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Participatory research on innovation – Methodological approaches to challenges in the field and practical experiences

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Innovation processes in organisations are subject to profound changes: For example economisation, standardisation, and intensification of labour. It is a key challenge to conduct participatory research in this organisational setting, especially when increasing workloads of interview partners form a strict schedule for necessary interview or discussion time. The article introduces a participatory research design to address these challenges. The methodology was developed and applied in the research project "Smart Innovation" which studied impediments and promoters of innovation in the mechanical engineering branch. It combines agile principles with classical elements of participatory research. Interview partners are involved with active parts throughout the research process and seen as experts of their work. Yet, participation in hierarchical organisations and under time and market pressure entails a potential for undesired limitations and side-effects. In fact, participative methods can enhance economic tendencies and backfire on emancipation.

Key words: participation, innovation, innovation processes, action research, agile method

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1. Researching innovation processes in a dynamic economic sector and with public funding

In the year 2000 Van de Ven and Poole have indicated a research gap for theoretical concepts and empirical studies on innovation processes in organisations. In recent years studies have steadily increased focus on the profound changes of innovation processes and their ambivalent results (Westerman, Mc Farlan, & Iansiti, 2006; Van den Ende & Wijnberg, 2001). The organisational redesign of innovation processes is a typical coping strategy of economisation tendencies (Boes & Kämpf, 2010; Will-Zocholl, 2009): economic mechanisms and higher market pressures imply major challenges for organisations to decrease costs, accelerate idea-to-launch processes, manage uncertainties and secure future revenues through innovation (Wang & Zang, 2012; Pfeiffer, Schütt, & Wühr, 2010; Pfeiffer, Sauer, & Wühr, 2012). Design recommendations include adherence to standardisation, which strives to formalise and streamline organisational practices (Brunsson, Rasche, & Seidl, 2012; Cooper & Edgett, 2010, 2012). This development is coupled with the implementation of digital technologies whose process rigidity however, is known to impede innovation activities (Henderson, 1991; Thurk & Fine, 2003). Simultaneously, the opposite trend can be observed. Direct forms of supervision and management regulation are reduced while employees are increasingly responsible for the outcome of their work. This requires a type of work action filled with subjective qualities, systematic self control and tendencies of self-exploitation (Pfeiffer, 2014; Pongratz & Voß, 2003). The post-tayloristic strategy has proven to be far more effective in complex work situations such as innovation processes (Böhle, Bürgermeister, & Porschen-Hueck, 2012). However, central governance is not abandoned. Instead control mechanisms change to indirect forms by introducing market principles in work operations such as management by objectives or performance parameters (Townley, Cooper, & Oakes, 2003; Pongratz & Voß, 2003).

The effects of these paradox conditions on employees` can be easily illustrated by looking at stress-level and burnout rates. Conflicting organisational demands, as well as the extension and intensification of labour have been

identified as main causes for high exhaustion rates in innovation and R&D related fields (Kratzer, 2013; Styhre, Ingelgdrd, Beausang, Castenfors, Mulec, & Roth, 2002; Kunda, 2006).

In recent years a new form of digitally organised innovation has emerged which emphasises the advantage of open, collaborative and democratic innovation activities of companies with their clients or consumers (Gloor, 2006; Hippel, 2005; Scott & Chaston, 2013). Also in intra-organisational processes a discourse evolved about democratic collaboration in innovation being "far better for the business" (Heckscher, 2007, p. 8) than attempts of hierarchical dominance or functional control. Nevertheless, the omnipresence of power especially in modern organisations is a reality with a long sociological research tradition (Fricke, 2013; Abbas, 2014; Courpasson, Golsorkhi, & Sallaz, 2012).

Considering the shifts in trends in the field of innovation processes, demand for adequate research methodologies becomes apparent. Case-studies have a long recognised tradition as a valuable way to investigate the interactive process of innovation (Slappendel, 1996). However, as Van de Ven and Poole (2000) pointed out, little systematic effort has been adopted in developing specific research strategies for innovation processes. A recent methodological approach called innovation biographies explicitly reconstructs innovation processes, involved actors and their regional interconnectedness (Butzin, Rehfeld, & Widmaier, 2012). Because of its macro focus on institution,s this technique is not adoptable when studying micro-processes within organisations. Van de Ven and Poole (2000) suggest a longitudinal tracking of innovations in order to avoid biases in the studies´ finding once the outcome of the project is already known. Yet, the prerequisites of a longitudinal survey, especially the repetitive investigation over a larger period in one organisation, does not always comply with the above described dynamic institutional, economic driven settings or subjective stress situations of participants.

These challenges had to be faced and managed during a three-year research project called Smart Innovation. Smart Innovation studied activators and impediments in intra-organisational innovation processes in the German mechanical engineering sector, an industry known for its high-tech innovativeness and economic centrality (VDMA, 2012). The starting point of the

research project coincided with the economic crisis in 2008, which impaired conditions for research in organisations. Available resources, especially time with company representatives, were essentially cut back due to short-time work.

In addition, the research design for the study needs to combine scientific analysis and organisational change strategies. The application-oriented approach is related to the requirements of public funding. The research project is supported from the German Federal Ministry for Education and Research (BMBF) whose research programmes intend to contribute to the nation`s economic strength and the industries` competitiveness. Thus, funded studies are bound to include intervention processes in partner organisations.

The methodological and theoretical foundation of intervention in work studies originates in participatory research approaches (Levin, 2006; Kemmis & McTaggart, 2005). Numerous authors sum up the core principles of participatory research by stating that scientific research without social intervention does not suffice (Fricke, 2013; Eikeland, 2012; Neilson, 2006; Williamson, 2002). A statement drawn from the ideological fathers of action research: Lewin and Collier (Neilson, 2006).

The object of this paper is to present the Innovation Process Analysis, a methodological research design developed specifically for the challenges of reconstructing innovation in highly dynamic organisational and economic settings while adhering to scientific and participatory research principles. The writers outline their practical experiences of applying the Innovation process analysis in the publicly funded research project “Smart Innovation” and conclude with a reflection on the ambivalences and side-effects a participatory design can have, considering the given research requirements and field conditions.

2. Innovation process analysis – Designing the research design

This study is based on a multiple-company-case study (Yin, 1993, 2009) including five cases (company A-E) from one of the most important industrial sectors in Germany: the mechanical engineering branch (VDMA, 2012). The companies represent the industry’s four general categories (Kalkowski &

Manske, 1993). These categories include machinery production for general industries (company C), machinery production for specific industries (companies A and D), production of components for different machinery (companies B, D, and E), and production of machinery tools and other wearing parts (companies B and E).

Selection criteria of the cases followed the vanguard model, which focuses on high-performance organisations that often set standards, values or principles for peers (Kanter, 2009). Since other organisations are likely to follow vanguard models, the analysis of vanguard organisations enables the identification of general trends and developments within industrial sectors. The selected five companies can be classified as vanguard models because of their outstanding innovative performance and for "building an enduring culture for the long term that enables continual change and renewal" (Kanter, 2009, p. 3). The companies are world market leaders with their products and have a high product innovation rate. The size and revenue of the five cases have grown considerably within the last decade and are extraordinary compared with the industry's average (see Table 1). Further, they are known for

Table 1: Company case sample compared to industry average

	Employees	**Turnover in Mio €**	
Industry Average	191*	28*	
Company Case	**Employees**	**Turnover in Mio €**	**n**
COM-A	3.800	800	19
COM-B	350	40	12
COM-C	8.500	2.300	10
COM-D	39.000	5.198	13
COM-E	1.350	137	17
Total	*53.000*	*8.47554*	*71*

* source VDMA (2012)

introducing innovation models that set standards in the industry e.g. new production processes (Kammüller, 2007). Also, the selected company cases are industry models for their extensive personnel training (Hofer, Feller, Herzog, Pfeiffer, Schütt, & Wühr, 2011, p. 109), continuous workplace innovation, and long-term community service in their region (Institut für Sozial- und Bildungspolitik, 2003).

2.1 Researching with partners – Participatory principles

The entire research design and its elements strive for participation. In our context, this means collaboration between researchers and company representatives with different backgrounds for example hierarchical positions (managers and employees) and functional expertise (engineering, sales, production, etc). The term collaboration has been the object of critical discussion (Eikeland, 2012). However, the term indicates that each collaboration partner is valued equally and recognised with her specific experience, interest and competence (Kristiansen, 2013). The object of collaboration is the active involvement in every phase of the research design as well as a mutual determination of central aspects including:

- Research object: deciding on the product innovation project for the analysis
- Research strategy: creating a mutual understanding of reasons for selecting the research object.
- Research process: co-determination on interview-partners and their backgrounds.

The decisions were taken in the setting of a group discussion (initiation workshop). The course of the group discussion was recorded, visualized and then analysed. The researchers suggested that company representatives participate for the entire product-life-cycle in order to ensure a sound basis for democratic decisions (Fricke, 2013; Neilson, 2006). A comprehensive functional diversity of company representatives also accounted for the research goal to reconstruct the course of innovation processes. Hence, satura-

tion of the sample was achieved by diversity rather than by numbers or socio-demographic factors[1].

The analysis of the innovation process was followed by suggestions for organisational change strategies (Fraser, Richman, Galinsky, & Day, 2009). The co-ordination process of the intervention was based on a consensus on the presented findings and suggestions. Again, the group discussion method was chosen to avoid traditional management reporting of the research results, but rather allow broad validation and discussion.

Visual elements, such as tag clouds, descriptive quotations or intuitive illustrations, were used to present the findings in the workshops. The visualisation of results is still more common in quantitative studies (Chen, Härdle, & Unwin, 2008; Belussi, 2007) but is increasingly applied in other scientific research fields, for example quantifying qualitative results in computer-aided-clustering (CAC) (Grimmer & King, 2011). These methods guarantee the sustainable recall of the findings and provide a common ground for discussion in an efficient manner (Tufte, 2006). These state-of-the art presentation methods address the mixed background of participants and were also chosen to enable a sensual, quick and easy understanding of the complex interconnections in the findings (de Nooy, Mrvar, & Batagelj, 2005; Tufte, 2001).

2.3 Dealing with time constraints – Traditional and contemporary interview methods combined

Considering the organisational context of our interview partners, the survey method had to fulfill conflicting requirements. Adhering to given time restrictions in order not to interfere with production and work flow in the organisations while conducting serious research and generating substantiated

[1] Representatives of the works council were not explicitly requested in the above description of the interview sample, because a specific add-on perspective of the research project analysed the role and co-determination options in the companies` innovation processes (Schmierl, 2012). In general participation of works councils is still a rather difficult matter in the design of innovation processes, or more general, organisation processes, since legal regulations traditionally govern co-determination on topics like collective work conditions, performance ratio or wage agreements (Becker, 2012). However, in recent years unions have launched a range of activities for more involvement in reorganisation processes of "white collar" jobs (IGM, 2012).

results for intervention. In order to accomplish both goals a combination of traditional and new methods was applied.

The research question focused on potentials and impediments in the intra-organisational innovation processes. In contrast to most other empirical surveys on success and failure of innovation (Van de Ven & Poole, 2000) this study reconstructs everyday work actions where innovation workers solve ambiguities, uncertainties and complexity in the course of action. To carry out the empirical investigation of this exploratory subject a qualitative, subject-oriented interview technique was chosen. Given the time restriction for data-collection the interviews were semi-structured, a method recognized for naturalistic settings or in this case organisational contexts (Patton, 2002). The thematic focus of the interview guideline was based on four theoretical topics resembling the categories of *labouring capacity* (Pfeiffer, 2014*)*, which are subjective qualities enabling (innovation) actors to perform in organisational contexts.

The interviews started with the interviewees` interpretation of the term innovation and followed with a personal story related to the innovation project (work object). The next step covered the collaboration and contribution of actors in the innovation project and then asked which actors had further potential to participate (work action). The third section of the interview included whether or not the interviewee experienced stress, the strain level of the interview partners, as well as a detailed description of their operation and working time (work organisation). The interview concluded with a standardised survey of social demographic data such as education/training, age, position, and years of experience in the field and company.

In sections one to three, visual elements were used in order to stimulate and also focus the interviewee´s narration. Visualisation is typically applied in social sciences in order to present and explain the results of data analysis or to illustrate social relations (Moody, McFarland, & Bender-deMoll, 2005; Wasserman & Faust, 1994; Mayer, 2011). Visualisation is rarely found as a methodology in the interview process (for examples see Banks, 2001; or Cañas & Novak, 2006). The latter approach was taken in our research design drawing on theory of knowledge generation. Orlikowski (2002) points out that knowledge always entails hard-to-articulate information. Based on these

assumptions the person and practice bound knowledge could be methodologically mirrored by visual and active elements, which transcend traditional and strictly verbal interview settings. For the research purpose, one image was used for the relation with the work object (interview section one), and in total three illustrations were used for the interview partners` work action (interview section two), and the organisational context (interview section three). While the image, a visualisation of the work object, helped interview partners to concentrate on the selected product, the three illustrations entailed a second function: A plain work-flow chart (product-life-cycle), a blank pie-chart for the working content and a blank stress scale served as an open ground for the interviewees` drawings, sketches and explanations in regards to the innovation process.

The narrative and visual elements during the interviews assigns interview partners an active role in designing the course and content of the process, thus complying with the intended participatory principles.

2.3 Adapting applied research to context and partners – Agile principles in social science

According to the chosen participatory approach researchers need to regard interests and requests of their partners. Or as Beaulieu describes it: "invoke the voices of stakeholders [… and] seeking perspectives that are defined by the stakeholders" (2013, p. 30). The practical realization of these essentials was cultivated in this research project by agile project management principles, which originate in the software industry. Agile ideals try to align (changing) customer requirements and faster but complex R&D processes. Cobb (2011) summarises that strict adherence to methodology and standard procedures are neglected in favor to a proper fit to the organisations and their context. Actions in the individual steps of the (research) process, especially in the implementation phase, are not defined beforehand, but rather mutually detailed during course of action. This openness requires a high amount of flexibility from researchers and being able to continually include the collaboration partners` needs and requirements as the project progresses. Schwaber (2004) emphasises another principle: collective decision making during the

project, which relies on active participation of all partners in defining and managing the process. Agile principles encourage democratic designs, because participation overall generates better results (Hope & Amdahl, 2011). Accordingly, all parties share responsibility for the project progress and outcome (Cobb, 2011).

The translation of agile principles to the research project consisted of the prompt and iterative feedback of findings to the organisations in order to provide broad access and continue with an intervention change process. A quick feedback-loop was accomplished by focusing the interview analysis on aspects relevant for practical application and implementation. Later a second interview analysis was conducted to satisfy the methodological premises of sociological innovation research. As described earlier, the decision on the content, method and process of the intervention was then to be mutually determined in the setting of a feedback workshop.

3. Practical experiences with the innovation process analysis

3.1 Good-till-canceled: Top down consent of participation

While researchers asked for the broad participation of departments, the number of participants was specified and authorised by top-management beforehand. The top managements´ approval of the initiation workshops and the endorsement of broad participation were tied to the time limitation of a maximum of two hours per workshop, which could only be guaranteed by the researchers performing as workshop-moderators. However, a full representation of the product life cycle phases could only be accomplished in three out of five company cases due to time and resource constraints.

The role of workshop moderators was also necessary to reach a democratic consensus about the product and interviewee selection (Neilson, 2006). The selection of a physical product innovation project was discussed and favoured over analysing abstract process structures. Physical product innovation projects enable the solidification of technical prerequisites, and thus daily work operations, a reconstruction of different experiences, and the comparison of everyday work reality with model standard processes within organisations. The individual product selection in the workshops was moti-

vated by different causes and considerations depending on the companies´ technological specifics. Further, the products represent typical innovation trends in the mechanical engineering branch.

– Company A: A complex yet clear defined logistics component of a machine system whose innovation enabled a radical efficiency improvement of the overall systems´ output. The product represents a new innovation strategy in the industry. While product development was located in Germany the entire production, including prototyping was off-shored. This practice has a long tradition is other industries. Yet it is very new for the mechanical engineering branch, which is known for its close co-operation between R&D and Production departments. Until now only certain, usually less complex, parts of the production process had been sent to other countries.

– Company B: An incremental product co-innovation with the customer where the innovation process was experienced from the supplier´s perspective and hence with co-ordination difficulties. The product development represents the industry's traditional strategy to establish and maintain a very close customer relation as a competitive advantage.

– Company C: Incremental innovation of a machine entailing numerous technical innovations whose innovation process was selected due to its fast and trendsetting course of action. The product innovation represents the industry's trend to increase systematic and strategic market research and market analysis activities to determine directions for new product development projects.

– Company D: Radical product innovation which was enabled by a new synergy of mechanical and electrical elements. The product innovation represents a radical business model innovation, which is unusual in the mechanical engineering branch. The industry's trend is to follow a path to systems integrators. However, this company took a strategic decision to enter the market as a direct supplier and offer products as an original equipment manufacturer (OEM).

– Company E: Product innovation for a new and highly regulated market whose innovation process was selected due to its long duration, complicated and difficult setting. Also, this product innovation represents a typical development in the industry, since the focus was shifted from product innovation and production to long-term service contracts.

According to the size and conditions of the selected product innovation projects, the workshop participants defined the departments, amount, and names of operationally involved personnel for interviews. The overall number of interview partners was 71 ranging between ten and nineteen per company. The social demographic structure of our interview sample is shown in Table 2.

Table 2: Interviewee sample

Company	n	Gender (n=71)		Training (n=69)			Leading position (n=71)	Age (n=69)			
		male	female	vocational	academic	both		< 30	30 – 39	40 – 49	50+
COM-A	19	17	2	11	16	8	14	0	5	9	5
COM-B	12	11	1	10	9	8	9	1	2	6	2
COM-C	10	10	0	3	6	0	3	0	4	3	2
COM-D	13	13	0	7	11	5	11	0	3	8	2
COM-E	17	17	0	6	13	2	11	1	7	8	1
Total	*71*	*68*	*3*	*7*	*55*	*23*	*48*	*2*	*21*	*34*	*12*
%		95,8	4,4	53,6	79,7	33,3	67,6	2,9	30,4	49,3	17,4

After the selection of interview partners the companies arranged schedules with the interviewees.

Finalising the initiation workshop, it was agreed that findings of the interview analysis would be discussed and reflected in a feedback workshop with workshop participants, representing the management perspective, and the employees' perspective. Based on the participatory validation of the findings

it would then be agreed on the content and process of the following change and implementation process. As will be shown later in this chapter, the real output of the feedback workshops was not identical to the above intention. In fact the process following the feedback workshop was far from the commitment to broad participation.

3.2 Talking with experts under rigid time constraints

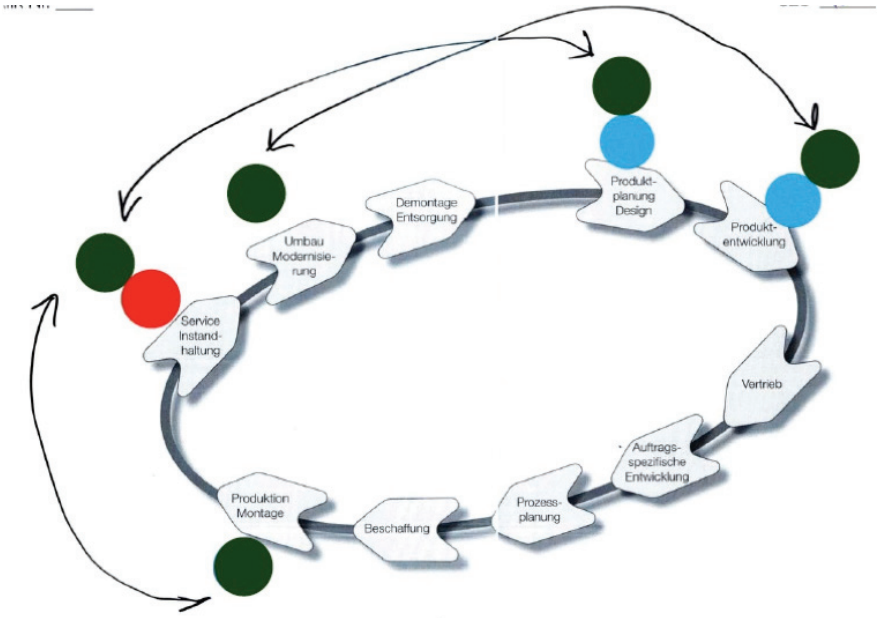
The interview topics were semi-structured with a guideline while preserving an overall narrative quality. The narrative style ensured that interview partners had time and opportunity to lay out their every-day work experiences in the selected innovation process. Interview partners were able to structure the content according to their relevance, and were given the chance to adapt the suggestions of the guideline structure when needed. These participatory interview principles guarantee that interview partners are not classified as informants or treated as data source, but are rather valued as experts of their field.

The status of experts was also promoted through the visual elements during the interview: the photo of the selected product was displayed and remained visible during the entire interview. The interview partners could easily refer with gestures or comments to the visual object. Hence the product also received a central position in the narration and facilitated a way to distinct between general and product specific experiences.

In the second section of the interview a workflow chart resembling the product-life-cycle was used (Fig. 1). The illustration showed branch specific innovation phases of a product starting from Product Design to Recycling (VDMA, 2010). The sequence and elements displayed in the chart were first compared to the real work context of the interview partners. If interview partners noted a discrepancy between the chart and their experience they modified the illustration according to their perspective. Then interview partners marked their own position in the product-life-cycle while concretizing their responsibilities and actions. Also the interviewees drew their collaboration patterns in the chart, indicating the contribution of other actors in the innovation project as well as further potential for contribution. Before inter-

view partners would decide on their markings a long reflective and interactive process preceded. During this intense narration interviewees would explain, justify and deliberate their visual reconstruction of experience and thus provide detailed insights, which could not be accomplished in strict verbal question-answer-settings.

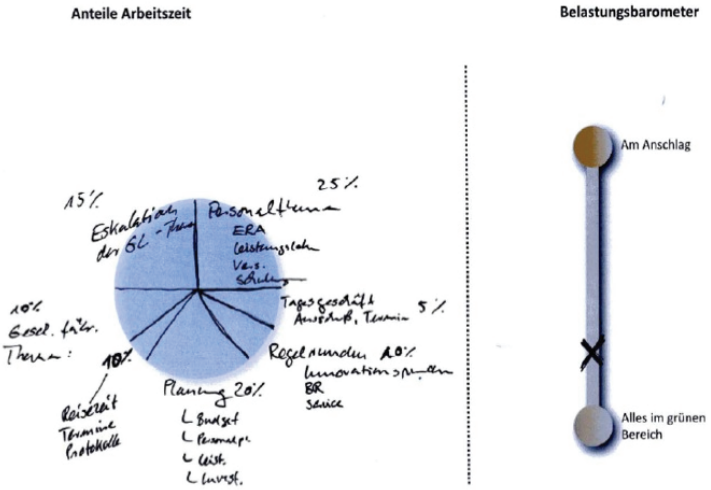
Figure 1: Workflow chart



In section three, the organistional context of innovative action was addressed. First interview partners were asked to break down the time ratio of their assignments in a blank pie chart (Fig. 2). Hence, interviewees decided entirely on how to cluster and specify the information and thus generated very different illustrations. The visualisation was accompanied by reflection on the organisational reasons for the ratio and whether the ratio is legitimate or not. Then interview partners assessed their subjective stress level supported by a blank scale shaped like thermometer (Fig. 2). One pole represents exhaustion by work overload the opposite pole stands for settled work situations while the equilibrium point stands for balanced stress and recuperation curves.

Once again visualization enabled intense contemplation of the (organisational) reasons for the subjective stress level, followed by explanations of personal coping strategies.

Figure 2: Pie chart for work analysis and stress level scale



The active participation of interview partners continued to the final portion of the interview, where they were invited to verify the completeness and accuracy of the selected interview participants and thus given the chance of redesigning the research procedure. If the list of selected interview partners did not match with the views of the interview partners, they were asked for their suggestions. However, there was a broad verification of the interview sample, the interview partners referred only very few additional interview partners, who were then included in the sample.

These methodological strategies successfully stimulated and focused narration while keeping the maximum duration of the interviews to 90 minutes. On the one hand, this time restriction was a prerequisite to receive access to the interview partners, since research funding only provides compensation for time but not production loss. On the other hand, the time restriction prevented larger time conflicts with the extensive work load of interview partners, who

also emphasised their high stress and exhaustion level in the interviews. Further, the work intensity of interview partners was noticeable during the interviews through frequent interruptions by incoming e-mails or colleagues with important questions, phone-calls, etc. Several interview partners apologised for shorter interview durations, early leave or delay because of parallel meeting schedules.

3.3 Complexity of decision processes does not adhere to schedules

The next step after interview analysis was the feedback workshops in the companies. In order to build the necessary context for the feedback workshop and the suggested intervention, this text will first explain the core findings and suggested interventions. Then, the feedback workshops including the decision process on intervention will be described.

The most important research finding is a trend towards standardised innovation processes. The companies recently implemented standardised innovation processes, which follow the Stage-Gate model. Stage-Gate is a standard process well known in the automotive and other mass production markets. It's intent is to increase efficiency and predictability while reducing risks of innovation (Cooper, 2009). The innovation process is divided into several stages, which are separated by decision meetings, so-called gate meetings. In the gate meetings R&D and other company divisions decide if the innovation process can continue to the next stage or shall be aborted. Milestones describe events of great importance such as the beginning of a new stage like product approval or start-of-production. The findings show, that the standardised process conflicts with needs and practices of the informal work level. The process theory claims to support and foster innovation activities. However, the standard process implies a hegemonic terminology and framework to address innovation needs. As such, innovation workers describe the standard process, in particular gate meetings, as an illusory world. Employees feel like actors *on* a stage rather than engineers *in* the design stage (Pfeiffer et al., 2012). The promised efficiency, transparency, and risk control are converted into facade-like gate meetings, time intensive justifications, and extra workloads. The analysis of work assignments reveals that interview partners spend

an average of 25% of their work time on additional, process-related jobs. Additional jobs are not related to core tasks and include e.g. irrelevant meetings with little focus on technological readiness, bureaucratic paperwork, data management or other process related issues. As a results interview partner indicate a very high stress level. 27% are exhausted, 36% balanced and only 36% find themselves in a high performance situation.

Based on these findings the researchers presented interventions strategies to reduce problems and side effects. Designing and changing the implemented innovation process is a complex, continuous task, which involves many different departments. Therefore an iterative, step-by-step approach was suggested. The primary focus was to provide immediate support for exhausted and overloaded innovation actors. Hence, a short-term recommendation was to introduce positions for technical assistants to support highly qualified innovation actors and alleviate some process related task. To balance the dominant process logic, the mid-term advice was to apply strategic team building methods in innovation projects. The object was to assure a balance between technical proficiency and process expertise. For example, the process separates decision making in the gate meetings from operational responsibility for technological readiness. As a result, decisions, project and process planning become abstract at times. Finally, in a long-term perspective the researchers suggested introducing a continuous improvement of the innovation processes. The goal of regular process updates is to align operational needs and process logic. This responsibility should be performed by an in-house team including operational expertise from different departments.

The intention and design of the feedback workshops were driven by broad participation Researchers asked interview partners and managers, who were present in the initiation workshop, to take part. The systematic integration of different perspectives was a response to the fact that the findings affected several departments simultaneously. A simple intervention in one area would not have benefited or suited the complex interconnections in the innovation process. Instead a holistic and bottom up implementation process was favoured and consequently the participation of all related areas and actors.

The feedback workshops were structured similarly in the five companies and started with a presentation of the interview analyses by the researchers.

The presentation of findings was followed by the above-described suggestions of process improvements. The participants discussed the findings, intervention strategies, and also ranked the suggestions according to their relevance.

Despite the analogue structure, the actual course of the feedback workshops differed between the companies. Only two out of five companies enabled the participation of interviewees and managers. Two companies endorsed the broad participation of the managing board, one of the two organisations even promoted a second feedback workshop on the management level to ensure a wide extension of the results in the company. One company could only facilitate a very limited version of the feedback workshop with the main contact person and circulating the written outline of the findings and implementation suggestions afterwards.

Since the discussion und decision making process for larger groups with different backgrounds and interests requires *time,* the previously allotted schedule for the feedback workshops was especially critical in this part of the research process. However, more than two hours were not feasible in the company context, due to the fact that the extensive participation of key personnel from the entire product-life-cycle imposes a temporary but severe cut back in the work flow.

Yet, the time and personnel restriction entailed a challenge for the holistic and participatory approach as well as for the initiation of the implementation process. Achieving a consensus on the implementation across different hierarchies and/or disciplinary and functional backgrounds is a very complex process, which can hardly be accomplished in a rigid time frame of two hours despite broad affirmation of the findings. This reality imposed a perilous situation for the participatory approach in the research project, leading to a situation when at the end of the workshops no decision on further steps could be obtained. In order to promote any of the required change process (higher) management representatives decided on intervention strategies after feedback workshops.

Time restriction though was not only set from the companies but also from the funded research project. Funded research projects of this type have a duration of about 36 months and require an application of research findings.

However, while three organisations continued postponing the suggested implementation, two of the five companies initiated change processes during the time span of the research project. These implementations included aspects of our proposed findings but did not address the core issue of the indicated problems. Thus implementations could proceed in locally specified areas without broad involvement of several departments. As a result further co-ordination of the changes between different functions became unnecessary, yet the full potential of suggested improvements could not be effectuated.

4. New challenges for participatory research on innovation

The main purpose of designing the Innovation process analysis was to develop a methodology, which allows a process oriented reconstruction of innovation (Van de Ven & Poole, 2000). Due to the company context, the research method needed to be cautious of economic settings and the changing trends in work organisation (Scott & Chaston, 2013; Thurk & Fine, 2003; Brunsson, Rasche, & Seidl, 2012; Kunda, 2006). Further, the research design should provide intervention strategies based on the findings. Hence, the methodological design included a participatory approach, which has a long tradition in combining thorough scientific research with organisational change processes (Fricke, 2013; Eikland, 2012; Neilson, 2006; Kristiansen, 2013). Classic qualitative methods like the case study approach (Yin, 1993; 2009) and semi-structured interviews (Patton, 2002) were updated with visual (Banks, 2001; Cañas & Novak, 2006) and agile elements (Cobb, 2011; Schwaber, 2004; Hope & Amdahl, 2011). A reflection of the research design´s application highlights the experiences and reveals open questions, as well as undesired side-effects of participatory research in economic settings:

First, the participation, democratic dialogue, and dialogue spaces often conflicted with hierarchical power in organisational settings (Fricke, 2013; Williamson, 2002). The writers encountered this dissonance at several occasions, when participatory or democratic principles were neglected. For example the involvement of representatives of the entire product life cycle, management, and staff, could not be accomplished. Hence the selection of the innovation project, interview partners or intervention process was rather

adhering to management wishes than to the prerequisites of a participatory design or in other words: the need of affected parties. While the inclusion of all involved parties is a so called truism for successful innovation processes (Hope & Amdahl, 2011; Heckscher, 2007), the actual research practice differed considerably from this value. Unequal power relations between collaboration partners were most clearly after the feedback workshops, when decision making was in the hands of the management level, which in several cases procrastinated the suggested interventions. This is a known situation for participatory research (Kristiansen, 2013), when the lack of commitment to learning from practice involves "much self-reflection with little change" (Williamson, 2002, p. 589). Also agile principles depend on "the willingness and ability of the [… parties D.W.] to provide ongoing collaborative input and to share responsibility for project direction" (Cobb, 2011, p. 114). The postponed implementation of organisational changes indicates a second challenge for the participatory research design in economic contexts:

Participation will be accepted, if it directly contributes to economisation mechanisms. During the implementation phase the initial collaborative partnership between researchers and company representatives shifted to a market situation with a "client – vendor" like relation. Researchers resembled the vendor who was faced with the managements` requirement to proof the financial benefit of organisational improvements before the implementation. Despite the validation in the feedback workshops, a request for previously calculated change processes emerged. Naturally, such a procedure contradicts research projects with newly generated application strategies in complex contexts. Three companies postponed the intervention until the project expired. In these cases the demand for economic reasoning and calculated intervention (Will-Zocholl, 2009; Wang & Zang, 2012; Pfeiffer et al., 2010) superseded the outlook to overcome existing organisational problems with new approaches. Two of the five companies conducted interventions. The selection and realisation of the change processes were handled by researchers and the companies` personnel. The mutual reflection time outside of the workflow certainly helped to reduce the existing deficits in the organisations (Pfeiffer et al., 2012; Fricke, 2013). One could argue that the involvement of the employees contributed to empowerment and improvement of work condi-

tions. However, economic principles function more ambiguously. The management's permission of the employees` participation entails an economic intention: To use participation instrumentally in order to increase the company`s efficiency and productivity (Townley et al., 2003; Pongratz & Voß, 2003). Hence participatory approaches entail the hazard to burden overloaded employees with additional tasks. As Fricke (2013) points out, such instrumental use of participation is far from the employees` interest of co-determination. The aspect of add-on task for employees increasing the stress and exhaustion leads to the third obstacle of the applied research methodology.

The third challenge for the innovation process analysis is the result of a very pragmatic reality. Considering the tight schedules and high workloads in the companies, which were aggravated by short-time work, the collaboration partners simply had not the necessary time resources for intensive research or intensive democratic discussions (Fraser et al., 2009; Hope & Amdahl, 2011). This condition was already anticipated in the research design. Yet, the tremendous extend of exhaustion and time pressure was an unexpected result of the study. While the applied methodology intends to integrate thorough research and time restriction, it is not possible to dissolve this inherent conflict (Pfeiffer et al., 2012). In fact it becomes a matter of research ethics, when for example visual elements successfully stimulate narration and the interview partners demonstrate their willingness of detailed explanations beyond the scheduled interview time. Williamson (2002) highlights the first priority of ethical concerns, which state not to cause harm to participants. Consequently, interviewers strictly adhered to agreed time limits or otherwise participants would have had to make up for the lost time after work hours. In this context participation could unwillingly increase stress for collaboration partners (Kratzer, Dunkel, & Menz, 2010).

One limitation to the study applies to the participatory premise of the study and results from the funding requirements. Since the scientific research was bound to intervention processes, it was never a truly open decision whether change processes should follow research results.

In a general context, this article outlined the profound changes in innovation processes and their impact on participatory research methods. The

ambivalent effects of economisation require a sophisticated use of participatory methods in order to avoid unintended side effects. An intentional use of participated approach in market driven organisations could open a broad access to subjective labour capacities and hence enforce economic principles on employees. Nevertheless, if applied deliberately, participation entails the great potential to minimise negative work conditions for employees and simultaneously to optimise work operations which ultimately increases the organisation's overall innovation capacity. The challenge of designing suitable participatory research designs is still a theme for future research.

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