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Validation of a set of design principles to promote knowledge productivity and innovation

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This study explores the learning processes that contribute to knowledge productivity: gradual improvement and radical innovation of an organisation's procedure and products and services, based on the development and application of new knowledge. The research is based on the assumption that innovation is the result of a series of powerful social learning processes. Based on previous case study research we formulated a set of twelve design principles. Those principles reflect key factors relevant to the innovation processes. The study at hand presents the validation of this set of design principles. The method used is a set of circular scales with which people involved in innovation practices analysed their innovation process. From the data it reveals that the design principles do not miss elements that are essential for innovation practices. The two design principles that seem to be ambiguous and need further elaboration are principles 11 and 12. Furthermore it became clear that reflecting upon an innovation practice works best when doing it together instead of doing this individually.

Keywords: knowledge productivity, innovation, validation

1. Introduction

Our society is gradually becoming a knowledge society. Peter Drucker (1993) speaks of a revolution that is comparable to the industrial revolution that started in the 18th Century. This means that the traditional factors of production, labour, land and capital, make way for the factor of the production of 'knowledge'. By applying knowledge, people develop gradual improvement and radical innovations that lead to new products and services which provide for economic growth. This shift from an industrial society towards a knowledge society requires a change in the way we look at learning and working.

According to Kessels (1995, 2001), in an economy where knowledge is dominant, daily operations in organisations should be designed to support the process of *knowledge productivity*. This process of knowledge productivity entails: identifying, gathering and interpreting relevant information, using this information to develop new capabilities. When applying these capabilities the process of knowledge productivity becomes visible in gradual improvement and radical innovation of an organisation's procedures,

products and services. The process of knowledge productivity is based on powerful learning processes. Work becomes a place where participants consider questions that connect to their own curiosity and which at present go unanswered (J. Kessels & Keursten). In order to find new solutions, learning that facilitates knowledge development is necessary. This view reflects what Cohen & Levinthal (1990) state; they regard problem solving and learning capabilities as similar concepts. For gradual improvement and radical innovation to occur, it is necessary for the people involved to develop the capability to actively work on discontinuities (Patriotta, 2003) and breakthroughs (Op de Weegh, 2004) which will lead towards innovation and improvements.

Developing this capability is not something to be learned from a book or training. In environments where the desired outcome is to achieve standardisation, repetitive routines and fixed procedures, the desired level of performance can be clearly described. In these environments a gap analysis helps to identify the required interventions. This is not the case in the knowledge economy (Harrison & Kessels, 2004). When the desired situation cannot be defined clearly, which is the case with questions whose answers are aimed at leading to innovative solutions, a clear path of interventions cannot be defined. It is not possible to systematically design a learning process that analyses the actual and the desired situation and to design a learning process to overcome the gap. There is no fixed training that helps people to acquire the necessary skills. It is a process that happens in practice and that it is about creating a context in which people participate and thereby acquire the abilities needed (Brown & Duguid, 1991). This process of learning in practice can not be managed systematically (Harkema, 2004). The term management implies control of processes that may be inherently uncontrollable (Von Krogh *et al.*, 2000). It is a learning process that takes place while working, driven by people who are motivated to find answers to the intriguing questions they encounter.

In literature on innovation, learning is assigned an important role as well. Innovation literature used to be pointed merely at technical innovation and considered innovation as a linear process of development and implementation, merely pointed at the development of new products and technology (De Leede & Looise, 2005; Harkema, 2004). Movement, interaction, feedback of knowledge and resources did not then have a prominent place in theories. Innovation was seen as something initiated by the Research and Development department of an organisation. If knowledge was acknowledged, the emphasis was on learning from external knowledge sources (Harkema, 2004). In more recent literature innovation is seen as a cyclical interactive process in which learning plays an important role (Tidd *et al.*, 2005). Recent research in more than four hundred Spanish organisations showed that organisational learning positively influences innovation and the organisation's success (Aragon-Correa *et al.*, 2005). Not only technological product innovations but also process innovations are reckoned as an important source for innovation (Volberda *et al.*, 2006). This means that R&D-departments are no longer the only initiators of innovation (Moss Kanter, 2006). Rather, everyone in the organisation contributes to the process of continuous improvement and radical innovation of their products, processes and services.

2. Problem statement

The idea that people and learning processes are the only true source of competitive advantage in a world where products can so easily be replicated (Walton, 1999) and the

fact that high levels of success can only be achieved in organisations that are able to develop creativity and innovation (Majaro, in: Walton, 1999) give rise to this research. The learning processes necessary for innovation cannot be learned via training, nor can they occur through systematic management. Rather they are part of the daily work. This means it is important to learn more about the learning processes that bring about the necessary improvements and innovations. Therefore in our research we want to learn more about the characteristics of a work environment in which learning for knowledge productivity is stimulated and supported. One of the preliminary results in this study is a set of twelve design principles (Verdonschot & Keursten, 2006) that collaboratively characterise the work environment in which learning that leads to knowledge development and innovation can take place. The study at hand presents the validation of this set of design principles. The questions that are central in this validation study are:

Is the set of design principles valid?

How do people, involved in an innovation practice, give meaning to the design principles?

The next paragraph gives an overview of the design principles and the previous research that was carried out to develop them. After the presentation of the design guidelines, the method is elaborated upon and the results are given.

3. A set of design principles for innovation and knowledge productivity

The set of design principles is a result of several research activities. A reconstruction study of 16 innovative practices in various organisations and networks in the Netherlands, China and Indonesia led to a first overview of stimulating and hindering factors for knowledge productivity (Keursten *et al.*, 2006). Next, a parallel research was conducted in 9 innovation practices in the context of Habiforum, a Dutch network-organisation that initiates various innovation projects in the context of spatial planning. The findings of this parallel research, combined with an extensive literature review, contributed to the development of the set of design principles (Verdonschot & Keursten, 2006). The design principles are meant as pillars that together constitute the learning environment that supports people to be innovative. The context in which they are expected to work, are *innovation practices*. An innovation practice is a situation in which a group of people collaborate in a particular context on a particular question with the aim to find an innovative solution through a new way of working. Habiforum[1], the main context for this research, works with innovation practice in the context of spatial planning. For instance an innovation practice could evolve around the restructuring of a district; the ambition to build a multi-layered business area; or restructuring a dangerous crossroad in the city centre. An overview of the set of design principles that aims to support learning necessary for innovation in these innovation practices, is given below[2]:

Principle 1: Formulating an urgent and intriguing question
Developing an urgent and intriguing question is necessary for knowledge productivity. Such a question is not a given, it needs active development in interaction with key

[1] For information on Habiforum see http://www.habiforum.nl
[2] For a more detailed description see http://www.knowledgeproductivity.com and Verdonschot & Keursten (2006).

players and stakeholders. Urgency not only relates to a rational urge but especially to the personal feeling that there is an urge: the question has to be formulated in such a way that the people who work on it, have the feeling that the question cannot remain unanswered. It becomes intriguing when people feel enticed to develop new perspectives on the question.

Principle 2: Creating a new approach
In order to find new solutions ('thinking new'), a new way of working ('acting new') is necessary. A new way of working is not only about new techniques (e.g. new forms of structuring a meeting), but also about giving shape to an innovative process. You should design a new path that you make increasingly concrete along the way.

Principle 3: Working from individual motivation
Individual motivation is a powerful engine for innovation and a condition to make it something special: without strong motivation, breakthroughs are not likely to occur. The personal motives deal with a passion for a certain theme or they deal with a personal interest. When one can work with things that are important to yourself, you create ownership (take responsibility) and entrepreneurship (take action). People's own motives also make them curious. When it concerns you, you want to take action. Even when it means that you have to leave the conventional roads and make detours. People dare to be disobedient and break with existing patterns. This is necessary to find new roads and arrive at innovation.

Principle 4: Making unusual combinations of subject matter expertise
For innovation, subject matter expertise is essential: innovations are about real new concepts and ideas in certain knowledge areas. Therefore it is crucial to constantly examine, combine and develop new subject matter expertise. Innovation evolves when new connections are made. New connections are found by bringing in new ideas from a different context or expertise, and by playing with and changing the context in order to give existing elements new meaning.

Principle 5: Working from mutual attractiveness
For innovation processes, an environment in which people are attractive to each other is necessary. This means an environment with powerful and constructive relations between people. Interactions in such an environment can be fun, pleasant, creative, but also confronting. In such an environment the care for each other and trust play an important role.

Principle 6: Tracing successes and define everyone's contribution to it
Innovation can be improved by working with the things that are already there, the things that you are already good at. By making explicit each other's contribution to the process and by using your successes as a starting point, you can improve the knowledge development. This principle consists of three elements:

- Look back and define the successes that you had. Share these.
- Examine the contribution of each one in the group to this success.
- Give it a future perspective: what can we bring about with help of these strengths?

Principle 7: Creating something together
In the case studies, there were groups who found it hard to make valuable connections with each other. They had polite conversations, discussions and reflections but couldn't develop new knowledge. By creating something collaboratively, people acquire and combine knowledge, insights and skills. By making something concrete (e.g. a scale model or a scenario for a workshop), experiences that used to be implicit now become explicit, people talk about them and elaborate upon them. That is crucial for the development of new knowledge. It helps to create a common practice instead of merely talking about it.

Principle 8: Enticing in order to see new signals and to give these new meaning
For innovation it is necessary to develop an antenna for new signals and to entice people to give more and new meaning to those signals. Looking for new (little) signals and to develop a kind of sensitivity for it is the first step. The second step is to actively look for new information that teaches you more about these signals. Finally, it is about a process in which people collaboratively develop new meaning based on the information found. The use of new, not yet existing words and other kinds of representations, and the use of stories are important in this principle.

Principle 9: Connecting the world inside the practice to the one outside the practice
In order to be successful, the world inside the innovation practice needs to be connected to the world outside. Otherwise the risk is that within the innovation practice great ideas are developed that never cause a breakthrough with far-reaching consequences in the world outside the innovation practice. Positive attention from persons with a certain status, or attention from media, gives access to the outside world. This kind of attention in itself is not enough to realise a breakthrough, but it offers the opportunity to meet people and start to connect the two worlds.

Principle 10. Organising creative turmoil
A sense of urgency, experienced by all participants, is necessary for innovation. This sense of urgency arises when there is some form of external pressure, or when you have set milestones; certain moments in time when people have to deliver something.

Principle 11: Making it a social and communicative process
Knowledge development is a social process. Communicative and social skills are the vessel in this process. That's why it is important to give attention to the quality of the interactions: encourage listening to each other, investigating underlying meanings and assumptions, focusing on understanding before judging, connecting each new input to previous ones, concentrating not only reflecting on the past but also generating new futures.

Principle 12: Supporting the development of competencies
It is important to work actively on individual and collective competencies: the innovation process should be designed as a learning process for the people involved. Therefore it is important to think of the competencies that should be developed, to define what competencies everybody can contribute, and to develop approaches and ways of working that stimulate learning in that direction.

4. Research design

In essence, in both quantitative and qualitative research, the concept of validity is the same (King, 1994). In quantitative research, an instrument is valid when it actually measures what it claims to measure. In qualitative research, a study is valid if it truly examines the topic that it claims to have examined. However, where both traditions differ is that in quantitative research, notions of validity centre on methods, whereas in qualitative research the concern is for the validity of interpretations. The conclusion that certain main themes emerge should be plausible. In order to determine the validity, the involvement of other people like interviewees and experts is crucial to interpreting data (King, 1994). The study at hand presents a validation of the set of design guidelines in which we involved people that participated in innovation practices. Table 1 gives an overview of the research questions that were leading, the rationale behind these questions, the method that was chosen, and the respondents that were involved.

Research question	Rationale	Method	Respondents
1. Is the set of design principles valid?	In order to determine whether the design principles reflect the most important pillars that constitute a work environment that promotes knowledge productivity, the design principles are used to reflect upon innovation practices the respondents are involved in. In this way it is checked whether the internal validity (Merriam, 1999), the extent to which the findings are congruent with reality, is realised. Using the design principles to reflect upon an innovation practice helps to see whether the set is complete, and whether the design principles are clear.	As a data collection instrument a set of circular scales was applied. The participants were asked to place cards, with design principles as labels, in the rings according to the degree they found these active in their innovative practice: from very much attention for a principle (inner circle) to absence of a principle (outer circle). This instrument is based on the method of 'mapping' as described by van der Waals (2001). The rings resemble a five-point Likert scale with the difference that people are allowed to place cards in between circles. The method of mapping combined with in-depth interviews offers the possibility to understand how the respondents interpret and use the design principles.	23 Respondents (10 were participants of innovation practices and 13 acted as facilitators in innovation practices) filled out 21 circular scales. In-depth interviews were held with the facilitators.
2. How do people give meaning to the design principles?	In order to find out what meaning the respondents give to the design principles, the respondents, all involved in an innovation practice, are asked to reflect upon their innovation practice with help of the design principles. From the differences and similarities that come from respondents' interpretation of the design principles we learn if their way of giving meaning is consistent (are their interpretations various or do they all refer to the same aspects). At the same time, it gives insight in the way people work with the principles.		

Table 1. Overview of research activities conducted to validate the design principles

4.1 Selection of respondents

The circular scales (see table 1) were filled out by 13 facilitators of innovation practices. This resulted in 11 scales since four of them were co-facilitating the same innovation practice. Another 10 respondents, who were participants in different innovation practices, worked individually with the circular scales that were made electronically available for this purpose. The innovation practices the participants were involved in, are in part the same as the innovation practices that were analysed in constituting the set of design principles (Verdonschot & Keursten, 2006). The facilitators were familiar

with the design principles (they had worked with them before), to the participants of the innovation practices the design principles were new.

4.2 Instruments

The instruments used consisted of a set of circular scales and cards on each of which a principle was printed, an electronic version of this instrument (available, in Dutch, at http://www.kennisproductiviteit.net/tool), and an interview guide. For a picture of the electronic instrument, and for a picture of people working with it, see figure 1 and 2.

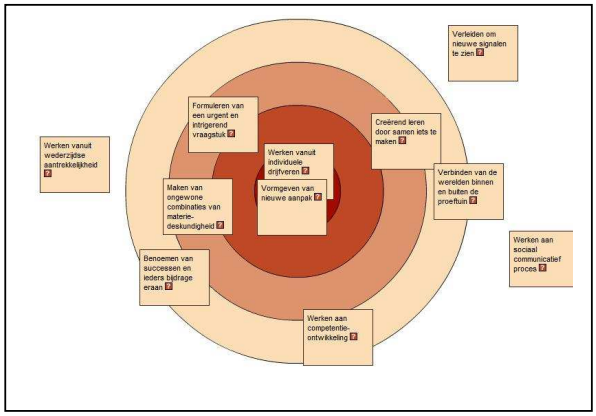


Figure 1. Instrument consisting of circular scales

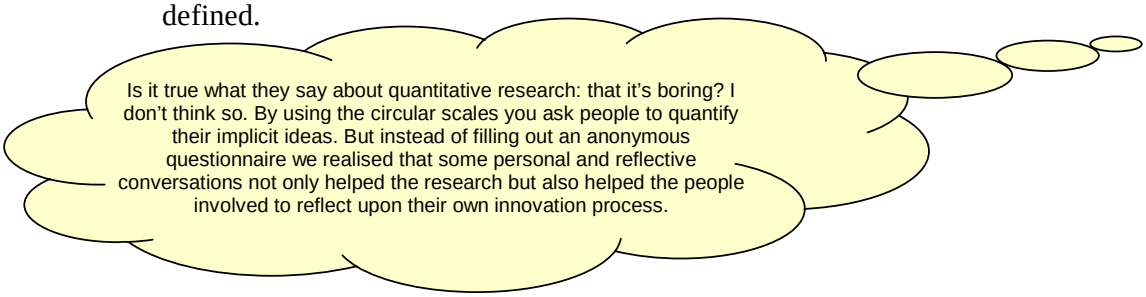
Figure 2. People working with the instrument

4.3 Procedure

On one hand, the research activity was introduced as a way to validate the design principles, and on the other as a means for the people involved to reflect upon their own innovation practice. The facilitators filled out the circular scales under while interviewed by the researchers about their choices and to get a more detailed description of the breakthroughs they referred to. The activity took about 90/120 minutes per respondent. The innovation practices' participants all filled out the scales individually.
The data was gathered at several moments in time, in a period of eight months (May 2005-February 2006). While gathering data it was revealed that two principles needed to be combined. The idea of creative turmoil (principle 10) was combined with principle 1 (formulating an urgent and intriguing question). In the first principle (the need for an urgent and intriguing question), a large part of principle 10 was already covered. 4 of the respondents, as can be seen in table 2, worked with the instrument using a set of 11 design principles, the others all worked with the set of 12.

4.4 Data analysis

The cards with design principles in the circular scales were scored according to their place: cards in the inner ring were assigned value 1, cards in the 2nd ring received a 2, cards in the 3rd ring a 3, cards in the 4th ring a value of 4 and cards placed outside the 4th ring received a value of 5. Cards that were placed in between two rings, were assigned halves (1,4; 2,5; 3,5; or 4,5). In doing this, for each group of respondents the mean of their rating, and the standard deviation to define the spread of the values could be defined.



5. Results

The analysis of the acquired data falls apart in two sections, consistent with the research questions that were central. The next section answers the first research question about the design principle's validity. Here it reveals that the design principles are supportive in tracking down breakthroughs in the innovation practices, and that an element that people experience in their daily practice, power, is missed. As for the second research question a table is offered with an overview of the meaning given to the design principles by the respondents. Picturing the similarities and differences in the way they give meaning learns us more about the way the design principles are interpreted. From that, several observations can be given with respect to the data. Here we distinguish:

- the best recognised principles;
- principles that are assigned a different meaning than was originally intended;
- principles that are described as either active or passive principles;
- principles of which respondents easily describe their effect;
- and the relationships between principles as assumed by the respondents.

5.1 Validity of the design principles

The respondents that were interviewed while working with the circular scales confirmed that it was possible to track down the most important breakthroughs in their innovation practices with help of the principles. From this, it reveals that the design principles do not miss elements that are essential for innovation practices. For the people who worked with the scales individually, with help of the electronic tool, it was more difficult to describe all the breakthroughs. For every principle they placed in the scales, they were asked to give an explanation by means of an example. Some of the respondents filled in these examples easily while others tended to have more difficulties. In the interviews held with the facilitators it was easier to go deeper into the examples mentioned and therefore get a good picture of the breakthroughs in their innovation practice, whereas the electronic version of the tool didn't stimulate the participants of the innovation practices to elaborate upon breakthroughs in detail.

An aspect that was missed in the design principles was the role of practicing power. They wondered whether power is sometimes needed to overrule certain decisions in order to reach breakthroughs. In reaction to these questions it could be stated that power

plays a role at two levels. First, at the level of the individual. One could state that someone working from power or position wants to influence the process. That wish sprouts from a deeper wish, a motivation, underneath it. It helps to trace that motivation (principle 3) and to support people to work from that, particularly as using power as a starting point for conversations, is not constructive but rather destructive. It prevents others from working from their own motivation.
Second on the institutional level: some people have the power and position to 'overrule' certain activities. Using power in such a limited way, does not support innovation. Power doesn't contribute to innovation but rather it can stop it. The question remains if it would be possible to look for underlying motivations when power comes from a decision-making institution (e.g. stopping a financial compensation).
From the research point of view therefore, the aspect of power is not something to add to the design principles. Since it is either something that connects to the individual motives or something that cannot be influenced, but that is rather imposed on people in an innovation practice by people within an institution.
There are two design principles that seem to be ambiguous. Principle 11 (Making it a social and communicative process) is interpreted in various ways. Respondents do not give meaning to this design principle in a consistent way. Principle 12 (Supporting the development of competencies) seems to be more ambiguous than the other principles as well. Respondents place this principle almost without exception in the outer rings of the circular scales. They do have an idea about the meaning of the principle, but do not recognise it in their own innovation practice (see table 2 and 3).

Principle	Mean	St. Deviation	N
Principle 1	2,20	1,03	10
Principle 2	2,40	1,02	10
Principle 3	2,75	1,09	10
Principle 4	3,60	0,99	10
Principle 5	3,15	1,23	10
Principle 6	3,35	1,11	10
Principle 7	3,20	1,51	10
Principle 8	3,95	1,09	10
Principle 9	3,65	0,91	10
Principle10	3,75	0,99	6
Principle 11	3,45	1,36	10
Principle 12	3,90	1,07	10

Table 2. Means and St. Deviation of the participants in the innovation practice

Principle	Mean	St. Deviation	N
Principle 1	2,32	1,12	11
Principle 2	2,09	0,92	11
Principle 3	2,27	1,13	11
Principle 4	2,95	1,35	11
Principle 5	2,41	1,11	11
Principle 6	2,68	1,31	11
Principle 7	2,86	0,90	11
Principle 8	2,50	1,30	11
Principle 9	2,64	1,19	11
Principle10	2,82	1,17	11
Principle 11	2,41	1,04	11
Principle 12	3,59	1,00	11

Table 3. Means and St. Deviation of the facilitators of the innovation practice

5.2 Meaning given to the design principles

Below a summary is given of the results with respect to the second research question, on how respondents give meaning to the design principles.

1. Formulating an urgent and intriguing question

Respondents mention either an urgent or intriguing question. A question is termed 'intriguing' if seemingly contradictory combinations need to be made. E.g. People want to combine innovative architecture and on a small-scale. A question is termed 'urgent' if:

- There is a shared ambition about a region or area that cannot be realized. E.g. Plans had been made over and over again, but implementation didn't start because the ideas originate from a compromise that didn't hold one of the original ambitions of the people involved.
- The situation will escalate if no one takes action. E.g. The department of town and country planning threatened to reject all the plans as submitted by the municipality of a large city. The situation then became intolerable, the development of the particular district was in serious danger and something needed to be done.

2. Creating a new approach

People consider this principle as something that lies at the core of what they're doing. In their innovation practice they look for new ways to give shape to the innovation process since the procedures normally used (decision groups or project groups) didn't work out and therefore were the motive to start an innovation practice. This principle relates to the reason of existence of the innovation practice: the problem couldn't be solved by doing what people always did. Respondents describe three ways of creating a new approach:

- By using new ways of working and breaking with traditional routines (e.g. instead of a regular meeting with a chair, an agenda, and someone who takes the

minutes, the meeting is a personal conversation in which the facilitator interviews all the attendees and asks what they would like to contribute).
- By involving parties that are usually not involved in these kinds of processes or in such an early stage (e.g. involving students to collaborate with, or interviewing inhabitants of the area where they want change. Other examples are asking firemen in a very early stage about the best escape routes instead of asking them to contribute after finishing the plan and then not being able to use their input effectively).
- By focussing on individuals rather than on 'officers' representing an organisation, municipality or pressure group.

The respondents emphasise mainly concrete ways of working they used. In only one innovation practice there was made a more overall approach, a distinction between four phases in the process: 1. Collecting a group of people who are motivated to work on the central issue of restructuring a district in North Holland. This phase does not end and continues even when the next phase has started. 2. Working from four themes that are related to the content of the central issue in order to explore everybody's ambitions. 3. Meetings in which personal conversations had a central place. These conversations concerned everybody's individual motives and the way their own patterns of behaviour hampered progress in realizing their ambitions. 4. Back to the issue of the district in order to take action and have effect.
In this approach working from individual motivation (see next section) is important as well.

3. Working from individual motivation

For the respondents, the most important element of working from individual motivation consists of a focus on the individuals, the person behind the function. Focussing on individuals helps to determine someone's true motivations. The emphasis is more on tracing individual motives than on developing or connecting them. Respondents work on these individual motives in mainly three ways:
This is done in several ways:
- Discussing what everyone finds important, what they would like to have as a result and what is needed to reach that result.
- Discussing the personal affection the participants have with the region that they are working for.
- A facilitator who makes an inventory of all the personal motivations and who looks for ways of connecting them.

4. Making unusual combinations of subject matter expertise

Examples relating to this design principle consider bringing in or developing expertise or finding a new perspective:
Bringing in or developing missing expertise:
- People from outside the innovation practice are invited in order to bring in missing expertise (e.g. about developments in a certain region; ecology).
- People from different disciplines within the innovation practice collaborate and make products.

Finding a new perspective:
- Combining diverse concepts (like nature and health) in order to have a new perspective on the central question.

- Bringing in a new concept (e.g. working with culture as a central concept rather than economy. Economy didn't invite the participants to relate to, but the concept culture did).
- Bringing in a new perspective (e.g. an architect, an artist, an expert from outside, who doesn't see the central problem (too many Antilleans living in one neighbourhood) as a problem but as a chance to make something special of the district).

5. Working from mutual attractiveness

The core element of this principle is interpreted as finding the different interests and making a connection between them.

Examples given by respondents of how this principle leads to breakthroughs in their innovation practice:

- Mutual attractiveness between people in an innovation practice and relating fields, projects or persons outside. Facilitators try to make these relationships visible.
- The extent to which the innovation practice is attractive for certain parties to work in (such as a research organisation which sees an opportunity in developing a practical model by participating in the innovation practice or the collaboration between government and market; government and citizens).
- Mutual attractiveness among participants within the innovation practice ("*seeing the mutual attractiveness makes it easier for people to think along with people who have an ambition that seems to be opposite of their own. Simply because it is in your own interest to do so"* and "*because people knew what they really did it for, they found it easier to support initiatives of others in the group or to collaborate"*). One respondent explains: "*The participants paid more and more attention to one another's outcome. They strived to come to one complete end result"*.
- Mutual attractiveness in the form of negotiation. E.g. one of the officers of a municipality was willing to participate in the innovation practice and to slightly change her plans. But, a certain number of houses needed to be constructed and she didn't let go of this number. The other participants in the innovation practice agreed with this because she gave in on other aspects.

Principle 6: Tracing successes and define everyone's contribution to it

This principle is referred to in various ways:

- Celebrating breakthroughs with a small treat (pie, party, etc…).
- Give each other compliments either explicit or implicit (a facilitator who tells the participants that they are working on an extremely difficult issue). Some of the respondents reported that these compliments were often toned down since people are not used to receiving and giving each other compliments.
- To reflect upon the obtained results by analysing the successes that were booked. The facilitator often initiates this kind of interventions.

7. Creating something together

This principle is always taken literally: respondents interpret it as getting something done together: a product, a plan, a paper. In doing this, people experience an impulse for collaboration and something to hold on to. One of the respondents describes creating something as antithetical to a consumerist attitude: "*The project team of the municipality became creators instead of consumers. They made sketches in which they*

took into account all the aspects (green areas, infrastructure, recreation, etc…), this helped to work in collaboration instead of in competition".

- At places where they do create things together, like a workshop with a scenario, a project plan, an image of the region they are restructuring, it immediately gives an impulse for the collaboration.
- At places where people are not ready for creating something together (e.g. because it was not yet a real group that could do something together), people create things individually (mainly printed material like papers).

8. Enticing in order to see new signals and to give these new meaning

Starting to think from opportunities and possibilities, instead of threats and risks is what most people take from this principle.

- Giving new meaning to the subjects that are central in the innovation practice is what many respondents recognise: e.g. the highway zone as a gateway instead of something that obstructs the new plans; the ministry of defence as a party that needs to be involved instead of avoided ("*that meeting wasn't a fiasco but it rather offered us the room to pick up new things*"). The pattern here is that things, people, developments, events that were seen as a threat or not useful for the process, are now seen as something useful that could contribute.
- People see these new meanings after hearing a personal anecdote from someone who has a different perspective; by using a new way of working (e.g. working with scenarios); by a critical facilitator who continually asks questions about your perspective and who helps to think of new ways to give meaning, by looking at examples of other projects that relate to the one you're working on.

9. Connecting the world inside the innovation practice to the one outside

Respondents emphasize the importance of this principle: without the connection to the outer environment, the plans and product of the inner practice will have little meaning. In order to connect activities inside the innovation practice to the regular planning process outside the innovation practice, the following are necessary:

- proposing plans
- inviting the alderman and project managers
- asking people from the local governance to participate in the innovation practice
- constantly asking the individuals in the innovation practice: '*John, is your direct manager still standing behind you?*'
- spotting interesting developments in other places in order to connect it to the process of the innovation practice

10. Organising creative turmoil

Respondents note the presence of turmoil as a restless feeling (not creative) that people in the innovation practice experience and that originates from the original question that made them become involved in the innovation practice in the first place. This is not *creative* turmoil.

- Creative turmoil can be regulated by creating deadlines or a sense of urgency (after involving a new party)
- More likely is creative turmoil that comes into being when something unexpected and threatening happens (e.g. an unexpected party suddenly comes up with a plan that gives you the idea that action should be taken quickly.

11. Making it a social and communicative process
Respondents mention this principle in very different ways, such as:

- "*Communication is central*"
- "*We worked to make it an open and positive atmosphere pointed at constructive contributions of the participants*".
- "*Draw each other's attention to what really matters, use each other's time efficiently and work from everybody's strengths*".

Respondents describe interventions done by the facilitator as an important aspect of this design principle. Facilitators can stop the process during a meeting and do an intervention in order to give information, to build trust, or to give attention.

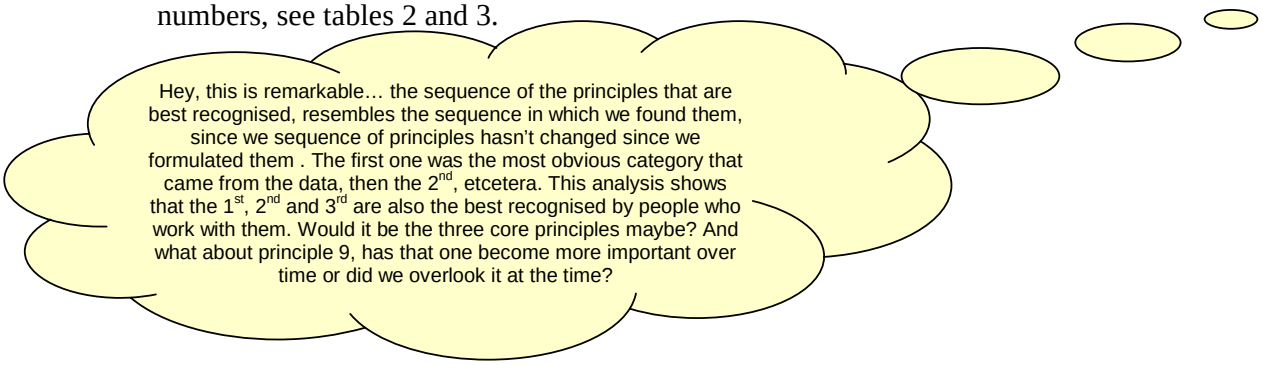
12. Supporting the development of competencies
Respondents refer to the function of this design principle as:

- Something needed to make the gains of this innovation practice available for other contexts. E.g. organise reflection sessions in which insights are shared with others like statesmen.
- Something that doesn't need specific attention but that is developed while working together in an innovation practice.
- People cannot easily give concrete examples. The people who have a clear picture of this design principle see the competences either as something that is developed and owned by the people working in the innovation practice or as the gains that need to be transferred to others.

5.2.1 Observations that come from the data

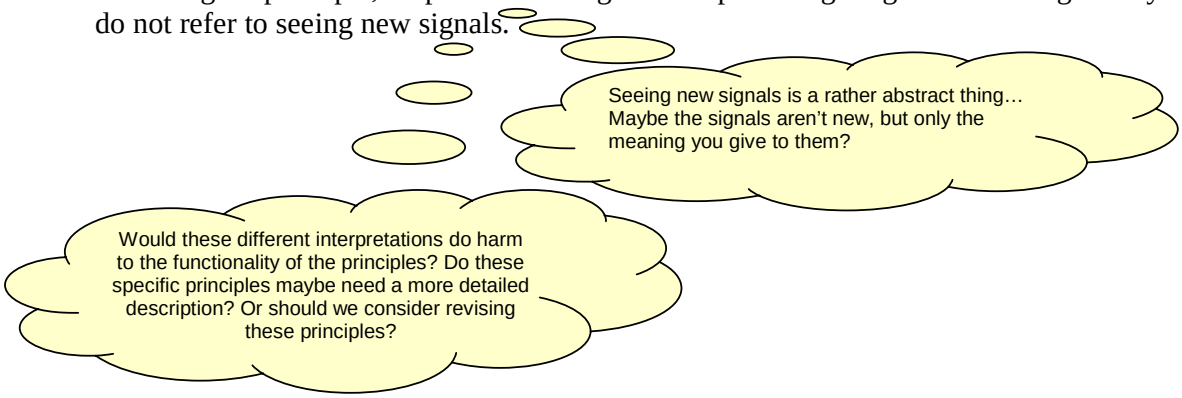
The observations that come from the data are described in the section below

Best recognised… (1, 2, 3, 9)
Principles 1 (Formulating an urgent and intriguing question), 2 (Creating a new approach), and 3 (Working from individual motivation), are placed primarily in the inner circles. Respondents find it easy to give examples of the way they recognise these principles in their innovation practice. Especially principle 3 is found crucial for an innovation practice. Principle 9 is also very well recognised and examples are easily found. This principle however is placed in different circles on the scale. For the exact numbers, see tables 2 and 3.

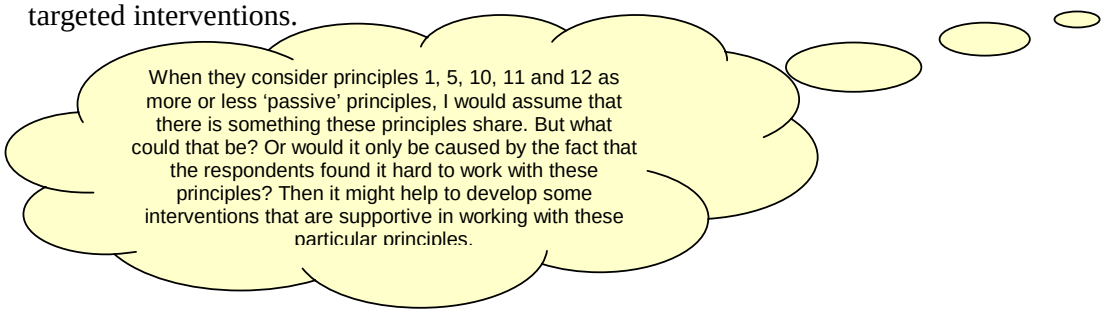


A different meaning… (1, 4, 8)
The meaning the respondents give to design principles 1 (Formulate an urgent and intriguing question), 4 (Making unusual combinations of subject matter expertise) and 8 (Enticing in order to see new signals and to give these new meaning) differs from the principles intended meaning.

As for the first principle, we notice that the question the respondents formulated in their own innovation practice are not always both urgent and intriguing. The urgency of a question is more easily formulated than the extent to which it intrigues the people involved.
With respect to the fourth design principle it is observed that *utilising* expertise in particular (either from inside or outside) takes an important role, not so much making *unusual combinations* of expertise. In the innovation practices we see groups who bring in or develop new expertise, and groups who look for a new perspective in order to find a new direction that allows them to show and use their own expertise in search of a solution or breakthrough.
In the eighth principle, respondents recognise the part of 'giving new meaning'. They do not refer to seeing new signals.



'Active' and 'passive' (1, 5, 10, 11, 12) design principles…
Although none of the design principles are described as a conditional requisite, rather as factors that can be actively supported by people in innovation practices, the respondents clearly distinguish between design principles that are seen as something that 'is' (they are either present or absent, respondents mention their presence or the mechanisms that they regard as underlying) and design principles that are seen as something that you 'do' (respondents mention examples in which they made an intervention that was done in line with the particular principle). Principles 1 (Formulating an urgent and intriguing question), 5 (Working from mutual attractiveness), 10 (Organising creative turmoil), 11 (Making it a social and communicative process) and 12 (supporting the development of competencies) are seen as principles that are either present or absent; e.g. for principle 1 respondents regard an urgent question as something that gave rise to the innovation practice, something it originates in. It is not seen as something that could be developed during the process. The other principles are seen as factors that can be stimulated by targeted interventions.

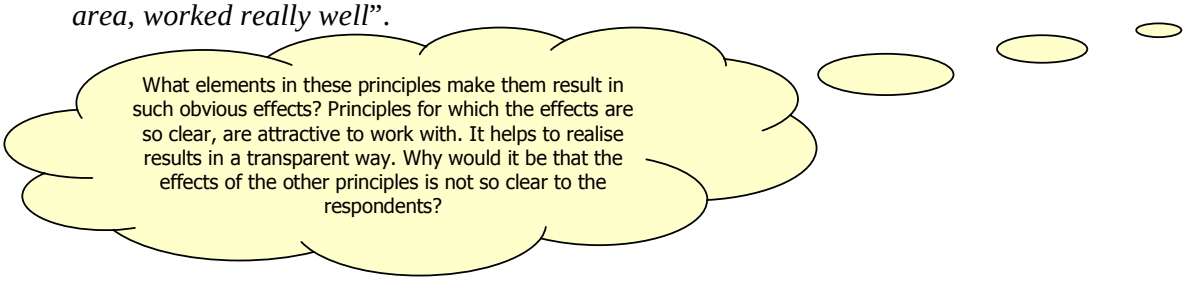


Clear effects of the design principles… (3, 4, 7)

In relation to principles 3 (Working from individual motivation), 4 (Making unusual combinations of subject matter expertise), and 7 (Creating something together), respondents clearly mention what effect working with them has. Working with the third principle results in energy in the innovation practice. People experience it as motivating when the traditional stakes are not central to the innovation practice but rather to everyone's personal motives. One of the respondents says: "*The individual motives determine the amount of energy that will be put into the process. At the moment we had to present a new direction for the process, it became clear that we wouldn't make a problem definition using the 'good old' way of thinking practiced by water management, but that we chose a problem definition where other stakes could play a more prominent role. This opened up the possibility to check the problem definition with our own motives and to sharpen it accordingly*".

When people manage to find a new perspective, as is the case in the fourth principle, the result is that the people involved become enthusiastic and see more possibilities to bring in their own expertise. And so this principle helps people to better recognise and utilise each other's expertise.

For principle 7 not everybody has a clear image of what it means to create something together. At places where they do create things together (like a workshop with a scenario, a project plan, an image of the region they are restructuring) it immediately gives an impulse to the collaboration: "*because it forces you to make explicit what you think is important and what isn't. For this purpose making a picture together of the area, worked really well*".



Related principles…

From the examples respondents give we can learn more about the relationship between the principles.

- 1 & 3: The extent to which the central question is intriguing is associated with individual motives. Respondents here connect the first design principle to the third. In innovation practices where the principle 3 didn't get much attention, the personal motives are seen as the sense of urgency that was the immediate cause of being involved in the innovation practice in the first place.
- 2 & the others: Most of the examples connected to the 2nd design principle could be placed under one of the other design principles as well. Especially many examples relating to principle 3.
- 10 & 1: The turmoil that is not creative, brought forth from the original question, is the reason for people to participate in the innovation practice.
- 4 & 8: The concepts and perspectives that are brought into play in relation with principle 4, are used by the respondents to think of possibilities rather than problems. This is the core of what respondents recognise in principle 8.
- 5 & 3: The 5th principle in which respondents speak of mutual attractiveness among participants within the innovation practice, actually offers a follow-up for the 3rd

principle. When the individual motives are uncovered with help of the 3rd principle, the 5th principle helps them to make it a productive collaboration in which not everybody strives for their own best, but where a collaborative aim can be reached by using the individual motives.

The relationshop respondents experience between design principles, teaches us more about the interrelationship between them. Since the principles are yet presented in the sequence in which they were initially developed, this finding might offer a helpful starting point for clustering them…

Beliefs concerning how principles work…

When placing a card in the outer circles, respondents explained their choice. In their answers we recognise two kinds of answers: they either explain their choice by mentioning that they've not yet paid any attention to this principle, or they explain their choice by sharing the conviction that they have in relation to the particular design principle. These underlying assumptions can teach us more about the design principles:

- With respect to the 3rd principle, a respondent explains: "*Individual motives cannot play a role because there are, besides the inhabitants, five municipalities, one district, and one party that is in charge of water management*". The belief here is that individual motives cannot play a role as soon as there are too many parties involved.
- With respect to the 6th principle, a respondent explains: "*In this project we didn't reach any milestones yet so reflecting upon the successes has not yet taken place"*. Here, the belief is that in order to work with this design principle, visible and concrete milestones need to have taken place. Respondents also mentioned that it was only possible to work with this principle after a common language is developed or only after the process has finished.
- With respect to the 8th principle, a respondent explains: "*Because of mutual mistrust mutual enticement was out of the question*". The conviction here is that trust is a condition for enticing each other to see new signals and to give new meaning.
- With respect to the 8^{4h} principle, a respondent believes that involving too many experts is dangerous for the process: "*They put too much attention on one aspect, They stress the importance of ground water or think that negotiation is necessary"*.
- With respect to the 5th principle, a respondent explains: "*This is not something you can impose. You can only check afterwards if it happened"*. This relates to the fact that this design principle was seen as a 'passive' design principle, as something that is either present or absent.

What comes first: not working with the principle and than developing your opinion about it, or the belief related to the principle that prevents you from working with it? I can think of myself in the supermarket, not buying all the healthy food I intended to. Usually, I come up with thousands of very good reasons not to buy the healthy food (and for putting my basket full with even more health damaging food). Did I make those up to back up my decision, or did those reasons prevent me from buying healthy food in the first place? On the other hand, when I get a big list with doctor's advice to prevent myself for getting a flu again, I would probably only follow-up the tips that are closest to my experience. Would the design principles better resemble me buying unhealthy food or me following up doctor's advice?

6. Conclusions

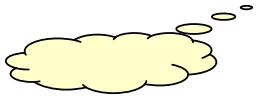
The first research question concerned the validity of the set of design principles. The respondents that were interviewed while working with the circular scales confirmed that it was possible to track down the most important breakthroughs in their innovation practices with help of the principles. From this, it reveals that the design principles do not miss elements that are essential for innovation practices.
The two design principles that seem to be ambiguous are principle 11 and 12. Principle 11 (Making it a social and communicative process) is interpreted in various ways. This principle needs more specification. In a way, aspects that matter in the social and communicative process are integrated in some other design principles. For instance the need for personal contributions comes back in the 3rd design principle, and being appreciative to each other's contribution is seen in the 6th principle. Making this design principle more specific can be done by describing the kind of communication that the principle is pointed at per phase of the innovation process. For instance, in the first phase of innovation the process of communication might be pointed at inviting people. Then, in the next phase, the communication might be aimed at building on each other's contribution in order to further develop initial ideas. This relates to what van Poucke (2005) calls the idea generation phase. In the third and last phase when ideas and directions need to be crystallized (Van Poucke (2005) calls this the crystallization phase) the communication might be pointed at converging and bringing the input together. In order to reach a robust innovation, the communication process might be pointed at critical inquiry.
Design principle 12 (Supporting the development of competencies) is ambiguous as well. Respondents place this principle almost without exception in the outer rings of the circular scales. They do have an idea about the meaning of the principle, but do not recognise it in their own innovation practice. This might be caused by the principle's name: supporting the development of competencies might be linked with a shortage. Within the idea of competencies that need to be developed, lies the premise that there is something to be developed, something that is now missing. For people it is more attractive to work on something that is already there, or even something they are already good at, than to work on competencies they apparently lack. This relates to the ideas of positive psychology (Seligman, 2005) and appreciative inquiry (Whitney & Trosten-Bloom, 2003). The focus of positive psychology lies on identifying and nurturing talent. Another explanation for principle 12 not being interpreted unambiguously might be its nature. Where the other design principles focus directly on the innovation process, the 12th principle seems to be formulated on a meta-level. For people working in an innovation process, the innovation or improvement itself would always be the first focus. Developing competencies is something that happens along the way. This principle might be the focus of a facilitator pointed at learning or researchers like ourselves but not so much of the people primarily concerned with the innovation itself.
The distinction between facilitators and participants in an innovation practice is something that was mentioned by the facilitators as well. They supposed that the design principles relate to their way of looking at an innovation process, namely to their process point of view. They wondered whether the formulations as they are now, do relate to the participants as well. Whether the principles need adaptation in order to better connect to the participant's language needs further examination.

The second research question concerns the way people, involved in an innovation practice, give meaning to the design principles. It became clear, that except for principle 11 (Making it a social and communicative process), respondents give meaning to the

design principles in a similar way. For the people who worked with the principles individually it was harder to give meaning to the design principles than for the people who worked with them together with a researcher, while being interviewed. Working with the design principles requires a reflective conversation that is not so easily attained when working individually. This is in line with what Reynolds and Vince (2004) argue. They state that less emphasis needs to be placed on reflection as the task of individuals, and more emphasis needs to be put on creating a collective process of reflection. Following this line of reasoning it might be interesting to not only work together with a researcher and the facilitator but to involve more participants from the innovation practice in the reflection process. We might even go further and use the set of principles as an instrument to enhance that collective reflection process.

Furthermore the research at hand brought up leads for further research. Such as the fact that some principles are better recognised than others; that some are given a different meaning than intended; that some of the principles are seen as active and others as passive principles; that for some of the principles the effects are quite obvious;
that some principles are related to each other, and that respondents have various beliefs that explain why they didn't work with the particular design principle.

7. Discussion



The results of the study at hand, offer many starting points for discussion and further research. Throughout the text of this paper, the researchers' reflections can be found. These thoughts are meant as an invitation to work further on the results together with the participants of the 10th European Conference on Creativity and Innovation.

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