Reflection-For-Action: A Collaborative Approach to the Design of a Future Factory

Åsa Wikberg Nilsson, Stina Johansson

Department of Human Work Science
Luleå University of Technology
Sweden

ABSTRACT

This paper describes a collaborative process of designing a concept of a future factory, in a three-year research project called “the Future Factory”. In the paper we aim at presenting our approach and some results from the same. We argue for a resumed discussion on future work organizations, and do so through the project aim of designing a conceptual future factory. The Future Factory project may be considered somewhat different from traditional research projects, since it includes a design team consisting entirely of women. The reason for this is that Swedish manufacturing industry is heavily male-dominated in numbers, and solutions based only on their ideas thus risk being incomplete or unilateral. The approach of the project encompasses multiple perspectives of values of industrial organizations. The main method has been participatory workshops sessions, in which we have explored contents of future factories together with our stakeholders. Our joint proposal includes aspects of gender awareness, participation in change processes, control of work situations; continuous learning and development in order to become both an attractive and efficient future factory.

Keywords: Participatory design, Reflection-for-action, the Future factory, Collaborative approach

INTRODUCTION

There is a reason to argue that something needs to be done to resume a discussion on future management and work organizations (Isaksson, 2008). This paper describes the methodological approach of our contribution to such a discussion; a proposal of a future factory designed by both employers and employees and other stakeholders. The approach is applied in an interdisciplinary three-year project, called “the Future Factory”. This paper addresses the contributions from the field of design to the project approach, including workshop sessions that are inquiries into a future situation of use. The inquiry implies a search of participants’ understanding of values and needs. The objective of the approach is that ideas grounded in the participants own life- and work contexts, provides better conditions for an outcome that will fit in its context.

We draw on a tradition of a Scandinavian human-centered approach, initially focused on people’s use of technology but that today has a broadened scope of everyday life issues (Westerlund, 2009). One example from the early 80s is the UTOPIA project that dealt with design of, and training in, technology and work organization (e.g. Ehn, 1988; Bødker et al., 2000; Sundblad, 2000). An additional example is Volvo’s development of the Swedish Kalmar and Uddevalla plant (e.g. Sandberg, 2007).

Within the automotive industry it is common to develop a concept car, as a way of marketing business and test new ideas. Such a concept car is seldom produced (at least without changes), the purpose being to draw attention to the brand. The idea behind the Future Factory project is based on similar ideas; to develop a concept factory in order to draw attention to, not a particular brand but, to industrial organizations and their design.

THE FUTURE FACTORY PROJECT

The Future Factory project is carried out by an interdisciplinary research group at the department of Human Work Science, Luleå University of Technology, Sweden. The team consists of seven researchers representing expertise in the areas of production systems, systems design, gender, organizational design, ergonomics, and industrial design. The practical aspect of the project is to explore the possibility to design a sustainable and at the same time efficient concept of a “factory”. The overall purpose of the project is to explore new approaches to change management and production design as well as to develop theories of organizational design in an industrial context. We base our approach on the notion that change management and developmental work must continuously be upgraded as the social context and the conditions of production change. Furthermore, from our perspective there is an emerging trend to encompass multiple perspectives within the field of ergonomics,

(e.g. Charytonowicz, 2009) something we find to be at least to some extent addressed in this project.

The Future Factory is a triennial project expected to be completed by the end of 2010 and that is performed in three phases; 1) knowledge overview and mapping of relevant areas such as inter alia contemporary manufacturing industry, new trends within production systems, organizational design, and change management etc., 2) exploratory study of social and organizational aspects together with the interest groups, and 3) design work, which includes working with a design team consisting of participating women production engineers, systems designers, human resource managers, CEO's, industrial designers, architects, students, and researchers.

AIM

The specific aim of this paper is to describe our collaborative approach based on a design team consisting entirely of women and to present some of the outcomes that this has resulted in. Moreover, from our perspective there is a difficulty in transferring research discussions on work organizations to the people that have the ability to implement them in their organizations. Our approach includes participating stakeholders, and we thus want to contribute to transferring knowledge on these issues. However, we also see the participants' knowledge as something that will contribute to refining our approach and the methods used. The expected outcome of the project is thus a proposal of a future factory that includes needs and preferences of *both* women and men needs. Therefore, there is no particular problem, solution, organizational design or production system to explore. Research projects can explore how things are; the Future Factory project instead aims at exploring how things might be.

OUR APPROACH

A design process can be performed in many different ways. The design process of the Future factory project focuses on a future vision of a factory, including ideas on organizational design, production systems, and information technologies. In extent research there is claimed that this makes the process more complex than problem-solving, meaning that requirements cannot be fully stated beforehand (Westerlund, 2005). Furthermore, such problems are proposed as "wicked"; as problems that cannot be definitively described and that involves aspects that cannot be solved neither correctly nor falsely (Rittel & Webber, 1973). As a result, our driver to start a design process has not been problems, but instead to develop a future factory based on new perspectives, possibilities and visions.

A design process is often described as a linear process starting with a problem and ending with a solution to that problem. Such a process is often based on various disciplines contributing with their expertise at different stages during the road. For

example, the marketing department performs a mapping of needs and then forwards them to a designer. However, Westerlund suggests that this is a waste of understanding since not all relevant knowledge can be represented this way. In contrast, there is an emerging trend to engage people from different disciplines in the design process, an approach also applied in the Future Factory project. Henderson (2005) suggests the approach of interacting needs of technology, user value, business value, and strategic value. Moreover, he emphasizes the importance of addressing all these values at the same time.

Given that we in this project are trying to include all dimensions, we consider it important to address all these values in our activities as well. Our solution to this has been to form a multidisciplinary design team, as previously mentioned composed of production engineers, systems designers, human resource managers, CEO's, industrial designers, architects, students and researchers. What makes this project different, and from our perspective exciting, is the fact that we have chosen to work with a design team consisting exclusively of women. The reason for this is due to a problem faced by Swedish manufacturing industry; e.g. the dilemma of how to attract young people and women. Thus we want to explore a possible constitution of a future factory particularly with these stakeholders. In addition to this, Swedish industry as a whole is heavily male dominated in numbers, meaning that women are excluded from organizational design processes. Solutions based solely on men's ideas and visions are not general and their solutions often are not all inclusive, and thus risk being incomplete or limited.

The expected outcome of the design process is a proposal for a future factory, i.e. a visualized model of a future factory including ideas based on women's preferences for a; production systems, organizational design, and change management.

Krippendorff (1995) argues for a development process that has a network of stakeholders, since he believes design to be a social process that relies on stakeholders with different and potentially conflicting interests. An approach based on this perspective is sometimes described as an inquiry into a future situation of use (Gedenryd, 1998). From our perspective such an inquiry builds on people's own experiences and provides resources for them to be able to act. For us, such an inquiry includes an understanding of the situated work practice and human factors as a ground for technology and system development, as suggested by e.g. Heath and Luff (1991), Suchman (1997) and Bannon (1998). A proposal is that if stakeholders are involved in the process, it ensures that its outcome will be better received and will be better adapted to their needs and preferences (e.g. Saschkin, 1984; Müller & Kuhn, 1993; Bødker et al., 2000). By reflecting on how manufacturing industries conceive the concepts of efficiency and attractiveness together with our participants, we therefore believe that it is possible to design a proposal for a future factory that benefits both organizational and individual perspectives. This means that the approach of the project builds on a model of design based on the notion that the interest is in how things out to be rather than how things are (Simon, 1969).

REFLECTION

The concept of reflection was introduced by Dewey (1998/1933) and further developed by Schön (1995), who initiated reflection-in-action and reflection-on-action. The latter includes a process of identifying and developing knowledge of a particular context or workplace and the actions taken there. The process of reflection is according to this concept, claimed to deal with learning and thinking, since we are said to reflect in order to learn and learn as a result of reflection. Ghaye (2007) includes the analysis of what people do in the concept and consider it dealing with important work-placed based and profession-specific knowledge. Furthermore, he adds *reflection-for-action*, occurring for a reason, a particular purpose, and including elements of thinking of the practice in order to improve it, which is: plan for action. As mentioned, in this project there is no particular practice or context to reflect upon, however, there is a particular purpose upon which we might reflect, i.e. the design of a future factory. It is, for example, rare in Swedish industries to include all groups of employees in change projects (Bellgran & Safsten, 2005), even though it is described as a successful approach that would contribute to improvements (Vink, Imada & Zink, 2008). This might result in changes that are not based on the knowledge and experience of the organizations members, which might lead to restorative actions (e.g. Abrahamsson, 2002; Charytonowicz, 2009) and/or outcomes that do not work in their contexts (Ullmark, 1996).

To reflect is also described as looking forward into *what we want to achieve* (Ghaye). Such future scenario-making is also proposed as a more solution-oriented back-casting approach (Edeholt). The assumption behind this is that when thinking of a practice in order to improve it, a plan for action takes place. If planning is based on a future practice, *what might be*, and thinking of actions that have to take place in order to implement the solutions, the solution-driven back-casting approach is used.

PARTICIPATION

Participatory design is defined as researchers and people at stake working together to define project goals and design new technologies, attending to implications for new ways of working (Blomberg, 1999). Participation is proposed as both a mean and as an end; as a mean to achieve, maintain or develop a purpose (e.g. Sashkin), or as an ideological manifest to achieve a democratic, progressive, and humanistic approach (e.g. Ehn). Already mentioned is the idea that participation better ensures a satisfactory outcome of the process. Additionally, participation is in itself claimed to increase the chance of successful implementation, regarding both productivity and job satisfaction (e.g. Vink et al.).

However, participation is also said to engage people in reflecting on their own knowledge, their understandings, skills and values, as well as the ways they interpret themselves and their actions (Kemmis & McTaggart, 2000). Since there is no particular context or practice to change in this project, this is what we emphasize.

METHOD

As previously mentioned, we draw on a human-centered approach, involving an understanding of the world as not true, fixed or stable, but instead socially constructed in collaboration with others, as suggested by inter alia Krippendorff (2006). As a basis for the project, we therefore performed a comprehensive survey of Swedish manufacturing industries including collaborative inquiries within the *research* team. The inquiries within the research team help us understand the issues we are dealing with, the stakeholders we are concerned with, as well as help us discover possibilities through communicating different perspectives on the issues in an interdisciplinary group.

We are especially dedicated to highlighting and developing gender awareness in the social and organizational design, which is why our *design* team consists entirely of women. However, in the beginning of the project we performed activities with young people, trade unions, industrial employers and employees in various companies to explore meaning and context with them. In total, about 140 people have participated so far in the project (see the contribution of Johansson & Wikberg Nilsson to this conference).

These initial activities became the basis for developing a number of personas (see Wikberg Nilsson, Fältholm & Abrahamsson, 2009). Personas are fictive characters used to describe and communicate stakeholders to others (Cooper, 1999). The aim of using personas is to overcome difficulties in communicating and understanding meaning and needs. We have also found inspiration in the Critical Incident Technique (CIT), as proposed by Flanagan (1954). The main method, though, has been participatory workshops, with the design team, supported by techniques as personas, scenarios, and CIT.

PARTICIPATORY WORKSHOPS

In the project, rather than workplace actions, we explore the participants' knowledge through participatory workshops. Such workshops are proposed to support co-operative learning and understanding of what meaning is to the participants (Westerlund).

In the approach to our workshops we draw on inspiration from the Future Workshop technique as introduced by Jungk (1989). The aim of such a workshop is suggested to support participants in a change process to reflect on the past and present, future possibilities and visions, and plan for action. The future workshop approach is facilitated by specific rules of communication, claimed to create a dialogue on equal terms (ibid.). The proposed structure consists of three phases of reflection on the present in 1) *the critique phase*, creating visions of the future in 2) *the utopia phase*, and finally the discussion of how to move from the present to the desired future in 3) *the implementation phase*. Such workshops are described to nurture shared understanding, compromises and shared commitment (Muller, 2003).

Furthermore, the proposition is that the setting of a workshop ideally should promote each actor to evolve as a function of other actors' behaviors in order for a synergetic interaction to occur (Latour, 1996).

An important aspect of a workshop is of course the participants. Westerlund demonstrates that participants that act only as representatives for stakeholders do not commit to the issue. For that reason, the suggestion is that the participants *should have personal experience and knowledge that they contribute within the workshop and thereby participate in the proposals* (p. 73). In our activities, this has meant that each participant represents her/his own point of view, in contrast to representing "all engineers", or their organizations perspectives, or something else.

We have held most of our workshops in our DesignLab, where there is material and space for a lot of people. So far, we have carried out four workshops with the design team, varying between eight and seventeen participants at a time.

It is alleged that the discussions during a workshop should not be understood as represented in language, but instead constituted *through* the dialogue (Westerlund). From our understanding this means to carefully explore the dialogues in terms of meaning, both with the participants and within the research team after each activity.

DISCUSSION

In this paper we have presented parts of our methodological approach, its background, and incentives. In this final discussion, we take up a few of the aspects of a future factory we believe this approach have contributed to. As mentioned, our task in the project is to design a proposal for a future factory that includes preferences and needs of both women and men. For that reason we involved different stakeholders in the pre-study and introduced this initial mapping of needs to the Co-design team of women for further development. It is however important to note, that the aim of the project, and thereby its solutions, were never intended to be solely directed at women. Instead the aim of the design team of women is to include their ideas and visions into a further discussion of design of industrial organizations.

In our activities, we have aimed at *encompassing multiple values*, introduced as concepts of attractive and efficient factories, and explored what these might consist of; i.e. what is an attractive workplace, and what is needed to make an attractive workplace also competitive and effective.

The collaborative approach of this project has turned out as also part of the solution proposed for a future factory. Thus, there should be a broad participation of all stakeholders that might contribute to the process of change. *Gender awareness* in recruitment, workplace culture, group interactions and participation is something we jointly emphasize as well. Several of our participants have told us about incidents when they felt discriminated on the basis of their gender. Moreover, we see the synergetic effects of addressing all resources simultaneously; people and technology as well as business and strategic values. Based on our understanding, if the participants find the process meaningful, they are more likely to adapt and agree

upon the outcome of the process. Additionally, we find the inquiry into the future, as a *positive proactive approach* that we would like to propose as a solution for the future factory's management as well.

Nevertheless, we also see a need of *continuous learning*, including *learning to participate*, because many of our stakeholders have not been accustomed to such processes. Based on our inquiries, our participants have found it difficult to address all needs at the same time. However, this may also be due to the project task being “conceptual”, and thus not having any real context to change or improve.

Furthermore, a design of a future factory should consider the incentives for people to work there, and their needs and preferences for *confirmation*, *diversity*, *control of work tasks* and *participation in change processes*. We understand incentives to be different for different people, so diversity should be given space and be affirmed. Furthermore, our participants have recognized that atmosphere and how people interact with each other are of great importance. Thus, we propose for a future factory to embrace a *positive workplace culture*, also recognized within management literature as a driving force for development.

FUTURE WORK

In the project, there are still some activities to be completed, including finalizing a model, which is intended to address all aspects found as a proposal for a future factory. Our intention is then to use this model as a basis for further discussion with our stakeholders about future industrial organizations. The Future Factory project will not have a direct impact on Swedish manufacturing industry, but we hope to contribute to a resumed discussion on future management and work organizations and a growing recognition of the need to consider multiple perspectives in the development and design of the same.

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