

Framing Creativity. User-driven Innovation in Changing Contexts

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Abstract

This article outlines a way of understanding and modelling how it is possible to design for creative processes. The processes in question involve user-driven didactic design in a Danish project for developing e-learning designs to be used at small and medium sized enterprises (the ELYK-project). After briefly discussing the concepts of creativity and innovation, the article outlines three levels of analysis. On a meta-level, a new model of quadruple helix innovation is introduced, providing a framework for interrelations between enterprise, government, knowledge institutions, and users (learners). On a meso-level, a four-field model is introduced. It is an operational model for user involvement in creativity and innovation processes, depicting and demarcating the changing roles of users and developers at different stages of the design process. On a micro-level, the design practise of running workshops as “communities of ideas” is discussed. Some examples of the practical application of the model are discussed. It is concluded that creativity and innovation are the outcomes of multidisciplinary collaboration where different rationalities and competences become articulated.

Keywords: Creativity, innovation, didactic design, quadruple helix, SME, user-driven innovation, materiality.

Introduction

This article discusses an approach to didactic design, focusing on and actively involving “users” (learners, teachers, technical specialists). The aim is to outline a way of understanding and modelling how it is possible to design for creative processes. The concrete case underlying the authors’ work is a large Danish research and development project in e-learning, the ELYK-project.

The EU-funded research and development project ELYK (2009-2012), has attempted to address the problem of developing and retaining competencies in remote areas. The purpose is not to offer training or support for inter- or intra organizational learning, but to develop concepts that transcend the traditional training models. An important component is the development of models for involving users in innovation of learning media. Taking this experimental approach to developing concepts, the project acknowledges the differences in rationalities defining the understanding of learning in SMEs and in knowledge institutions – differences that explain why in general in-service training offered by knowledge institutions is not always enthusiastically received (Bentley, 2008). The ELYK-project operates with a number of cases representing three different ways of competence development: 1) Flexible work-place learning integrated in the development activities of the enterprise; 2) Short courses tailored to a particular target group (defined by sector or work function); and 3) Formal vocational education. The cases referred to in this paper belong to categories 2 and 3. Our main focus, however, is on the actual concept being developed through the project for framing the creative and innovative processes.

Therefore, first we briefly discuss the concepts of creativity and innovation, and account for the theoretical and methodological foundations for the ELYK e-learning-project. Next, three levels of analysis are expanded upon. On a meta-level, the popular triple helix models for innovation are criticized, and a new model of quadruple helix innovation is introduced, providing a general framework for the interrelations between enterprise, government, knowledge institutions, and users (learners).

On a meso-level, a four-field model is introduced. The model has been developed for structuring both the spatiality and the processes within the e-learning project. It is introduced as an operational model for user involvement in creativity and innovation processes, depicting and demarcating the changing roles of users and developers at different stages of the design process.

On a micro-level is discussed the design practise of running workshops with participants from business, education and research. The workshops are conceived as “communities of ideas” where different domains come together to develop new forms, not because they follow the same rationality, but because they are united by a vision of novelty generated by differences.

Defining creativity

The concept of *creativity* is difficult to grasp. The etymology of the word refers to the act of divine creation – that is creating something out of nothing (*creatio ex nihilo*). Often, creativity has been associated with the “divine inspiration” that artists in particular are gifted with. Such use of the concept is a construction of 19th Century romanticism. However, it remains a part of our everyday understanding of what creativity means. Typically, creativity is seen as something special; deriving from inspiration, and constrained by rationality.

In the years following World War Two, particularly within American psychology there was an increasing interest in identifying creativity traits and in developing measurements for individual creativity. Growing criticism from the fields of psychology, management theory, and also learning theory of this notion of measurability has opened up for a number of alternative understandings. Firstly, they tell us that creativity is a term that is used to describe how novelty is generated. Secondly, that the understanding and hence the definition of the term is a product of history and culture. In consequence, it is difficult to define creativity in a general sense. Rather it has to be understood in the particular socio-cultural context where it is debated and/or where it occurs (Sawyer, 2006).

Nonetheless, venturing a general definition of the concept of creativity, a tentative bid could be: *Turning potentials into accepted new form(s)*. This means that we do need to have something (potentials), which should be given form. The form should be new – otherwise it might be appropriate, but not creative. The form should then again be accepted. Acceptance does not necessarily mean accepted as – but that this very form will be considered. A slightly different but also more operational model, the generative socio cultural model suggested by Sawyer with references to Amabile and Csikszentmihalyi, defines three elements: Person, Field, and Domain. The creator develops new ideas. The field then decides firstly whether they are appropriate and secondly whether they are “new”. The gatekeepers then allow for the product to enter the domain – or else it is rejected (Sawyer 2006).

In recent years, the term creativity has gained importance as a way of describing one solution to some of the challenges facing modern societies that are moving from conventional industry towards new kinds of industry. In these emerging societies, novelty, creativity, and innovation constitute important drivers.

Summing up, it is possible to identify a progression in the understanding of the concept of creativity from *the creative individual* (creativity seen as something embedded in the individual); to *the creative context* (interplay between individual and context); and finally to *distributed creativity* (complex processes). However, these stages are not mutually exclusive.

Adopting a view that creativity is neither divinely inspired nor readily quantifiable traits, but rather potentials, this article aims to outline a way of understanding and modelling how it is possible to design for creative processes.

Task and Solution

The concept of “creativity” pertains both to tasks and to solutions – to stimulus and to response (Kaufmann, 2004). Consider the case of Open Educational Resources (OER). Transforming a familiar task into a learning object or an OER and applying it in a teaching programme in an entirely conventional manner amounts to *problem solving*. Applying it in a novel way, however, involves some order of *adaption*. Such adaption, requiring a complex process of identifying pedagogical patterns in existing designs and repurposing them in a new didactic design, is demanding. As yet such practices are not widespread (Conole, McAndrew & Dimitriadis, 2010).

Alternatively, it is possible to reconsider the task, i.e. to create an unconventional type of OER. Kauffman (2004) defines offering novel solutions to novel tasks as *reactive creativity* and offering novel solutions to somewhat familiar tasks as *proactive creativity*. In OER-terms the former would correspond to developing unconventional teaching methods for new and unfamiliar subjects. The latter would correspond to designing OER for existing subjects in novel ways.

This article will address creativity from the proactive point of view. Based on the premise that there is a growing recognition of the significance of the needs and learning styles and especially learning strategies of the individual learners, it will be argued that didactic designs can and should be based on the perspective of the individual learner, and that there is much to be gained from actively engaging actual and potential users of OER in the design process.

Using as an example the ELYK-project, the objective of which is to develop new methods for designing for e-learning and to create new designs to be utilized in developing curricula and teaching materials, we will propose bringing user-driven innovation into the design of OER. Furthermore, the “user” will be considered not some abstract entity, but a user-in-context. In the co-design process context to be outlined below, the user is not simply *situated* in a Lave & Wenger (1991) sense. But more broadly, the context in which the innovative process takes place is dependent on actors representing enterprise, government, and

knowledge institutions. To bring out these interrelations clearly, we will develop a user-oriented version of a quadruple helix model for innovation.

Involving users in didactic design

The ELYK project, focusing on small and medium sized enterprises (SME) in outlying areas in Denmark, takes an experimental approach to help develop competencies by means of internetworking and net-based learning (Helms & Heilesen, 2010). It is a basic premise that net-based collaboration and learning will be useful in achieving the project goals. Yet, it is also acknowledged that existing formats of e-learning may not altogether address the needs of SME-employees. Indeed, the existence of a gap between the cultures of work and learning in enterprises and knowledge institutions may be one of the reasons why in-service training offered by knowledge institutions is not more eagerly sought-after (Bentley, 2008).

Basing itself on theories and methods of user-driven innovation (Hippel, 1986, 2005; Nordic Council of Ministers, 2006) as well as action research, especially theories explicitly viewing theory construction as an important component of action research, as suggested by Friedman and Rogers (2009), the ELYK-project strives to involve SME-employees, i.e. the potential learners, in the process of didactic design. The project makes use of an iterative four-stage process of exploring, prototyping, experimenting and implementing designs in close collaboration with users (cf. below). The designs are meant to be exemplary. They are not offered as courses by the project itself, but they are turned into courses and learning objects through collaboration with institutions and companies offering training in subjects relevant to the SME-employees. Thus, the designs can be understood as open educational resource frameworks.

Models of innovation

Innovation is another phrase that is widely used and almost as widely defined. When engaging in innovation, one deals with the process where novelty is transformed into a new practice. Or as Theodore Levitt (1963) puts it: "Creativity is thinking up new things. Innovation is doing new things." However, the two terms *creativity* and *innovation* tend to be used interchangeably, and therefore they can be difficult to differentiate. This may be explained by the evolution of the two terms; creativity primarily being related to art and to scientific areas as psychology, art studies and to some extent philosophy; and innovation being an offspring of social science, economics and management. Just as is the case with the concept of *creativity*, it is possible to identify an evolution in the understanding of *innovation* from being the achievement of a heroic individual, and to a present day focus on more organic and combinational models (Tuomin, 2006). Analytically, it is also possible to identify a progression from a stage where innovation results from specific knowledge regimes (science or development departments) to more horizontal models such as *user driven innovation* (Hippel, 2005), *open innovation* and *broad-based innovation* (Chesbrough, 2003). The relatively new concept of broad-based innovation includes services (in the present context understood as education) as well as technologies, products and organizational processes, and it understands innovation as the result of complex interactive processes among various actors (Edquist, Luukkonen & Sotarauta, 2009).

In short, we may characterize innovation as turning new forms into accepted new practices; or to put it more simply: innovation is turning creativity into new practices.

At Meta Level: from Triple to Quadruple Helix Models

Enterprises, government, and knowledge institutions are actors collaborating in producing innovation, according to the still-popular triple helix models of innovation (Etzkowitz, 2002). The notion of a triple helix approach has been inspired by Luhmann (1997) who suggested a socio-diagnostic analysis involving a functional differentiation of society. The triple helix approach owes its prominence mainly to the fact that it has become part of several national as well as European Union policy initiatives.

The triple helix offers a spiral model for understanding innovation as emerging from multiple reciprocal relationships between business, science and government. The idea is that these three actors are functionally differentiated systems with distinct rationalities. They are not stratified; rather they have the same sociological status. They co-function and thereby enable the triple helix of innovation. But in order to enable, different zones of translation and transformation are needed. These zones may be thought of as enablers for structural couplings.

The main problem with the triple helix model is that it is meta-structural, even though its advocates suggest the establishment of "translation zones" which should enable structural couplings between the systems (Helms, 2009). Being a kind of meta-model, at an operational level it assumes a top-down approach based on the contributions of experts. Still, the model may be used also in a world of distributed creativity and innovation.

In recent years, in addition to enterprises, government, and knowledge institutions "civil society" or "the user" has come to be recognized as yet another important actor, giving rise to a new set of quadruple helix models of innovation (Arnkil, Järvensivu, Koski & Piirainen, 2010). In contrast to the top-down triple helix

meta-models, quadruple helix models recognize that non-expert citizens acting as users or consumers actively participate in the co-production of new knowledge and new products. As yet, there is no universally accepted definition of the quadruple helix concept. But according to a recent Finnish report on quadruple helix research (Arnkil, Järvensivu, Koski & Piirainen, 2010) the various existing definitions can be summarized into four models, representing a continuum. At the one end we find an augmented triple helix model, where user experiences are solicited, and where users may be involved in testing the nearly finished product. At the other end we find the citizen-centred model, where end users are initiators and actual producers of innovation with the support of enterprise, government and knowledge institutions. Between these two extremes are the enterprise-centred and the government-centred models, each one catering to the special needs of business or the public sector.

Particular focus on local innovation in the private and public sectors may explain the omission from the Finnish report of a knowledge-institution centred quadruple helix model. However, one could easily be constructed using the same template as used in the other models. Knowledge institutions would thus be developing services (e.g. courses and learning objects), supporting citizen involvement, collecting information about users, and supporting the dissemination and sharing of products. Government would support research, development, networking, and knowledge dissemination. Business would support research and development activities, make use of know-how in implementing commercial solutions, and collect information on user needs. As in the enterprise-centred and the government-centred models, users would contribute experiences, and to some extent would also be involved in generating ideas and developing innovations.

All four strands in the quadruple helix model are defined within the tradition of systems theory which for practical purposes means “broadly defined”. Enterprise, government, and knowledge institution all are complex organizational structures that need to be more narrowly defined in any particular instantiation of the model. Moreover, some kind of relationship exists between each of them, e.g. administrative, cultural, and economic.

Equally, “user” or “citizen” needs to be understood in terms of a particular human endeavour. Thus, in the context of developing educational resources, the user may be a learner, a teacher, an administrator or an it-specialist involved in selecting software.

Moreover, the “user” will always be rooted in a socio-cultural context, and this context is likely to represent a complex weave of dependencies. Helix-models in a general fashion suggest interdependencies among the various strands. But strands tend to be defined as separate entities. This simplification may be convenient for dealing with the various “roles” in the innovation process. But it obscures the dynamics of the process. Consider the concept of “user”. From the point of view of enterprise, he or she is an “employee” or a “consumer”. From the point of view of government, the user may be a “party” or “a client”. From the point of view of the “knowledge institution”, the user may be an “informant” or a “student”.

Obviously, the concept of “user” is always construed from a particular point of view. But, even if one particular aspect is emphasized, users are still multi-dimensional. The individual seeking in-service training is a student, but also an employee, and perhaps even a client if the teaching program is subsidized by public funding. Rather than just augmenting the quadruple helix models proposed by Arnkil et al.(2010), as outlined above, it may be useful to consider a variant type of quadruple helix model combining roles, relationships and dependencies among the actors (Figure 1).

The basic understanding here is that the relationship between government, business and knowledge institutions (primarily educational institutions) are undergoing changes in rationality and form.

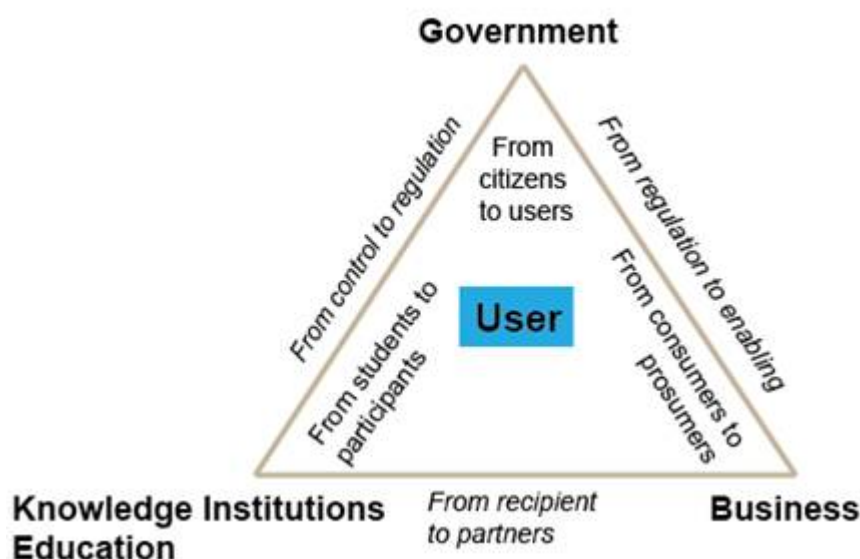


Figure 1. A new quadruple helix model.

Of course, the traditional regulation towards business and industry is still taking place and is part of the rationality. But due to the changes in the global economy, the rationalities or codes are undergoing changes. The primary objective for a state such as Denmark, and its conceptualization "The Danish Welfare State", is to enable the society in general and business in particular to cope with global changes. Policies to support this are evolving, but due to the complexity and uncertainty, the general tendency is to establish frameworks for solutions rather than actual solutions – and then let various actors work out the solutions. In this way innovation is also seen as a policy tool, and as means of developing policy. To be more specific: the actual project becomes part of the evolving policy. Examples may be found in the activities of European Union Structural Funds aiming at developing regional competitiveness through "more and better jobs" (Programme for The European Social Fund in Denmark 2007–2013, <http://www.deaca.dk/eusupport>) and "Better knowledge and innovation to secure growth " (Programme for the European Regional Development Fund in Denmark, 2007-2013, <http://www.deaca.dk/eusupport>). Programs of this kind offer general statements and combine them with different indicators thus refraining from proposing more operational targets or descriptions. The latencies within society should then be given form as new solutions developed through the project, e.g. as it is formulated in the ELYK-project, "The primary objective is to devise new ways to develop competencies for employees in small and medium sized enterprises in outlying areas in Denmark. This should be done by means of user driven innovation" (unpublished project description).

Universities are seen not as autonomous entities, but as resources for societal and commercial growth. The triple helix model suggests how this could happen within a society with horizontal differentiation. Being derived from system theory, the claim is that these systems have no direct interaction or for that sake hierarchy; but rather that differentiation demarcates society in complementary parts, which orientates themselves toward different codes. Spheres of action and sets of orientations are separated horizontally from each other, like the educational, the political and the scientific system. The question is whether these codes are undergoing change? Some researchers suggest that they are becoming porous (Grant 2004), that they are more fluid and under debate. Others suggest that the codes are shifting within organisations; that so-called shifters transform the rationality of the organisation toward different codes (Åkerstrøm Andersen & Born, 2003). The authors would like to propose a somewhat different approach, namely in times of change we need to operate with parallel regimes that operate along with the established systems. These are not organisations in the systemic perception of organisations (defined by membership), but temporary settings defined by idea and interest. This approach is inspired by Werner Rammert who describes such a new regime as constituted when:

"The emergence of a new knowledge regime besides an established one can be stated, if one can identify new patterns of coordination in the academic, industrial and political fields of knowledge production as well as between them and if these patterns can be condensed into a coherent set of 'rules of the game'." (Rammert, 2004).

The codes then would be *firstly* creative and innovative developments structured towards the user. Framed by economic incentives i.e. different Research & Development programmes directed towards political issues such as developing new structures for innovation and learning. *Secondly*, a general interest in creating new accepted forms; and *thirdly*, the media that enable this communication – the media here being "the user".

Summing up, the traditional triple helix model describes the changing relations among different systems within a new industrial society. This is a modernistic project joining various systems in transformative projects of modernization. On first impression, quadruple helix models may seem to represent a more humanistic project, bringing the individual and/or civil society into the picture. In our conceptualisation, however, it should be understood rather as the muddy battlefield between different rationalities and the actual inner struggles as to how one should understand the challenges arising. Challenges such as how should research, business, and governance take place – when having the user as measuring point? This very user who is "the media" is a construction whose ontological status is defined by the emerging rationalities in the different domains and also a media for the cross domains which evolve within these new knowledge regimes. In this line of reasoning: When the user is a construction, it is possible to reconstruct or re-design the model seeing the various relationships as mediations of the structural couplings between the different systems. Further, we can discuss how these meetings and constructions arise. Thus, the meta-model provides an analytical point of departure for understanding the rationalities of creativity and innovation at a systemic level. Next, there is a need for moving on to the actual design for creativity and innovation.

At the Meso-level: the Four Field Model

The ELYK-project has developed a model meant to structure both the spatiality and the processes within the project (Figure 2). The initial reflection was that if a user is a construction, then it will make sense to move from a position where the researchers merely observe, to one where the user actively participates in the observation, and further to a situation where the user becomes a partner, and finally to a new situation where novelties become part of a (new) practice. The idea is that these different positions are guided by

different rationalities and methods, which then again call for a more general methodological discussion.



Figure 2. The ELYK four field model.

In the upper left section of the model (Figure 2), the present practice is represented. When developing new learning media, of course there is a need to know about current practises, the context in which the learning tools will be used, and the end users who in an educational setting are students, teachers, and IT-specialists. These initial observations could be carried out as different kinds of ethnographic researches. At this stage, the “innovators” (researchers) are observers and the users are being observed.

In the upper right section, is indicated “the Lab”. The Lab is where new artefacts (or “things”, to use Levitt’s term) are being developed, or it could be the setting where new artefacts are being tested. It is not a physical place, but rather a setting for sessions of user testing of prototypes and for brainstorming with various user groups about new potentials. In the ELYK-project, typically the Lab has been instantiated in the form of workshops where the initiators (researchers) submit their initial findings for discussion with the users, and where all participants help envision prototypes for new practices. In the Lab, the users become articulated actors, and the innovators also change their role from observers to developers.

Next, in the lower right section, is the “Project”. This is the arena for developing and testing prototypes. The Project is where all the various actors participate in bringing different rationalities and competences together. The initial differences in roles are now being redefined into a partner model that is not defined by position (observer-observed) but by competence.

Finally, in the lower left section, “New Practices” are being implemented. In the actual ELYK cases, new learning media are being rolled out and gradually become part of everyday life. Ideally, the technologies fade, so to say, and become part of the practice.

In summary: The four-field model is an operational model for user involvement in creativity and innovation processes. It depicts and demarcates the changing roles of users and developers at different stages of the process. It is a comprehensive model inspired by different approaches to and traditions within research in innovation (and to some extent creativity). For the ELYK-project as such it has been useful as a kind of materiality, a “boundary object”, which has enabled sense making across different domains, much in the same way that prototypes have been successful in the workshops run with numerous different actors throughout the project.

At the Micro Level: Workshops and Materiality

Following an initial phase of examining actual practices of different workplaces and educational settings, in the second of the four phases of the model, various workshops are being held with participants from business, education and research. The workshops may be viewed as special temporary communities. Community is not to be understood in a Lave and Wenger (1991) sense. They are looser, and they are also characterized by difference rather by uniformity. From the outset, the participants are embedded in different domains. In the workshop process, the participants break away from the domains, while at the same time representing them, and they come together mobilized by the challenge of developing new learning media, better educational practices, novel ideas. This newness and the challenge, which in the different domains will be interpreted in different ways, generate the need for a conceptualization distinct from that of communities of practice.

In the project context, it may be more apt to use the concept of “communities of ideas” (CoIs, Fisher 2001). They are what Fisher calls communities of communities where stakeholders from different communities of practice come together. In our understanding, this is the operational model of new knowledge regimes. It is the situation where different domains come together to develop new forms not because they follow the same rationality, but because they are united by a vision of novelty generated by differences. Facilitating

this situation is the essence of the ELYK-project. It is not just important, but absolutely essential to bring together different domains – or rather actors or stakeholders (in the words of Fisher) from these different domains so as to generate new emerging knowledge. Hence, it is also important that these communities are and remain temporal in order to avoid homogeneity. Moreover, there should be the structural shifting of openness and closeness in the process; and in speaking about *multi-disciplinarity*, using differences, rather than cross-disciplinarity, which would mean focusing on sameness. When actors work together in zones in the intersection of domains in a special creative and innovative context, we need materiality or mediating artefacts. Fisher states that:

“learning in CoIs requires externalizations ...in the form of boundary objects ... which have meaning across the boundaries of the individual knowledge systems. Boundary objects allow different knowledge systems to interact by providing a shared reference that is meaningful within both systems. ... In this sense, the interaction between multiple knowledge systems is a means to turn the symmetry of ignorance into a resource for learning and social creativity (because innovations come from outside the city wall).”
(Fisher, 2001).

In a community of practice we would be speaking about the relationship between reifications or mediating artefacts. The core of Wenger's (1998) theory is that we learn by becoming part of a community and that this “becoming” is a dual process of reification and participation. Since reifications stabilize the process, we do not use reifications as a means to tell us what to do, but as ways of understanding. Moving on to the more temporal communities of innovation and creativity, they are unstable and the reifications change and become different both through our changing interpretation of them and through the actual development of the very externalization.

In the light of the above, it may be claimed that further research in this area may benefit not from following the user, but the externalizations and their transformations and translations so as to understand the process. Externalizations – mediating artefacts – are both outcomes and part of the scaffolding of innovation processes. They are mediators between different domains or knowledge systems. Where the earlier viewpoint may have been that this knowledge should be distributed through means such as education and then applied in “real practice”, the experience of the ELYK-project is that knowledge in such processes indeed consists of many different voices and externalizations: That we are not engaged in a sort of vertical “top down” process, but rather are involved in a horizontal learning process where different contributions create media such as e-learning applications, which at an ontic level is the same but in the different domains contribute to different ontologies.

Framing creativity in practice

In order to illustrate how the models discussed above can be applied in didactic design practice, this section will introduce two recent designs in the ELYK project, both involving vocational training and SMEs.

Case 1, Training Electrician Apprentices (formal vocational education)

This case was developed in 2010-11 in collaboration with management, faculty, and apprentices at a vocational college in the southern part of Denmark, and with local electrician companies. The project should be understood in context of the Danish vocational system (VET-System). This system is a so-called dual-mode system where periods of attending college alternates with periods of training in an enterprise.

The project was headed off with a study of current practice involving ethnographical observation at the vocational college as well as interviews with faculty and apprentices. The most notable finding was that the apprentices have difficulties understanding how formal learning at college relates to the informal learning acquired during the altogether five periods of apprenticeship in the enterprises. They experienced the system more as a parallel system than as a dual system (Gleerup, 2010).

The initial observations provided inspiration for a day of workshops (Constructing phase) where faculty, apprentices, electrician masters and journeymen, working first in peer-groups and next in mixed groups, discussed challenges in the present teaching programs. The discussions provided hints that problems with coupling learning contexts may be aggravated by the fact that the formal exchange of information between college and company is reduced to a very simple paper form. Also, it was evident that the apprentices feel cut-off from peers and the college environment during periods of apprenticeship in the enterprises.

Altogether eight themes were identified in the first workshop. A simple mock-up was constructed for each of them, and these designs were presented and discussed in a second workshop, involving only students. The outcome of the second workshop was the identification of three designs to be tested as working prototypes.

Moving into the Co-constructing phase, the three designs, worked into a collaborative social software

environment, were introduced to teachers and apprentices at a workshop at the college, and then implemented in a period of apprenticeship. The designs, providing tools for reflection on practice, and facilitating communication between college, apprentices and workplace, were tested in real-life by all parties involved, and were eventually evaluated in a third workshop, the outcomes of which were modifications to be made before attempting to integrate the designs as new practices at the college. At the time of writing, the Re-constructing phase has not yet been completed.

Case 2, Training safety regulations (short course for a sector)

This case was also developed in 2010-11. The partners were University College South Denmark, University of Southern Denmark, a number of private operators (hauliers) and the International Transport Denmark (ITD, a branch organisation). The initial part of this project (Observing phase) was carried out partly as desk research and partly as field studies where the researchers observed a short course for drivers on the regulations of driving time and rest periods. This is an area of quite complicated legislation meant to further safe road transportation. Next, interviews were conducted with the instructors. The challenges in current practice identified related to understanding the actual implications of the legislation, and furthermore the retention in practice.

The researchers formulated these initial findings and used them in the first workshop (Construction phase). Through a process of generating personas of the actual target group for training, and a complementary process of non-stop writing, the instructors developed an understanding of their own practice. This was defined as a process of generating knowledge, and it led to a second phase, where the participants generated ideas by means of brainstorming techniques.

The researchers then conceptualised these results and presented them in a new workshop. Whereas in the first workshop all participants were instructors and staff members from ITD, the second workshop also included truck drivers and hauliers. This workshop focused on validating the findings in discussions with the shareholders from practice. It had a dual purpose: on the one hand the actual end users should develop ownership, and on the other hand the participating branch organisation should be ensured that moving on from the accustomed practice would be accepted and appreciated by their members.

Next, the researchers moved into the Co-construction phase where a mobile application was developed as an initial prototype. Fundamentally, this application addressed the problems relating to retention and complexity. Moreover, it was designed to facilitate integrating learning in the daily practice of the drivers, making use of so-called "time pockets", i.e. periods of waiting caused by logistics, traffic, or legislation. The actual app-product is an interactive questionnaire combined with a kind of thesaurus about the regulations. It will ask the drivers questions, and if they answer incorrectly, they will be taken to the relevant part of the thesaurus. A session takes only about ten minutes and can be dealt with at a daily basis. Each time the driver opens his smartphone, new questions will be generated. Eventual changes in legislation can be implemented in the app online.

The initial tests in this Co-Construction phase has implicated that the application helps solve the retention and the complexity problems. Whether the users will uphold the motivation and whether learning object will be integrated in the daily practice is not known at the time of writing.

Summing up

The results to date of the ELYK-project suggest that creativity and innovation are the outcomes of multidisciplinary collaboration where different rationalities and competences become articulated through the process and where the affordances and the constraints of shared models scaffold that process. Further, the project has indicated that such multi-disciplinarity, or competence disciplinarity, in processes of iterations and mutual sense making are facilitators for *creativity*, interpreted as suggested above: "Turning potentials into accepted new form(s)"; and for *innovation* when it is seen as turning new forms into accepted new practices.

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