firms, contractors, real estate agents, and consultants' firms

To study the use of quality management practices in strategically important innovation processes and the results and failures due to the use of these practices the Oikos project is studied during a considerable interval of time. In the case study the interviews and observations are planned on a regular basis (see figure 1). Observations are repeated frequently to document the effects of the use of quality management practices in the management of strategically important innovation processes (Yin, 1994).

***Figure** 1. Interviews and observations*



***Data** analysis*

The gathered information is organized with the analytical framework (Yin, 1994). The description and analysis of the information with the analytical framework provides analytical insights in the supportive function of quality management practices to the management of strategically important innovation processes (Yin, 1994).

Limitations of the research design

A limitation of the research design is that the results can not be statistically generalized. A strength but also a limitation of the research is that it focusses on the suppottive role of quality management practices in the management of strategically important innovation processes. Other management aspects that play a significant role in the development of

strategic innovations, such as: leadership, innovation champions, availability of innovative technologies, and social interaction between innovators (Silvester, 1996; Tjallingii, 1996; Van Hal, 2000) are not illuminated. A third limitation of the study is that strategically important innovation processes that are not supported by quality management practices are not studied.

3. Analytical framework: quality management practices

In this section the analytical framework is described. The framework is based on a literature study on the strategic function of quality.

A considerable amount of research in quality management is dedicated to strategic quality management practices. Concepts that occur in literature, are:

- Strategic management of quality (Walsh, 1987);
- Quality strategy (Ali and Seshadri, 1993; Barclay, 1993; Anand, 1996; Ittner and Larcker, 1997);
- Total quality management strategy (Kennerfalk and Klefsjö, 1995);
- Strategic total quality management (Madu et al., 1996);
- Strategic quality management (Aravindan et al., 1996; Calingo, 1996; Tummala and Tang, 1996; Chapman et al. 1997); and
- Total quality strategy (Smith and Angeli, 1995; Jones, 1998).

These concepts contain quality management practices that can be divided into six distinctive categories. These categories are: design practices, planning practices, systems practices, goal practices, positioning practices, and interaction practices. Each practice is build upon specific underlying philosophies and contains several characteristic quality methods and techniques. This collection of practices, key philosphies and characteristic methods and techniques represents the analytical framework (see Table II). The analytical framework can be used to identify and describe quality management practices that have a supportive function in the management of strategically important innovation processes.

Table II. Analytical framework: strategic quality management practices

Quality management practice	*Key philosophies*	*Characteristic methods and techniques*
Design	• Design of a quality strategy • Quality inspection routines • Feedback of failure information to manufacturing processes • Separation of the quality function and the innovation function	• Failure mode and effect analysis • Flow charts • New seven tools • Seven tools • Single minute exchange of die • Statistical process control • Quality function deployment • Quality improvement programmes • Taguchi methods
Planning	• Stage-by-stage implementation of a quality strategy • Integral use of statistical analysis in manufacturing processes • Quality and innovation are separate functions	• Formal planning techniques • Plan-do-check-act cycle • Quality plans
Systems	• Systematic coordination, monitoring and documentation of quality procedures • Mutual harmonization and coordination of design and manufacturing processes • Quality and innovation are separate functions	• Quality auditing • Quality information systems • Quality systems
Goal	• Quality goal setting and goal realization • Continuous improvement of products, services and processes • Quality and innovation are integrated	• Continuous improvement • Performance indicators • Policy deployment • Quality costing • Right first time • Zero defects
Positioning	• Remaining competitive in the marketplace through identification of unique opportunities related to quality • Making qualitative decisions to gain competitive advantage	• Benchmarking • ISO certification • Quality competitions
Interaction	• Creation of value by simultaneously aiming at customer satisfaction and employee satisfaction • Creating synergy between the organization and the environment	• Cross-functional management • Empowerment • Interdepartmental cooperation • Interfirm cooperation • Interlinked quality councils, teams and circles • Quality awards • Stakeholder management • Visionary leadership

The key philosophies and characteristic quality methods and techniques of the six practices are described below.

Design practices

In design practices quality strategies are designed. Heuristics, algorithms and statistical methods are used to design quality into the organization. Design practices in quality management can be compared with the quahty engineering phase or quality control phase in the evolution of quality management from 1930 till 1960 (Feigenbaum, 1983). This phase is characterized by: quality inspection routines, feedback of failure information to manufacturing processes, and the separation of the quality function and the innovation function. Characteristic methods and techniques of design practices are: failure mode and effect analysis, flow charts, new seven tools, seven tools, single-minute exchange of die, statistical process control, quality function deployment, quality improvement programmes, and Taguchi methods (Smith and Angeli, 1995).

Planning practices

In planning practices quality is implemented stage-by-stage in the organization. This approach can be compared with the quality assurance phase in the evolution of quality management from 1960 till 1980 (Foster and Whittle, 1989). Planning practices in quahty management are characterized by: integral use of statistical analysis in manufacturing processes, and separation of the quality function and the innovation function (Foster and Whittle, 1989). Characteristic methods and techniques are: formal planning techniques,

the plan-do-check-act cycle, and quality plans (Kennerfalk and Klefsjö, 1995; Aravindan et al., 1996; Calingo, 1996).

Systems practices

Systems practices are based on a systematic view on quality. Product quality is systematically assured and improved through a complex of interrelated quality coordination, monitoring and documentation systems. This approach can be compared with the total quality control phase in the evolution of quality management from 1980 till 1990 (Feigenbaum, 1983). Systems practices are characterized by: systematic coordination, monitoring, and documentation of quality procedures, mutual harmonization and coordination of design and manufacturing processes, and separation of the quality function and the innovation function. Characteristic methods and techniques are: quality audits, quality information systems, and quality systems (Ittner and Larcker, 1997).

Goal practices

Goal practices focus on the definition of quality goals and the realization of these goals. In goal practices symbolic goals like 'zero defects' go together with precize goal statements like '2 production failures per billion products'. Goal practices can be compared with the total quality management phase in the evolution of quality management from 1990 till 1995 (Bossink et al., 1992). Goal practices are characterized by: continuous improvement of products, services and processes, and integration of the quality function and the innovation function. Characteristic methods and techniques are:

continuous improvement, performance indicators, policy deployment, quality costing, right first time, and zero defects (Tummala and Tang, 1996).

Positioning practices

In positioning practices the quality aspect is used to attract customers and to compete with competitors. Organizations try to gain a competitive advantage in the marketplace through the management of quality. Positioning practices are typical for the strategic quality management phase in the evolution of quality management from 1995 till now (Aravindan *et al.*, 1996; Calingo, 1996; Tummala and Tang, 1996; Chapman *et al.* 1997). Characteristic methods and techniques are: benchmarking, ISO certification, and quality competitions to improve performance and attract customers (Ali and Seshadri, 1993; Madu *et al.*, 1996; Chapman *et al., 1997).*

Interaction practices

In interaction practices organizations create value through continuous interaction with their environments. Interaction practices are based on the creation of value by simultaneously aiming at customer and employee participation and satisfaction. Interaction practices are typical for the strategic quality management phase in the evolution of quality management from 1995 till now (Aravindan *et al.*, 1996; Calingo, 1996; Tummala and Tang, 1996; Chapman *et al.* 1997). Characteristic methods and techniques are: cross-functional management, empowerment, interdepartmental cooperation, interfirm cooperation, interlinked quality councils, teams and circles, quality awards, stakeholder management, and visionary leadership (Anand, 1996).

The Oikos project is described and analyzed by the elements: quality practices, key philosophies and characteristic methods and techniques. In the case study these elements are traced and described. The analysis concentrates on a description of the sustainable innovation results that were booked with the help of these elements.

4. Quality management practices: innovation results and failures

In this section the results of the case study in the Oikos project are described. The description is based on the analytical framework. A description is given of the quality practices that were used to support strategically important innovation processes, and of the innovation results and failures that followed from the use of the quality practices.

The organizations in the studied case did use planning, positioning and interaction practices in quality management to organize their innovation activities and did not use design, systems and goal practices for this purpose. An overview of the practiced quality philosophies, methods and techniques is given in table 111.

Table III. Quality management practices

Quality management practice	Key philosophies	Characteristic methods and techniques
Design		
Planning	· Stage-by-stage implementation of a quality strategy · Focus on technical aspects of innovation	• Formal planning techniques • Plan-do-check-act cycle • Quality plans
Systems		
Goal		
Positioning	• Remaining competitive in the marketplace through identification of unique opportunities related to quality · Making qualitative decisions to gain competitive advantage	• Benchmarking • Quality competitions
Interaction	• Creating synergy between the organization and the environment	• Cross-funtional management • Empowerment · Interdepartmental cooperation · Interlinked quality councils, teams and circles · Interfirm cooperation · Visionary leadership

The elements of the used quality practices are described below.

Planning practices

In their strategic plans the organizations dedicated relatively small budgets to the development of innovations in the field of sustainability. They planned to participate in innovative sustainable construction projects, so called 'incubator projects'. These incubator projects are subsidized by the Dutch govemment. The projects are organized and supported by organizations that are affiliated with the Dutch govemment. Oikos has the status of an incubator project and the organizations that participated in the project planned to become 'green companies'. In the Oikos project the organizations focussed on

the technical aspects of innovations in the field of sustainability. Examples of technical aspects of sustainability are: integration of solar energy cells and recycled materials into the designs for town and country planning and the designs for houses. The organizations did not develop innovations themselves but picked them from an innovation reservoir that is developed by national research centres and universities. The organizations planned to develop procedures and routines to integrate the selected innovations in their work.

The organizations used: formal planning techniques, the plan-do-check-act cycle, and quahty plans to plan their innovation activities. Formal planning techniques like: project management, cost accounting, and network planning methods are used to implement the selected innovations in the construction projects in Oikos. The plan-do-check-act cycle is used to secure that the innovations are processed in the right way and on time. Quality plans are used to specify the quality and innovation levels.

Positioning practices

Organizations participated in the Oikos project from a positioning point of view. They tried to gain competitive advantage by joining as many as possible incubator projects in the country. This strategy enabled them to position themselves in the market as green organizations, capable of developing sustainable objects of high quality. Sustainability is a new demand of the Dutch govemment and green organizations expect that this demand will develop into a regular demand in the near future. A demand that also is appreciated by customers.

The organizations used: benchmarking and quality competitions to position their sustainable competences in the market. Organizations compared their sustainable

competences with other green companies and improved their sustainable performance by leaming from the best practices of those companies in incubator projects. Most of the designers in the Oikos project joined in quality competitions in which their sustainable designs were evaluated and sometimes awarded. The use of these two instruments enabled participating organizations to develop innovative capabilities and to position themselves as green innovators in the market.

Interaction practices

Most of the organizations that participated in the Oikos project interacted with other participating organizations. They adapted their innovation proposals to one another. These interaction processes had synergetic effects. The interaction processes initiated new innovative activities in the field of sustainability.

The organizations used: cross-functional management, empowerment, interdepartmental cooperation, interlinked quality councils, teams and circles, interfirm cooperation, and visionary leadership to interact with other organizations. Empowerment, interlinked quality teams and circles, interdepartmental and interfirm cooperation, cross-functional management and visionary leadership are embedded in the Oikos project to create space for mutual adaptation of innovation proposals and the creation of new innovations.

These practices were used to support innovation processes. The innovation results and failures that follow from the used quality management practices are presented in table IV.

Table IV. Innovation results and failures

Quality management practice	*Results*	*Failures*
Planning	Innovations that were developed with the help of planning practices are: • Methodologies for sustainable designing • Checklists for sustainable designing · Scoring methods for sustainable designing	Innovations failures that came up are: • Methodologies for sustainable designing were introduced too late in the project • Checklists for sustainable designing were not used at the right moments · Scoring methods for sustainable designing were not explained to the designers
Positioning	Innovation capabilities that were positioned in the market are: · The capability to develop sustainable construction materials • The capabdity to develop sustainable designs for houses · The capability to develop sustainable designs for town and country planning	Innovation capabilities that were not positioned in the market are: • The capability to develop sustainable construction materials with a relatively high quality-costs ratio • The capabdity to develop sustainable designs for houses with a high quality-costs ratio • The capability to develop sustainable designs for town and country planning with a high quality-costs ratio
Interaction	Innovations that interactively were developed are: · Buildings with a high sustainability score · Ecological infrastructure with a high sustainability score · Civil objects with a high sustainability score · Civil infrastructure with a high sustainability score	Interactive innovation failures are: · Deletion of many sustainable innovations in the building designs • Deletion of many sustainable innovations in the ecological infrastructure · Deletion of many sustainable innovations in the civil objects · Deletion of many sustainable innovations in the civil infrastructure

The results and failures that followed from the use of these practices are described below.

Results andfailures of planning practices

Innovations that were developed with the help of planning practices are: methodologies, checklists and scoring methods for sustainable designing. These instruments were selected from a reservoir of innovations that is developed by national research centres and universities. The methodologies, checklists and scoring methods for sustainable

designing are developed for practical use. Use of these instruments can be seen as a process innovation: it made the organizations able to innovate.

The use of the methodologies, checklists and scoring methods for sustainable designing also caused innovation failures. The methodologies for sustainable designing were not introduced on time. The organizations in the Oikos project debated for two years on the methodology to be chosen. At the time they chose a methodology it was too late: there was not enough time left to use the methodology properly. A comparable problem arose with the introduction of checklists for sustainable designing. These checklists were not introduced at the right moment. The checklists for sustainable designing were introduced before the design methodology was chosen. Designers did not know how to use the checklists effectively because of the absence of a design methodology. A third failure followed from the use of scoring methods for sustainable designing. These scoring methods were not explained to the designers in the Oikos project. As a consequence, they were not able to evaluate and improve the sustainability score of their designs.

Results and failures of positioning practices

Innovation capabilities that were positioned in the market by organizations that participated in Oikos are: the capability to develop sustainable construction materials, sustainable designs for houses, and sustainable designs for town and country planning. Professional clients and potential buyers were informed about the capabilities by means of extensive communication campaigns. Organizations that used this positioning strategy succeeded in creating and sustaining a green image.

Failures also followed from the use of the positioning approach. Professional clients and potential buyers were not informed about the high quality-tost ratio of the sustainable designs. As a result many sustainable designs were hard to sell and many designs had to be made more traditional to be able to sell them.

Results and failures of interaction practices

Innovations that were interactively developed are: buildings, an ecological infrastructure, civil objects, and a civil infrastructure with high sustainability scores. The organizations succesfully created synergetic interaction settings in which the proposed innovations were adapted and combined and new complementary innovations were developed.

Innovation failures that followed from the interactive innovation activitites are: deletion of many innovations in the building designs, the ecological infrastructure, the civil objects, and in the civil infrastructure. The interactive approach created space for cooperation and co-innovation but it also resulted in a lack of clarity. Leaders did not act as leaders but as facihtators of a creative process. By the time they wanted to transform the atmosphere into one in which the developed innovations had to be produced, they were not able to position themselves as leaders in stead of facihtators. Project members 'walked over' them and did not want to join the innovation reahzation process. Many participants chose to defend traditional ways of working and obstructed the in'novation realization process. Many innovations that were interactively created and adapted did not survive. Innovations that survived had to be forced by leading managers in the Oikos project.

5. Discussion

In this section the research results are discussed. For each quality management practice it is explained why it was or was not used and what the (probable) implications of the application are.

Design practices

Design practices were not used by the participating organizations. The reason is probably that the underlying philosophies and characteristic methods and techniques focus on assurance of quality by means of control, and this does not provide the space that is needed to create and manage innovation processes. Design practices in quality management become useful when innovations are already created and have to be implemented in the working routines and procedures of the organization.

Planning practices

Some elements of planning practices were used to plan the innovation process. The innovation process was energy and time consuming. At the start of the Oikos project the organizations started without a planning. They started brainstorming about their innovation ambitions and this brainstorming process was continued for almost two years. In this period organizations did not bother about choosing and realizing innovations. At a certain moment some of the responsible managers realized that too much time was spent on brainstorming and discussion sessions and that it was almost too late to actually innovate. As quickly as possible they selected methodologies, checklists and scoring

methods for sustainable designing, and because they acted under time pressure they did not consult many others in the project. Although some of the participants were passed over, this approach had the effect that innovations could be chosen and the realization of innovations could be planned. The amount of innovations probably would have been larger when the brainstorming process was ended earlier, design instruments were chosen earlier, and more members of the project were consulted.

System practices

Systems practices were not used to support innovation processes. Most of the organizations were busy choosing innovations from the available innovation reservoir at research centres and universities and focussed on the implementation of these innovations in their projects. The organizations did not focus on a systematical implementation of the innovations into their working routines and procedures. The organizations followed a strategy in which they were content with being innovative in the incubator project. Although systems practices were not used in the Oikos project they can be useful to assure that innovations become part of standard working routines and procedures.

Goal practices

Goal practices were not used in the Oikos project. The organizations started without innovation goals. Most of them started with a fuzzy innovation ambition. They wanted to achieve a high ambition level and a long time it remained unclear what that meant. The absence of goal practices in Oikos resulted in an innovation process in which space was created to be creative: every sustainable innovative idea could be developed and

implemented, but also fuzzyness existed: participants had no targets. Till the end of the Oikos project it remained unclear if it succeeded or failed. In terms of effectiveness it can be concluded that the project was effective: a lot of innovations were developed and implemented, but also that it was ineffective: there were no measures to evaluate the outcomes of the innovation process.

Positioning practices

The organizations participated in the Oikos project because they wanted to position themselves as green organizations. They wanted to develop and market sustainable competences and used incubator projects to develop these competences. The organizations organized publicity campaigns to inform professional clients and potential buyers about their capabilities. The use of positioning methods and techniques enabled them to gather information about their relative position to competitors in the green market. This approach worked well for them, but it also slowed down their innovation activity rate when they concluded that they were far ahead of their competitors.

Interaction practices

Interaction processes between participants in the project created space for additional innovations. Many innovative inter-personal, inter-departmental, and inter-organizational innovation teams were established and some of these teams developed innovative features. Also many disagreements, negatively oriented bargaining processes and quarrels were observed in these innovation teams. In the Oikos project a contradiction could be observed: organizations were interdependent and interactively developed innnovations,

but interaction was also the cause of the deletion of many creative ideas and innovations. Responsible managers failed to control the interaction process and were not able to guide it into the innovation realization stage. More emphasis on control-based management of the interaction processes could have led to the realization of a higher innovation ambition.

On the basis of the analytical framework on quality management practices and empirical research in the Dutch construction industry a description and analysis is made on the supportive function of quality management in the management of strategically important innovation processes. A conclusion, based on these research findings, will be drawn in the next section.

6. Conclusion

Planning, systems, goal, positioning, and interaction practices in quality management support the management of strategically important innovation processes.

Lessons that can be leamed from the results and failures that followed from planning, positioning and interaction practices in quality management in the studied case are:

- Innovation instruments have to be introduced early in the innovation project and have to be accompanied with information about effective use.
- Both innovation capabilities and quality-tost ratios of innovations have to be communicated to tbe customer.

- Inter-personal, inter-departmental and inter-organizational innovation processes have to be stimulated and have to be controlled in a loose-tight way. Loose: to create space for innovation, and tight: to realize innovations.

Analysis of the empirical research also indicates that although systems and goal practices in quality management are not used in the studied case, these two quality practices can contribute significantly to the management of strategically important innovation processes. Further empirical research can be focussed on the identification and description of the supportive function of systems and goal practices, and on a futher description of the supportive function of planning, positioning and interaction practices, in the management of strategically important innovation processes.

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