Vision Support Studios: A Framework for Research

Mariëlle den Hengst[1] and Gert-Jan de Vreede[1, 2]

1: Delft University of Technology, Faculty of Technology, Policy and Management
PO Box 5015; 2600 GA Delft; the Netherlands
phone: +31 15 278 8542; fax: +31 15 278 3429
email: M.den.Hengst@tbm.tudelft.nl; G.J.deVreede@tbm.tudelft.nl

2: University of Nebraska at Omaha
College of Information Science & Technology
Department of Information Systems & Quantitative Analysis
6001 Dodge Street, Omaha, NE 68182-0116
email: gdevreede@mail.unomaha.edu

Abstract

Approaches supporting organizational change must change due to changes in the organizational systems and their environments: organizations must deal with an information overload, the time for change is shorter than ever before, collaboration is more important. Fortunately, today's technologies enable the approaches to change: simulation, information visualization, and collaborative technologies. This paper describes a research framework for a new concept: Vision Support Studio (VSS). Collaboration and business modeling are combined to meet with the challenging requirements for supporting organizations today. Experiences with supporting organizational change are described in the paper and a coherent set of research topics on VSS is proposed.

1. Introduction

Although organizations have long faced varying degrees of uncertainty, complexity, novelty, and change, scholars agree the degree of these in today's environment is unprecedented. In the information economy, businesses are changing more often and more rapidly than ever before [12]. To stay efficient and effective in a changing environment organizations must continuously innovate to align their structure, processes, and technologies [7, 8, 13, 16, 26, 27, 33]: innovation is key to the survival of organizations.

Several approaches emerged in the 1980s and 1990s to support organizations in improving or even innovating their organizational systems. A classical approach is the problem solving process proposed by Simon [28]. Departing from incremental and piecemeal approaches such as the problem solving process, business process reengineering (BPR) emerged as a radical innovation and change program with a multidisciplinary nature [8, 15]. Despite the potential BPR has to improve business performance, many BPR projects turned out to be unsuccessful [16]. The lessons learned from a decade of BPR research may provide insight to the 'ultimate' BPR approach.

Although successful in the past, several BPR projects lead to experiences that ask for different approaches: differences between today's organizational systems and their environments, and that of the 1980s result in different requirements for supporting organizations in innovating their organizational systems.

- *Information*. Organizations have to deal with an information explosion and at the same time with infinite, ambiguous, and unexpected information. They are facing markets undergoing sudden chaotic change, and can hardly make predictions about the future. Although current information systems are able to generate an impressive amount of data, managers keep complaining that they are unable to get the right information at the right time to make decisions for the future [19, 32].
- *Time*. The time between different innovations is shorter than ever before. The environment of the organizations changes more frequently. Technologies develop at a high rate. To keep up with this, the innovation process

should be sped up, allowing less time for data collection, analysis, design, and implementation.

- *Scope*. In improving or innovating organizational systems, the focus used to be on individual elements of the organizational system, for example on the processes within one department. Due to the developments in information technologies (IT), the focus shifted towards the organizational system as a whole. Currently, the focus has even moved further up towards the interorganizational level. Developments in IT such as the World Wide Web, Electronic Data Interchange, and electronic mail opened up possibilities to design interorganizational systems [17].
- *Enabler*. Organizational systems traditionally improved as a result of 'statistical control'. The performance of the organization was measured and evaluated and suggestions for improvements were made, for example concerning the implementation of a new machine to speed up the process. Today, however, it is not about controlling the current situation, but designing for the future. IT is often a driving force for innovation [20].
- *Professionalism*. Where managers were able to make authoritative decision in the past, they now have to rely on the in-depth expertise of professionals [1].
- *Collaboration*. As a result of the increasing scope and the increasing professionalism, more and more actors are involved in the innovation process of organizational systems. Collaboration is required to deal with complexity, for acceptance reasons, for evaluation purposes, to create synergy, and to involve different stakeholders [24].

These changing requirements necessitate that BPR approaches supporting organizations to innovate should change accordingly: shorter time periods, more and different participants, and different business models. Fortunately, today's technologies enable the approaches to change: tools and technologies develop at a high rate allowing for a sophisticated support environment including simulation tools, information visualization technologies, and collaborative technologies.

Given the increasing possibilities of tools and technologies, the changed requirements of organizational systems, and the lessons of a decade of BPR, a new concept is proposed: Vision Support Studio (VSS).

- *Vision*. With the term vision we do not refer to a perception of the current situation or a forecast for the future situation. When we use the term vision, we think of a desired future, a future to be designed. Organizations that want to stay in business have to design their organizational systems for the future.
- *Support*. If innovation was easy or already well supported by existing methods, every organization would routinely do it. Innovation can be considered a complex design decision about organizational systems. Supporting organizations in this is key to the success of innovation.
- *Studios*. The term studios refers to a coherent set of activities, guidelines, tools and techniques that can structure, guide, and improve a design process.

In this paper a coherent set of requirements for Vision Support Studios is described. These requirements are sketched both by copying successful aspects of the many BPR projects carried out over the past decade and by demanding better support in the future on missing functionality. The second section presents a structured overall framework with which previous research could be compared. The third section describes the research method used to extract lessons from a decade of BPR projects. The fourth section addresses the experiences in supporting organizations with their BPR. These experiences are sewed together into a coherent set of requirements and research topics on Vision Support Studios in the fifth section. This combines into a research program on VSS about developing a studio to support organizations in designing their structure, processes and technologies for the future.

2. Business Process Reengineering

BPR projects have been carried out for many years now and many different (variations of) approaches have been used. To describe these approaches and their most important rules in a uniform way, we use the framework proposed by Wijers et al. [39]. The framework contains five components and is presented in Figure 1. The way of thinking reflects the underlying philosophy or 'Weltanschauung' of the approach. The way of working describes the activities to be carried out in order to address the problem of designing. The way of modeling describes the techniques used. The way of controlling describes how the activities and techniques are managed. Finally, the way of supporting describes the tools used to support the way of working, modeling and controlling.

The way of thinking of the traditional BPR approach was large dramatic improvements of organizational systems [15, 16]. Radical change is preferred over incremental improvements. Incremental improvement can lock organizations into the old processes [16]. Recent empirical results show that incremental implementation is possible as long as the design effort is radical [18]. Dennis et al. [12] present empirical evidence that radical and incremental techniques can be used concurrently.

The traditional way of working for BPR projects was to ignore the current situation [15, 16]. Recent research suggests that detailed analysis of current processes contributes to the success of the BPR project [5, 12, 14, 30]. It is argued that process modeling creates a shared understanding of the current situation, enables to identify

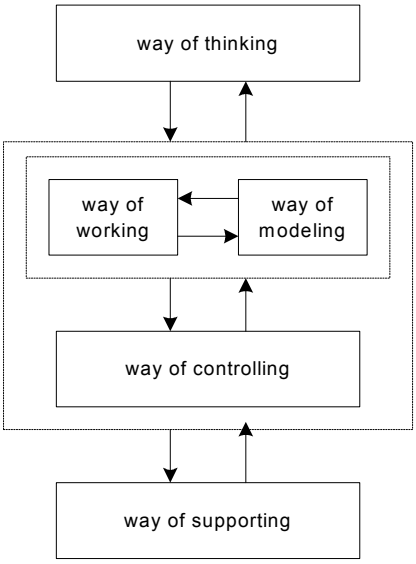

Figure 1: Framework for analysis

and keep the best parts, and creates a fact-based baseline against which to compare the new processes.

Many different ways of modeling have been used. Models support conceptualization, communication, analysis and design for development, and improvement of business processes. Models facilitate understanding the many steps and relationships of business processes. A distinction can be made between static models and dynamic models. Static models represent business processes by graphical symbols and are deterministic, for example flowcharts, structured analysis and design technique, and object oriented modeling. Most of these models are not able to show dynamic change, stochastic events, and random behavior. Dynamic models offer wider opportunities for understanding business processes: statistical output can demonstrate the costs and benefits of a particular organizational system [25]. This is especially valuable for the evaluation of different alternatives as well as for providing statistical evidence to convince participants of the efficiency and effectiveness of a particular organizational system [21].

The way of controlling pays attention especially to the involvement of different stakeholders. Traditionally, top managers were involved in the BPR project [15, 16]. According to traditional approaches, middle managers are to be avoided, because they lack the vision and the authority to implement BPR. A few outsiders are to be invited to bring objectivity and a different view [16]. However, there is evidence that it is important to include knowledge and build support from the bottom as well, by inviting the middle managers [5, 9, 12].

The way of supporting focuses on supporting the modeling and/or the collaboration. Many different modeling tools are available for modeling support. Groupware has emerged as an important enabling technology for a variety of group processes [23]. The use of groupware appears to increase the effectiveness and efficiency of group processes as well as the satisfaction of the participants of such processes [11, 22, 23, 31, 38]. Groupware and static modeling tools have even been combined into collaborative modeling tools and used with some success in a number of BPR projects [10].

Despite all 'rules' presented above for BPR projects, organizations today are still struggling with their BPR. Partly because the rules are not generally applicable, but need to be tuned to the specific situation. Dennis et al. [12], for example, noticed a difference between public and private organizations in the United States. Partly, because proper support to really collaboratively reengineer the business processes is still lacking [10]. And partly, because today's organizations and environments differ from those of a decade ago. By analyzing the lessons learned, building on our own experiences, and by taking into account today's requirements, VSS is proposed to support organizations in (re-) designing their structure, processes, and technologies.

3. Research Method

Over the past decade, many researchers within the Group of Systems Engineering of the faculty of Technology, Policy and Management, Delft University of Technology, were involved in BPR projects for research purposes. Many organizations were interested in conducting BPR with the expertise on the approach being provided by the researchers. This study, therefore, uses action research, where the researchers are both participants and observers. This method enables researchers to study unique situations, but creates the potential for bias, because the researchers can become advocates for the groups or phenomena under study [40].

For data collection, the researchers used two sources of data. The first source was their direct involvement with the projects. The researchers participates and observed the different phases of the BPR project. The second source for data was interviews. The researchers used both open-ended and closed interviews with the members of the BPR project teams.

The Collaborative Business Engineering (CBE) approach was used for the BPR projects. CBE departs from traditional BPR approaches and combines collaboration and dynamic modeling to support business engineering. The way of thinking of the CBE approach combines radical change and incremental improvement for business process reengineering. This is realized by a problem solving way of working that starts with modeling the current situation through both a conceptual and an empirical model. Modeling possible solutions, choosing a solution and implementing it are the subsequent steps. Implementation is not incorporated in any of the projects described in the next section. All projects stop with

choosing the solution preferred. Modeling, both static and dynamic is an important element of the CBE approach. The CBE approach focuses on dynamic problems with stochastic elements especially. Collaboration is important for the way of controlling of the CBE approach. To increase the effectiveness and efficiency of collaboration group support systems (GSS) are part of the way of supporting. GSS are believed to offer added value for collaboration by providing support for parallel communication, anonymous interaction, and automatic recording of meeting minutes [22]. Modeling tools, either static or dynamic, are part of the way of supporting. The tools used for a specific project could be different each time, depending on the characteristics of the project.

4. Experiences

The CBE approach as sketched in the previous section has been used successfully in many different projects and by many different researchers over the past decade. An overview of the lessons learned from some of these projects is presented below. Each project is described using the framework of the second section: way of thinking, way of working, way of modeling, way of controlling, and way of supporting.

4.1 Criminal Investigation Department of the Amsterdam Municipal Police Force [34, 35]

Organized crime has become a global problem. Currently, there are far more criminal organizations to be investigated than the Criminal Investigation Department (CID) can handle. In order to effectively combat crime the CID needs to employ available resources in terms of people, special equipment, and budgets as efficient and effective as possible. The objective of the project was to analyze the problem situation in more detail, and recommend how to change the processes of the departments involved in such a way that they are better capable of carrying out investigations.

The way of thinking mainly was that of incremental improvement. The way of working supports this by building models of the current situation first before moving to the situation to-be. The current situation was modeled using task structures. Task structures describe the way in which organizational processes are carried out by the actors in the organization. Task structures are static models and consist of three modeling constructs: tasks, decisions, and transitions between tasks and decisions [36]. The researchers found that task structures are easy to comprehend and use by both the researchers and the participants. The static task structures provided enough information for the participants to define critical success factors and to identify problems in the current situation. For designing new organizational systems, dynamic models with animation were used. Animations of dynamic models were much more appreciated than static conceptual models. The animation of the dynamic model raised participants' involvement and understanding. After a good explanation of the animation model, participants contributed to the design and evaluation process. Against expectations, the participants did not strive for 100 percent representation in the static model, but focused on a satisfying level of detail. With the dynamic model, however, participants were stimulated by the 'imperfectness' of the models: small logical inconsistencies or impossibilities were found to trigger the participants to study the model very carefully. Collaboration was important throughout the project. A group setting of several stakeholders executing the processes of the CID was used to build the models; the models were prepared by the researchers and further elaborated in a group setting. Using a group setting for building the models resulted in an implicit validation of the models. The way of supporting contains three main elements. First, GroupSystems of Ventana Corporation was used to support the non-modeling group processes. Second, the tool TeamGraphics, a collaborative symbol-and-arrow diagramming tool where changes made by one user are immediately visible on the screens of other users, was used for drawing the task structures collaboratively. TeamGraphics appeared to be a rather complex group modeling tool with a high learning curve for participants with little modeling experience. And third, ARENA was used for the dynamic model. Arena was not flexible enough to modify the model during a group session. Furthermore, the tool did not allow for different abstraction levels: some participants are more interested in the details of a small part whereas others prefer a broad overview.

4.2 The Insurance Company [21]

A department of a big insurance company in the Netherlands investigates insurance claims. The department is subdivided in clusters of experts with the same expertise, for example, fire, automobiles, and health. The problem faced by the department was a lack of insight in the performance of the department. The project focused on visualizing the performance and on exploring alternative solutions for the problems encountered.

The project focused on incremental improvement. A detailed model of the current situation was built before moving on to the solutions. This way of working was supported by a collaborative way of controlling. The project was carried out combining collaborative and individual efforts sequentially. GroupSystems supported collaborative efforts. The information for a static conceptual model was collected in a group setting, while the building of the model was done individually. The same process was followed for building the dynamic empirical model: the collection of relevant data was done

in a group setting and the researcher built the dynamic model individually. The dynamic model was subsequently validated in a group setting. Involvement of the participants in the model building process appears to boost trust in the model and acceptance of the results. Dynamic models constitute the main part of the way of modeling, which is supported by the dynamic modeling tool Arena. The dynamic model, built in Arena 3.0, was easy to understand for non-simulation experts. The participants did understand the structure of the model after explanation and made suggestions for improvement. The animation of the dynamic model supported the validation process well as experts from the field easily recognized the modeled situation.

4.3 The Central Security Study at the Airport [21]

Security checks of passengers take place at many locations at Amsterdam Airport Schiphol. The airport wanted to explore the concept of centralizing the security checks.

In contrast to the previously described projects, this project has a radical change as the way of thinking. The way of working is contrary to that used in the other projects: no model of the current situation was made. The way of controlling was different as well. Instead of individually modeling with collaborative feedback iteratively, the dynamic model was built completely by the researcher. Once the model was finished, it was used in collaborative sessions with stakeholders. During the sessions, it became clear that the participants were not willing to commit themselves to any target concerning the centralization of security checks. The participants looked for ways to invalidate the model that was already validated. It turned out that the political game was more important and that the model became subject of discussion, instead of a vehicle for discussion. For the way of supporting GroupSystems and Arena were used as core tools.

4.4 The Lounge Expansion Study at the Airport [21]

Changing airline alliances and changing relations with airlines made the Amsterdam Airport Schiphol rethink their existing terminal design. The project focused on the design of the lounges as part of the terminal.

The way of thinking was a combination of radical change and incremental improvement. The way of working was focused on the to-be situation without modeling the as-is situation. The way of modeling relied on dynamic models. The models were not built from scratch as in the other projects. They were based upon modeling concepts used for different projects. Although this sped up the time of model building, it slowed down the time needed for collaborative validation and verification. It turned out that most assumptions and errors were hidden in the models and hard to find. The way of controlling was that of collaborative action. In this project, the number of participants was relatively small, compared to the previously described projects. Gaining trust, however, was not easier. It's not the number of participants that influence the gaining of trust, but the gap between the participants' distrust and the trust desired that must be closed. Arena and GroupSystems were used to support the execution of the project.

5. Vision Support Studios: Research Agenda

The experiences described in the previous section are summarized in Table 1. They lead to a coherent set of requirements and research topics. Research topics, since we have described four projects only that show many similarities and many differences. Generalization of the findings is not possible. We use the five ways to cluster and describe the requirements and research topics that together combine into a research program on VSS.

Table 1: Overview of the projects

	Project 1	Project 2	Project 3	Project 4
Way of thinking	Incremental	Incremental	Radical	Radical and incremental
Way of working	Modeling as-is and to-be situation	Modeling as-is and to-be situation	Modeling to-be situation	Modeling to-be situation
Way of modeling	Static and dynamic	Dynamic	Dynamic	Dynamic
Way of controlling	Individually model building, collaboratively model validation and model use	Individually model building, collaboratively model validation and model use	Individually model building and model validation, and collaboratively model use	Individually model building and model validation, and collaboratively model use
Way of supporting	TeamGraphics, Arena, GroupSystems	Arena, GroupSystems	Arena, GroupSystems	Arena, GroupSystems

5.1 Way of Thinking

In two of the projects an incremental way of thinking was applied, while in the other two projects a more radical way of thinking was used. In those projects, where a radical way of thinking was used, verification and validation of the model turned out to be more difficult, Gaining trust took more effort as well. An interesting topic to research is the difference between an incremental and a radical way of thinking. Does verification and validation takes more time in case of a radical way of thinking? How much more can be gained by thinking radically instead of incrementally? Is a radical way of thinking possible in today's fast changing world? Is thinking incrementally appropriate when the changes made possible because of today's developments are huge? How should the other 'ways' be designed to contribute to a radical or incremental way of thinking?

5.2 Way of Working

The exact way of working appeared to be different in every project; it depends on the problem situation at hand. In other words, VSS cannot and should not be regarded as a cookbook. Rather, it comprises of a set of design steps. The order and extensiveness of these design steps depend on the type of problem, the bandwidth of the problem, the scope of the problem, and the existing amount of insight in the problem [21]. There are two guiding perspectives that we distinguish when the order of design steps has to be determined: problem-driven and goal-driven [4]. Problem-driven approaches continually seek out deficiencies in an organization that should be eliminated or reduced. This can also be interpreted as looking for gaps between current and potential performance. Goal-driven approaches start with the development of a vision for the organization. Analyzing the differences between this target vision and the current situation helps identify what improvements are desirable. The problem-driven and goal-driven approaches, however, are not as clearly distinct as this summary may imply. For example, in examining the current system, the analyst needs to have some appreciation of the system goals to understand the operation of the organization. Similarly, some appreciation of the current system is needed before a vision for the organization can be developed. The challenge for the VSS research program is to find a balance between problem-driven and goal-driven steps. An indicator for this balance can be deduced out of the projects. Two of the four projects used a goal-driven approach. These two projects showed the most effort taken for validation of the model and gaining trust. This might imply that some analysis of the current situation can be used to overcome this extra effort.

5.3 Way of modeling

All four projects rely heavily on dynamic modeling. And all four projects show the same challenges. First, dynamic modeling is time consuming. Especially in today's fast moving, hostile environment this time might not be available. Second, it is difficult to really integrate modeling (dynamic and static) in a collaborative setting. For the VSS research program it remains to be researched how to deal with these challenges.

To really integrate modeling in a collaborative setting requires than non-modeling experts are able to work with the model [29]. In three of the four projects described, the models were not really used by the participants: the researchers explained the models to the participants and made changes to the model in line with the discussion taking place among the participants. In one project, the participants put great effort into collaboratively drawing static models of their processes. Two solutions are available for improving collaborative modeling. First, the tools used to build the models should be easy to use with a small learning curve. Second, a model must closely resemble the mental models of the persons involved [6]. Using visualization on top of the existing models might contribute to this [37]. Animation of the dynamic models appeared to support the involvement of participants in the projects.

Building a model takes a lot of time. One way to deal with this time/completeness paradox is to build less detailed models. An interesting research topic is how this would influence the decision making process? As the first project showed, it is very well possible to define problems without using detailed quantitative data.

Another way to deal with the time/completeness paradox is to decrease the time required to build a model. Using building blocks that abstract more complex recurring parts of the modeled situation is very promising to speed up the modeling process. Building blocks also incorporate a danger: participants not involved in the construction of the building blocks can easily put the model on the agenda for discussion, rather than the decision they should make based on the model's information. The assumptions made in the building blocks should be very clear.

Furthermore, expert estimations could be used instead of exhaustive data collection to decrease the time needed for model building. Interesting research topic is to analyze how close expert estimations approach the real values, especially when the estimations are made collaboratively. Would a collaborative setting deal with some of the problems that are common in an individual setting, such as bounded rationality?

5.4 Way of controlling

The way of controlling relies heavily on collaboration. Collaboration is said to be important for reasons of acceptance. The projects described above demonstrate this. In those cases where the participants working with the model did not participate in building and validating the model, acceptance of the correctness of the model appeared to be a serious challenge. Although this might be an argument for including all stakeholders from the beginning, this is not always preferable. Time, for example, might be too short to do so. Effective guidelines are required regarding the involvement of certain stakeholders in particular steps.

Furthermore, it became clear that, although the projects focused on rational design issues, there may be other issues such as political, cultural, and social issues that influence the process (project 3). Process management is important when dealing with these issues. Process management finds its origin in the fact that besides rational considerations other issues are present when groups work together to solve problems and make decisions [3]. Organizations or actors establish relations with other actors to achieve their goals and serve their interest. Negotiation is often an important aspect in this. The content often comes second to strategic and power-political considerations. An interesting research topic for VSS is to see how techniques for process management can be used in a rational approach to deal with strategic behavior.

Another remarkable notion from the projects carried out is that models are always prepared by the researchers before they are introduced to a group of stakeholders. In order to incorporate all relevant information into the model and achieve stakeholder buy-in, it is important to research collaborative model building where the model is being built with and by the group from the beginning.

5.5 Way of Supporting

Most of the issues concerning the way of supporting are already addressed in the previous subsections. Special attention it required to integrate the modeling tools in a collaborative setting. In most projects, the researchers used the modeling tools and showed the results to the participants.

GroupSystems appeared to function well in the projects. This is partly because of the functionalities of the software and partly because of the capabilities of the researchers who knew how to use the tool. The importance of making this knowledge explicitly available as guidelines is addressed by [2].

6. Conclusions and future research

This paper has addressed the need for a new approach supporting organizations with their innovation: requirements coming from the organizational systems and the environment changed, and tools and technologies developed. Furthermore, it has been shown that there are many uncertainties with using approaches available so far. Many projects result in experiences that ask for further developments. The experiences with the Collaborative Business Engineering approach have been collected and were used as a starting point to design a research program on Vision Support Studios. The aim of this research program is to design a studio for designing and evaluating organizational innovations. The research program should produce insight into several studio elements: tools, techniques, steps, and roles and guidelines for using the studio.

The experiences presented cannot be easily generalized. Although some projects appear to have much in common, they differ on several aspects, such as the number of participants, the business area and the type of design questions. However, we feel that the reported experiences can serve as a base to structure the research program on VSS. Further research will, of course, concentrate on elaborating the research topics mentioned. It is also very important to expand the experiences with experiences from other projects to even more firmly ground the research program presented in this paper.

References

[1] Bots, P.W.G. and H. De Bruijn, 'Effective Knowledge Management in Professional Organizations: Going by the Rules', in: R.H. Sprague, *Proceedings of the Thirty-Five Annual Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Hawaii, 2002

[2] Briggs, R.O., G.J. de Vreede, J.F. Nunamaker, and D. Tobey, 'ThinkLets: Achieving Predictable, Repeatable Patters of Group Interaction with Group Support Systems (GSS)', in: R.H. Sprague, *Proceedings of the Thirty-Fourth Annual Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Hawaii, 2001

[3] Bruijn, J.A. de and E.F. ten Heuvelhof, *Netwerkmanagement. Strategieën, Instrumenten en Normen*, Lemma Uitgeverij, Utrecht, the Netherlands, 1995 (in Dutch)

[4] Bustard, D., D. Greer, Z. He, P. Lundy, G. Wilkie, and R. Oakes, 'Developing a Business IT Coevolutionary Change Plan', in: D. Bustard, P. Kawalek, and M. Norris (eds.), *System Modeling for Business Process Improvement*, Artech House Inc., Boston MA, 2000, p213-232

[5] Carr, D.K. and H.J. Johansson, *Best Practices in Reengineering: What Works and What Doesn't in the Reengineering Process*, McGrawHill, New York, 1995

[6] Checkland, P.B., *Systems Thinking, Systems Practice*, Chichester: John Wiley & Sons, 1981

[7] Coyne, K.P. and R. Dye, 'The Competitive Dynamics of Network-Based Businesses', *Harvard Business Review*, January-February 1998, p99-109

[8] Davenport, H., *Process Innovation: Reengineering Work Through Information Technology*, Harvard Business Press, Boston, MA, 1993

[9] Davenport, T.H. and Stoddard D.B., Reengineering: Business Change of Mythic Proportions, *MIS Quarterly*, vol. 18, no. 2, 1994

[10] Dean, D.L., J.D. Lee, R.E. Orwig, and D.R. Vogel, 'Technological Support for Group Process Modeling', *Journal of Management Information Systems*, vol. 11, no. 3, 1994-1995, p43-64

[11] Dennis, A.R., G.S. Hayes, and R.M. Daniels, 'Re-engineering Business Process Modelling', in: J.F. Nunamaker and R.H. Sprague (eds.), *Proceedings of the 27th Hawaiian International Conference on System Sciences*, IEEE Computer Society Press, Los Almitos CA, 1994

[12] Dennis, A.R., T.A. Carte, and G. Kelly, 'Breaking the Rules: Success and Failure in Groupware-Supported Business Process Reengineering', Technical Report, Kelley School of Business, Indiana University, www.kelley.iu.edu/ardennis/wp/tr123-1.doc, 2002

[13] Donaldson, L. 'The Normal Science of Structural Contingency Theory', in: S.R. Clegg, C. Hardy, and W.R. Nord (eds.), *Handbook of Organization Studies*, Sage Publications, London, 1996, p57-76

[14] Grover, V. and W. Kettinger, *Process Think: Winning Perspectives for Business Change in the Information Age*, Idea Group Publishing, Hersey, PA, 2000

[15] Hammer, M., 'Reengeneering Work: Don't Automate, Obliterate', *Harvard Business Review*, Nov/Dec 1990, no. 4, p104-112

[16] Hammer, M. and J. Champy, *Reengineering the Corporation: A Manifesto for Business Revolution*, Nicholas Brealy Publishing, London, 1993

[17] Jarvenpaa, S.L. and B. Ives, 'Organizing for Global Competition: The Fit of Information Technology', *Decision Sciences*, vol. 24, no. 3, 1993, p547-580

[18] Jarvenpaa, S.L. and D.B. Stoddard, Business Process Redesign: Radical and Evolutionary Change, *Journal of Business Research,* vol. 41, no. 1, 1998

[19] Lohman, F.A.B., *The Effectiveness of Management Information*, Dissertation, Delft University of Technology, 1999

[20] Lohman, F.A.B., H.G. Sol, and G.J. de Vreede, 'The Illusion of Effective Management Information: A Critical Perspective', Working paper, Delft University of Technology, 2002 (accepted for HICSS 2003)

[21] Maghnouji, R., G.J. de Vreede, and A. Verbraeck, 'Collaborative Simulation Modeling: Experiences and Lessons Learned', in: R.H. Sprague, *Proceedings of the Thirty-Fourth Annual Hawaii International Conference on System Sciences*, IEEE Computer Society Press, Hawaii, 2001

[22] Nunamaker jr, J.F., A.R. Dennis, J.S. Valecich, D.R. Vogel, and J.F. George, Electronic Meeting Systems to Support Group Work, *Communications of the ACM*, vol. 34, no. 7, 1991

[23] Nunamaker jr, J.F., R.O. Briggs, D.M. Mittleman, D.R. Vogel, and P.A. Balthazard, 'Lessons from a Dozen Years of Group Support Systems Research: A Discussion of Lab and Field Findings', *Journal of Management Information Systems*, vl. 13, no. 3, 1996, p163-

[24] Nunamaker jr, J.F., R.O. Briggs, and G.J. de Vreede, 'Value Creation Technology; Changing the Focus to the Group', in: G.W. Dickson and G. DeSanctis, *Information Technology and the Future Enterprise; New Models for Managers*, Prentice Hall, New Jersey, 2001, p102-124

[25] Paul, R.J., V. Hlupic, and G. Giaglis, 'Simulation Modeling of Business Processes', in: D. Avison and D. Edgar-Neville (eds.), *Proceedings of the 3rd U.K. Academy of Information Systems Conference*, McGraw-Hill, Lincoln, U.K., 1998

[26] Rockart, J.F. and J.E. Short, 'IT in the 90s: Managing Organizational Interdependence', in: *Sloan Management Review*, 1989, p7-17

[27] Short, J.E. and N. Venkatraman, 'Beyond Business Process Redesign: Redefining Baxter's Business Network', in: *Sloan Management Review*, 1992, p 7-21

[28] Simon, H.A., *The New Science of Management Decision*, Prentice-Hall, Englewood Cliffs, 1977

[29] Sterman, J.D., *Business Dynamics. Systems Thinking and Modeling for a Complex World*, McGraw-Hill, USA, 2000

[30] Teng, J.T.C., Jeong, S.R. and V. Grover, Profiling Successful Reengineering Projects, *Communications of the ACM,* vol. 41, no. 6, 1998

[31] Tyran, C.K., A.R. Dennis, D.R. Vogel, and J.F. Nunamaker, 'The Application of Electronic Meeting Technology to Support Strategic Management', *MIS Quarterly*, vol. 16, no. 3, 1992, p313-334

[32] Vedder, R., M.T. Vanecek, C.S. Guynes, and J.J. Cappel, 'CEO and CIO Perspectives on Competitive Intelligence', *Communications of the ACM*, vol. 42, no. 8, 1999, p109-116

[33] Venkatraman, N. And J.C. Henderson, 'Real Strategies for Virtual Organizing', *Sloan Management Review*, Fall, 1998, p33-48

[34] Vreede, G.J. de, 'Participative Modeling for Understanding: Facilitating Organizational Change with GSS', in: J.F. Nunamaker and R.H. Sprague (eds.), *Proceedings of the 29th Hawaiian International Conference on System Sciences*, IEEE Computer Society Press, Los Almitos CA, 1996

[35] Vreede, G.J. de, 'Collaborative Business Engineering with Animated Electronic Meetings', in: *Journal of MIS*, vol. 14, no. 3, Winter 1997-1998, p141-164

[36] Vreede, G.J. de, D.T.T. van Eijck, H.G. Sol, 'Dynamic Modelling for Re-engineering Organizations', *Journal of Information Systems and Operational Research (INFOR)*, vol. 34, no. 1, 1996, p28-42

[37] Vreede, G.J. de and A. Verbraeck, 'Animating Organizational Processes: Insight Eases Change', in: *Journal of Simulation Practice and Theory*, no. 4, 1996, pp245-263

[38] Wanninger, L.A. and G.W. Dickson, 'GRIP- Group Requirement Identification Process', in: R.H. Sprague, *Proceedings of the Hawaiian International Conference on System Sciences*, IEEE Computer Society Press, Los Almitos CA, 1992

[39] Wijers, G.M., P. Seligman, and H.G. Sol, *Analysing the structure of IS Development Methods: A Framework for Understanding*, Technical Report, Delft University of Technology, 1992

[40] Yin, R.K., *Case Study Research: Design and Methods*, Sage, Newbury Park, CA, USA, 1989