

Joint Interdisciplinary Research Programs: the Next Generation

Creating a common mental platform by using scenario planning

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Abstract

This paper proposes a way of using scenario planning within joint interdisciplinary research programs, i.e. where industry and academia collaborate on a set of projects, to create a common mental platform which improves the understanding and collaboration within the program, gives management support and in addition results in an appealing description of the research idea from different perspectives, and not just from a technical one. The background of scenario planning, the proposed work method and possible effects are discussed.

Keywords: Scenarios, Scenario planning, Project Managing, Interdisciplinary projects

BRT Keywords: [AE, DD, IB]

Introduction

Projects in large research programs naturally consist of people from different backgrounds, not only with different level of experience and expertise but from completely different fields of expertise. This is required as the scope of most large research programs are broader than a typical academic field and thus needing members representing all the necessary knowledge areas regardless of department or faculty. Today we can see a trend where new projects tend to be increasingly more interdisciplinary. Unfortunately these kind of projects tends to develop diverging and ultimately incompatible contexts as the participants during the process bring in own different perspectives and goals. This is common both in projects involving several different companies and projects between different academic disciplines, but are becoming increasingly more common in *joint interdisciplinary research programs*, e.g. in large projects which consist of several smaller projects where companies are working together with universities.

We see three major problem areas with joint interdisciplinary research programs:

- Projects in research programs mostly work in isolation and not seldom develop a local set of goals which in turn leads to a *management problem* when the program direction is changed.
- Getting innovative results from people with different backgrounds and fields of expertise is troublesome and there is often a *collaboration problem* due to the different perspectives involved.
- *Communicating the research idea* to both professionals and laymen require an appealing description of the area of the research effort.

This paper argues that the problem of shaping a *common mental platform* for participants from several disciplines, from both the industry and academia, is similar to shaping a common perspective between members of a management team or the employees in a small knowledge company. By common mental platform we don't mean the same opinions between the team members but something similar to a common cultural platform; i.e. a set of commonly defined concepts making discussions about a certain subject valuable to all participants. Instead of inheriting the perspective from one or two of the major participants our suggested solution proposes creating a new common mental platform from relevant components of the participant's contexts. Because of the different backgrounds most of the participants have different mental models of where the development is heading and why. This is especially the case when working with engineers and the social, political and economical changes might be important for the success of some of the projects. To be able to understand each other the participants must then stretch their mental maps so that some common ground is covered and some commonly defined perception of the future is the basis for the project work. This can be achieved by using scenario planning, which helps develop such a mental platform between the research program board, the project leaders and the participants. By sharing a mental platform the program will also achieve a better adaptivity and homogeneity which make the management process much easier. By creating scenarios the research programs will, in addition to the increased collaboration abilities and documented settings for specific results from projects, be able to present interesting scenarios where the collected knowledge from the whole program is displayed in readable form for people within the program as well as for the layman.

Common mental platforms can of course arise naturally from prolonged interaction between program participants in meetings, presentations and daily work, but scenario planning offers a structured working procedure. It does not place participants' different views against each other, which can easily be the case if the participants are just asked to express their views of the likelihood and importance of possible future events in the research areas. Scenario planning directs these different opinions towards the goal of making credible scenarios.

Scenario planning

The History of Scenario Planning

Scenario planning has its background in military war games. The military has for many years used scenarios in their causal analysis of possible events. After World War II the method was adopted by the RAND Corporation and in the late 1960s scenario planning was widely used within the corporate world. Primarily it was used for forecasting, trying to find the most likely scenario but it was soon realised that the qualities of the method was to be found in the higher level of group understanding and *qualitative causal thinking* (van der Heijden 1996) resulting from its use. Much of the development of scenario planning methodology has been done at Royal Dutch/Shell, a huge oil company which today seldom makes a decision about a new strategy without testing it through their scenarios.

In the early days of scenario planning thousands of scenarios were produced, several for each area under inspection. These scenarios which were based on numerical forecasts aimed at framing every possible future, i.e. very similar to the military approach. Today the benefit of using the method is primarily seen in shaping a few mind stretching scenarios in a narrative form which does not require huge mental efforts to understand, and will therefore trigger new interesting questions never raised before.

The Essence of Scenario Planning

Scenario planning is a semi-structured method for identifying and getting a deeper understanding of the environmental forces shaping the future in a specific domain by systematically and collectively produce narrative scenarios about the future of that domain. In the process the participants, usually a heterogeneous group, develop a common vocabulary and create a common mental platform for discussions about the important driving forces of this particular domain.

The scenario approach uses a qualitative oriented way of working. It is not used as a basis for decision making as such, but rather to visualise different aspects of a specific problem domain based on important uncertainties. It is especially valuable for those uncertainties which are difficult to quantify or in other ways grasp in a more structured way.

Scenario planning is the counterpart of the rationalistic method of planning and decision making, which is in short to gather and analyse all available information, assign different values to the data and make decision based on probabilities. This traditional method has two major problems:

First, it is easy to miss non-quantitative information as one is looking for data which fits the working method. Second, when important qualitative information is found, it is either ignored or given a value based on the collector's subjective opinion, as the unmodified data does not lend itself to rationalistic evaluation.

The inherent power of narrative scenarios of the future can be seen in how science fiction stories have influenced engineers and scientists and thereby the technology development. For example, The Star Trek communicator is the obvious direction in which the development of mobile phones, PDA:s and handheld GPS systems are heading today.

Outline of One Scenario Method

Early work with scenario planning featured many scenarios, based on permuting the extremes of all driving forces. More recently, scenario planning for management purposes (van der Heijden, 1996 & 1997 and Schwartz, 1991) has favoured the scenario matrix method that results in four

quadrants which could be viewed as four different scenarios, or a slightly more unstructured inductive method resulting in about the same number of scenarios. Experience from earlier work has shown that two to four different scenarios is both administratively and mentally a manageable number. Below, a brief description of the scenario matrix method of scenario planning is described.

1. Identify focal issue/question and determination of valid time frame

If there is a specific question or strategic decision which is currently discussed, this will probably be a reasonable candidate for a *focal issue*. This issue is used in later phases as a filter which guarantees the relevance of the suggested factors and forces.

2. Identify key factors

Find all known key factors affecting the focal issue by using brain-storming sessions and interviews with experts and practitioners.

3. Search for the "unknown" driving forces behind the key factors

Identify the underlying driving forces behind the key factors. The primary goal of this phase is to find previously unknown relations which explain or emphasise important driving forces. Basically all work here consists of deep group discussions about possible driving forces.

4. Organise forces in scale of importance and uncertainty

Find out which forces are the most relevant and influential in describing the future domain of the focal issue.

5. Pick the most important and uncertain forces and create a scenario matrix

By using a matrix spanned by the two most important forces, four quadrants appear, each outlining a different scenario. These scenarios are named and fleshed out as stories using the previously identified factors and forces.

6. Evaluate the focal question in each scenario

Evaluate what happens to the focal issue in each scenario. Normally, if the issue appears to be stable in more than two of the scenarios, it is most likely that there exist a robust strategy or decision concerning the issue. On the other hand, if the outcome is different in several scenarios, the strategy or decision is then uncertain, and a more cautious approach to the issue is probably wise.

7. Identify indicators which tell in which direction the environment is heading

Having produced a map over the future, the next step is now to find which landmarks shows the directions envisioned in the map. It is therefore important to find the important indicators which points out when a discussion regarding a change in strategy is relevant.

General advantages of using Traditional Scenario Planning

Scenario planning has been used in several management and strategy projects where a joint effort in "reperceiving" the company environment is required. In larger projects it has been applied in order to focus the group on identifying the company's future or present problems by initially establishing a common mental platform, thus making a discussion possible.

In other contexts the resulting scenarios are more important than the process of creating similar views. A less structured version of scenario development is used in creative design work when the designers must envision a future where the result of their work – a product or concept – should fit. These scenarios are probably more close to science fiction stories, because the design group is producing one scenario per project and is not trying to map the complete future from the driving forces. They are instead trying to produce one believable scenario in which the focused design object is brought out.

One of the key participants in the Royal Dutch/Shell Strategic Planning group, Kees van der Heijden states in his book *Scenarios - The Art of Strategic Conversation* – a number of identified advantages with the method from a corporate perspective. Four of these identified advantages are: *robust decision making, stretching mental models, enhancing corporate perception and energising the management.*

Robust decision making

The process of finding predetermined and uncertain driving forces which are likely to affect the future of an organisation inevitably leads to questions about the underlying factors behind these forces. These second level questions widen the discussion and take it to the conceptual level of "what affects what". Presenting a diverging picture with several futures built on the previous analysis where the most important uncertain forces create a number of different, but causally plausible scenarios, can be extremely useful in discussions of the future and strategy testing. The decisions which are made after being tested through the resulting scenarios tend to be much more robust.

Stretching mental models

As scenario planning focus on the underlying driving forces that influence the targeted future, the creation of a number of diverging scenarios can point out issues usually deemed irrelevant in the participants specific fields. By supporting each other with knowledge, and collaborate in creating views of possible futures the participants stretch their mental models and are able to imagine radically different futures.

Enhancing corporate perception

The third important effect of using scenario planning is that it allows an organisation to respond quicker and more effective to new developments in its environment. By thinking about the world in terms of different and equally possible futures one is forced to formulate strategies which are flexible and work in all, or as many as possible, of these futures. By sharing views about the future all participants in the scenario work will be able to identify a large number of indicators which immediately can be interpreted and available for recursively enhancing the common view. Participants is thus trained in "thinking the unthinkable". One traditionally cited example is the Shell oil company which, due to the commitment to scenario work, was able to work its way through the oil crisis in the seventies because they had allowed themselves to *think the*

unthinkable: that the oil price would not be stable forever. It adapted to the new and more harsh environment with less problems than its competitors because it had in advance prepared themselves for several different futures by internally conducting scenario sessions.

Energising management

Scenario planning can play an important roll in making projects in large organisations well-balanced and sound. By having the organisation manage itself, *not by direct instructions from above, but by sharing the same context or setting*, they are able to adapt to participants can quickly adapt to changes in the environment without being explicitly commanded. This degree of freedom makes the organisation work more smoothly and ultimately more adaptive to continuously changing surroundings.

Specific advantages for Joint Interdisciplinary Programs

Apart from the generic advantages scenario planning may have, there are a number of more specific advantages when it comes to inherently interdisciplinary fields such as Informatics, Artificial Intelligence and environmental sciences.

According to IDON Associates (IDON Associates, 1998), scenario planning can be used to identify so called *pockets of the future* in the present, i.e. places or environments where technologies or concepts of tomorrow are already in use. These pockets can be used to identify trends and new ideas of technology use or practice as well as finding potential test beds for developed project concepts or prototypes.

Concepts similar to scenario planning have been used in participatory system development projects usually by the name "future workshops" and an example of the use of these can be found in (Kensing & Madsen, 1991). These workshops have successfully been used when conducting the first analysis of the actual problem domain using experts in the area and having them brainstorm, shaping a future vision of their own area of expertise.

Proposed Method for Joint Interdisciplinary Programs

Organisation

Depending on the size of the program and the allowed administrative overhead it is probably valuable to have at least one responsible administrator/facilitator conducting these activities. Organising the scenario activities as a project in the program is helpful when it comes to seriously collecting interesting information, putting some effort in documenting and in the end feed information back to the projects. Participants in the scenario sessions are of course the project members, especially those with either administrative, leading or creative positions in the participating projects.

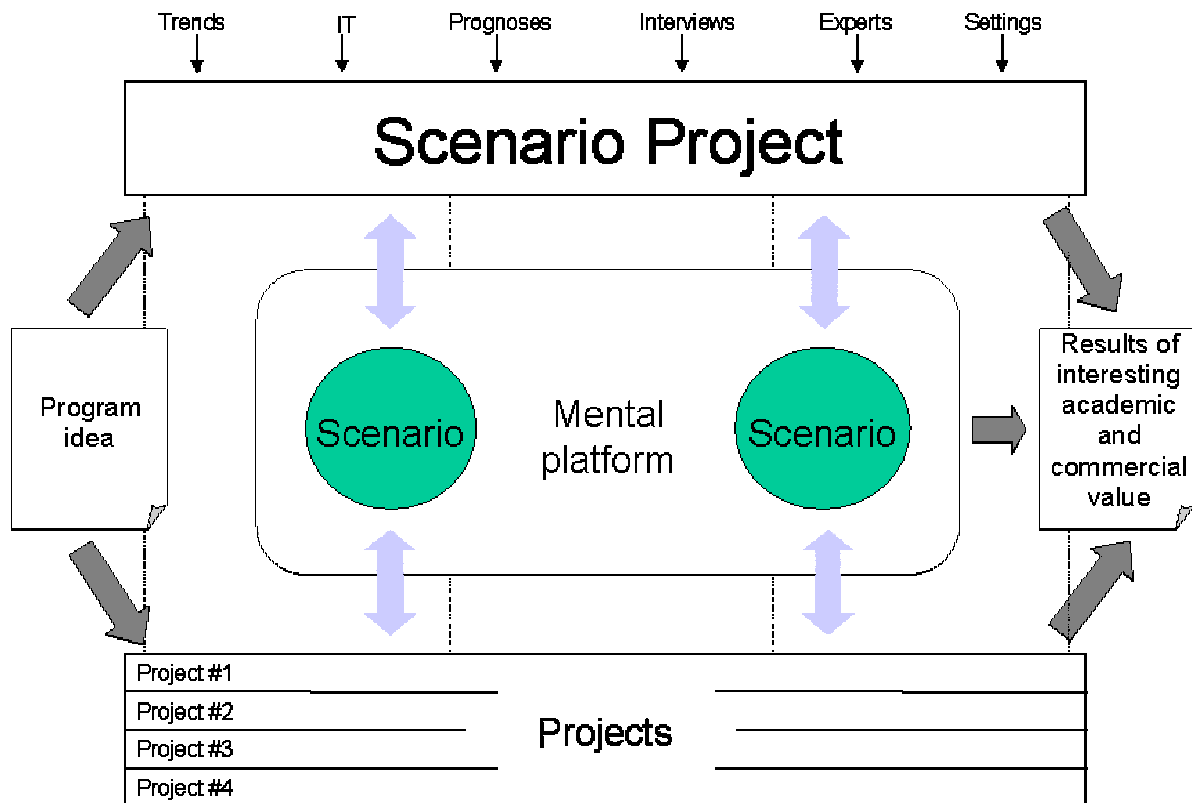


Figure 1. The role of a scenario project within a joint interdisciplinary program.

Time Schedule

A scenario project should work in parallel with the different activities in a research program. Apart from starting the program by building general scenarios for use as input to the projects, the scenario project members would keep in constant touch with the other project activities through both discussions with project leaders and by attending some of the other project meetings.

Phases

When specific questions or problem areas arise in an activity, or when the scenario project notice that similar areas are focused upon in parallel activities, a scenario activity is initiated. The activity begins with a *preliminary study of the area* and the resulting data is then used to focus the work in the following *scenario planning session*. After the scenario session is finished the project group *documents the activity* and *creates a presentation kit of the generated material*. The process of feeding the organised information back to the projects will hopefully lead to new questions and initialise a new scenario cycle.

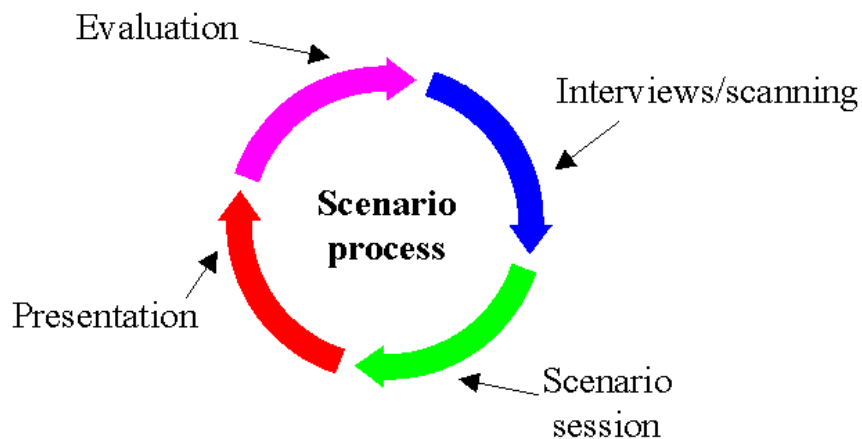


Figure 2. The phase cycle of the scenario process.

Due to the organisation of work around seminars including pre and post processing of results, the number of scenarios produced is related to the rise of questions and areas needing further exploration in the program.

Data Collection

The study consists of interviewing people in the various activities on their views on the subject, gathering information from other, maybe outside, sources and contacting experts in related fields for further comments. The objective of the study is to find a question around which influencing trends and driving forces could be organised to prepare material for a meeting spanning several days in which all related project participants meet to elaborate around the proposed focal issue.

The project group then prepares the material for the scenario planning session by distributing information on related subjects.

Compared to traditional scenario planning which often takes data from statistical analysis of companies and markets, data is in this case taken from academic articles, reports on technological breakthroughs, literary visionary work and reports concerning society development.

Scenario planning session

The creation of the actual scenarios in a scenario session with participants from several projects starts with an analysis of the collected material. The purpose with this is to identify factors and driving forces and make a model of how these interact, thereby identifying the most interesting driving forces affecting the focal issue. These driving forces becomes the foundation of ideally three to four scenarios. For each scenario a timeline is devised in order to visualise the causal relationships between the envisioned events that shapes the narrative structure for a scenario. The session has two goals: to make participants identify and be aware of all important driving forces behind the focal issue, stretching their mental models, and provide a sufficient amount of material for the scenario groups to create scenarios in the next phase.

Instead of the traditional focus on product and company strategies, the session is focused on developing a generic useful setting which could be used as a common platform for several research areas.

Documentation phase

The finished scenarios are given as reference material to the research program participants in order to give a interdisciplinary view of the perceived future. The scenarios are also used as an evaluation tool for specific projects and the program as a whole, identifying interesting issues which require special attention by researchers, or exposing issues that at closer inspection are of lesser interest to the program.

The documented scenarios should then be made available to the public in a suitable and readable form. As they are generic and not company or product specific, the scenarios can work as conduits for establishing relations to other researchers and give a general overview of the specific area of the research effort.

The value of using scenarios in research programs

The primary benefits of using scenario planning in joint interdisciplinary programs is that participants create a *common mental platform* and thus are able to understand each others' frames of reference, making co-operation between different projects easier. One can argue that this is not necessary since there exists projects who have solved this problem simply by meetings. Scenario planning is an alternative method for bridging the first harsh arguments and collective confusion and, quicker and without serious conflict, put the whole group on the same track. Our opinion is that increased *competitive co-operation* in the academic and corporate world is necessarily leading to an increase in interdisciplinary research programs. Since these kinds of projects are very beneficial for both industry and academia, it is crucial that they are successful. To be able to reach the overall goals, participants must be able to formulate, and work towards, a set of "common" subordinate goals and consequently have to be able to communicate and understand each other. As participants come from different fields and disciplines, one can think it may be impossible for them to form a common mental platform based on their different perspectives. A number of very large earlier joint programs, such as the Manhattan project and the Apollo project, have shown that it is possible even without the use of scenarios. However, these programs were started by military initiatives and was consequently controlled in a strict hierarchical way. We believe scenario planning offers a less hierarchical way to achieve co-operation and this is important in joint interdisciplinary programs as these tend not to have a clear hierarchical management structure.

An almost as important advantage as creating a common mental platform is the use of scenarios and the scenario method as *a tool for collaboration in the idea creation and design process*. Projects related to information technology are today in an extreme situation where the founding concepts of the field are changing and few traditional heuristics seem to be applicable in the future. Stretching the minds of the participants to create and identify interesting ideas for future concepts is thus a difficult but necessary task. Using scenario planning as a vehicle for enhancing co-operation within projects will make them more fruitful and more focused. The results can first be expected to be seen in better design goals of the projects and a more stable foundation for the program.

One could argue that by using scenario planning one risks the scenarios are based on wild fantasies about future worlds. This is not the case as outside experts are involved before, during or after the scenario work and act in a normalising way to ensure that a sound view is created. This could probably be true if the scenarios were developed by a small group of persons of similar minds or background, and was lacking the wide range of knowledge and perspectives required in our process.

Scenario planning takes time from the "actual" work in projects but the amount of work required for scenario planning is small compared to the amount of work normally spent on goal formulating in a joint interdisciplinary research program. Efforts in the scenario planning phase will most likely reduce the time lost in arguments and misunderstandings due to faulty communication, and some of the more fundamental misconceptions can hopefully be straighten out before they become a serious problem for the program.

The changed management model that is described in the proposed method does not in itself allow the management to know in detail what is happening in each research project. It does, however, give the management a way to actively work together with the participants and have a better holistic understanding of work being accomplished. One effect of this is that the purely administrative version of management will be non-existent in these programs, since more participants will contribute by sharing their ideas in central parts of several projects.

One negative effect that could be envisioned is that project participants lose respect for their management and act independently. This is the crucial problem with methods which rely on project participants being attracted to the management process rather than forced. As long as the interest for the scenario process and/or the result remains, this process works. On the other hand, this also ensures that the facilitators of the scenario process remains the core of an ongoing project. If and when the scenario project loses interest from the participants the whole process dies almost instantly.

The pure economical control does not necessary have to disappear because of the use of scenario planning, but we think it would be appreciated by all if the discussions of economical matters coincides with the project goals and is conducted on a higher and more informed level.

This paper does suggest the use of scenario planning for large interdisciplinary research programs or projects and not for small projects with few participants. The method can most likely be used in small projects but the management and collaborate benefits are of course much smaller. The effect of having a well developed scenario for describing the relevance of the research is still an important issue though.

Apart from the possible advantages of common mental platforms and support for idea creation and design process, scenario planning produces a product which stands for itself: *the scenarios and the discussion around the focal issue* which explains the program's ideas and goals and the rationale which lead to them. The scenarios can be used effectively to explain the project purpose for people not directly involved in the program. With the perspective from earlier comparison to the inherent strength in Star Trek or other science fiction narratives these stories can however turn out to be a double edged sword since they only appeal to specific groups of people, e.g. computer engineers. It is probably wise to recognise this problem and try to reach a more diverse group by formulating the scenarios in a less single minded way and ensure that the injected

knowledge is coming from an as broad perspective as possible.

When broadening the initial perspective many of the important driving forces in other areas e.g. social changes, changes of current business models and important political issues, are also taken into consideration. This is helping the program to envision a future featuring a lot of more perspectives than otherwise possible, which in the next step makes it possible to position and evaluate the project goals against a more elaborate view of the future. Having a broad societal, economical and political perspective on technology oriented research is usually left to research boards who in most cases are not engaged in the creative research situation. Those perspectives are in this process injected directly to the projects which we hope will make the hit rate of the projects much higher.

The most common objection to the use of scenario planning for "serious" purposes is that people do not want to read fantasy stories about possible futures, but concentrate on the actual problem. However, in order to be able to be prepared for the future, one must be aware of the current trends and issues which can influence the future. As these may come from any field, it is important to be able to receive new ideas from disciplines outside one's own and be able to *think the unthinkable*. Several stories about the experience from using the method (Schwartz 1991), comment on this and concludes that these objections usually disappear when the participants have been involved in the process and seen some of the results.

Conclusion

From the discussion above, it becomes apparent that joint interdisciplinary research program have much to gain by incorporating scenario planning in all stages on the program. First, before the actual work has started in the different projects, using the method described in the paper helps focusing on the overall goal and helps to build a common mental platform among the participants. Secondly, scenarios can be used in the program and the different project management processes to ensure the anticipated common direction of the program and evaluate it against an elaborate view of the future. Finally, the task of communicating the programs goals and visions to the outside world is easier when the first work on scenarios have been accomplished. Another interesting but not easily measured advantage is that working with scenarios can be beneficial to the projects creative climate, making it much easier to reinvent the projects when new ideas appear from within or outside the program.

We will have the possibility of testing these ideas in the *ITS and Mobile Work* program being started at the Viktoria Institute, involving several important Swedish industries.

References

IDON Associates, *Strategic Thinking With Scenarios*, Web page,
<http://www.idongroup.com/assoc/stratscen.htm>

Kensing, Finn & Madsen, Kim Halskov (1991). *Generating Visions: Future Workshops and Metaphorical Design*: in Greenbaum, Joan & Kyng, Morten (1991). *Design at Work – Cooperative Design of Computer Systems*, Lawrence Erlbaum Associates, Hillsdale, New

Jersey 1991

Schwartz, Peter (1991). *The Art of the Long View*, Currency Doubleday, New York 1991

van der Heijden, Kees (1996). *Scenarios - The Art of Strategic Conversation*, Wiley, Chichester 1996

van der Heijden, Kees (1997). *Scenarios, Strategies and the Strategy Process*, Bruekelen, Nijenrode University Press, 1997, Nijenrode Research Papers Series - Centre for Organisational Learning and Change ; No. 1997-01
<http://www.library.nijenrode.nl/library/publications/nijrep/1997-01/1997-01.html>