

Frameworks towards a virtual co-creation tool for fuzzy front-end of service development in health care context

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This paper combines entrepreneurial behaviour and innovation with design thinking in order to investigate the use of the IdeaWindow, the ict-based tool planned for employee-driven service development, in a health care organisation. The tool enables participation of heterogeneous group of people to fuzzy front-end of service development. The paper asks how virtual tool can be used for tackling the unknown - tacit knowledge, hidden possibilities and initiatives in this context. What kind of perspectives and topics the employees bring up when using a virtual tool in the front-end of service development. The results are based on IdeaWindow entries and electronic survey data collected in Finnish hospital ward.

1. Introduction

The public health care sector in Finland and other Nordic countries is facing many challenges. These include aging population and changes in the composition of population health. There are more patients with multiple traumas but also new health care challenges caused by changing life styles. The expectations of patients for better and more individualized care have also grown during last years. Rapid technological and medical development is increasing costs but also expanding the treatment for patients that previously could not been treated (Magnussen et al., 2009; Länsisalmi et al.; 2006; Varkey et al., 2008). At the same time reduction of expenditure in the public health services put pressure to increase efficiency and productivity.

The need for innovation in the public sector is widely recognised. Innovation is considered an important mean for promoting welfare and resolving efficiency demands (Saari et al., 2015; Sørensen; Torfing, 2009). In health care sector the need for innovation has become critical to enhance quality of care and there continues to be a quest to balance cost containment and health care quality (Omachonu; Einspruch 2010; Varkey et al., 2008).

Despite the importance, the generation of innovations and their adoption in health care organisation is often complicated (Länsisalmi et al, 2006). Hospital, which is the environment of our study, is considered to be a very complex and hierarchical social organisation. There have been claims that hierarchies and authoritative management styles have caused rigidity in work practices especially in hospitals. The boundaries between different professions are precisely defined and based on the education and certificates. These strong boundaries between work roles affect the renewal and innovation practices in hospital wards (Iedema, 2007). Restricted domains of responsi-

bilities and authority can cause limitations in the abilities to imagine renewals that touch several professional groups and several cross-functional operations.

In the heart of innovations in healthcare there are the needs of the patients and the skills of the healthcare practitioners. According to Omachonu and Einspruch (2010) *“healthcare innovation can be defined as the introduction of a new concept, idea, service, process, or product aimed at improving treatment, diagnosis, education, outreach, prevention and research, and with the long term goals of improving quality, safety, outcomes, efficiency and costs.”* Successful healthcare innovation focuses mostly on three areas 1) how the patient is seen 2) how the patient is heard and 3) how the patients' needs are met. This rises up the importance of healthcare workers in innovation processes. They see and meet the needs of patients in their daily work practices. Innovation requires the activation of corporate entrepreneurs who will articulate problems, opportunities and possible solutions and will exploit the windows of opportunities (Sørensen; Torfing, 2009).

Since, as described it is not always easy to act entrepreneurially and strive for renewal in hospital environment, we experimented if ict-based tool could promote initiative and innovativeness. In this research paper we combine entrepreneurial behaviour and innovation with design thinking in order to investigate the use of the Idea Window, the ict-based tool planned for employee-driven service development (Lahtinen et al., 2014). Idea Window was originally developed and tested together with the health care workers in research project during years 2012-2014. We will investigate how employee-driven service development can be initiated by the virtual co-creation tool. Employee-driven innovations are exploration and exploitation of new processes and work practices that originate from ordinary employees. We are interested to know how virtual tool can be used for tackling the unknown - customer needs, tacit knowledge, hidden possibilities and initiatives in the working life context. We explore what kind of perspectives and topics the employees bring up when using a virtual tool in the front-end of service development.

Our main questions are: 1) How and by whom the virtual tool is used in fuzzy front-end of open and unstructured innovation process? 2) What kind of initiatives are raised up and which proceed into brainstorming phase?

The paper is organized as follows. In the literature review we will shortly describe the core concepts of the paper: employee-driven innovation, fuzzy front end, effectuation, corporate entrepreneurship, collective creativity and virtual co-creation. In the following section, the case selection and the characteristics of the case, action research as a method for data gathering and the principles of data analysis are presented. From there we will continue to the findings, followed by the discussion of the value and implications of the virtual fuzzy front end innovation practices among employees identified as well as some future research opportunities.

This research is part of the project called Entrepreneurial renewal and design thinking in the organisational development funded by the Finnish Funding Agency for Innovation. The aim of the project is to help the organizations to identify and utilize the workers' tacit knowledge and vocational know-how, and to incorporate their ideas to the developing of new services or work practices. The project examines the employee-driven renewal of organizations from entrepreneurship and design thinking perspectives.

2. Literature

Our case study focuses on those parts of fuzzy front end (FFE) of innovation process that take place and are mediated by IdeaWindow. Some key tools to fully understand what happens in these situations are concepts like effectual logic, corporate entrepreneurship, collective creativity and co-creation. The concepts are linked to different elements of FFE in different ways. Collective creativity is perhaps most prominently (but not only) linked to idea generation, effectual logic to the idea selection, whereas corporate entrepreneurship to opportunity identification and selection and development elements. The element of co-creation is present in each element. These concepts are also interconnected and overlapping - the concepts of creativity, innovation and corporate entrepreneurship are all linked to each other (Fillis; Rentschler 2010). In the following we will have a closer look at the role of these elements in early phases of employee-driven innovation.

2.1. Employee-driven entrepreneurial renewal and fuzzy front end

In order to develop the work practices and service processes, tacit knowledge and skills of the workers should be incorporated to the innovation process. Incorporating the employees - the experts of their own work - into innovation activities, can be seen as co-creation aiming to **employee-driven innovation (EDI)**. By definition, EDI is a new idea created by employees which results in a new, shared, and sustainable practice (Kristiansen; Bloch-Poulsen, 2010; Hoeve; Niewenhuis, 2006; Feldman; Pentland, 2003). Most commonly innovation refers to commercialized invention like a new technology, product or process. Here, the concept is wider. By innovation we understand both radical and incremental renewal of the products and services, processes and work practices alike (Wolff; Pett, 2006).

The innovation process can be divided into three stages: front end innovation, new product and process development and commercialization (Koen et al., 2001). The early phase of development process has been called the **fuzzy front end (FFE)** (Smith; Reinertsen, 1991) or front end of innovation (FEI) (Koen et al., 2001). Characteristic to that phase is that there is no clear objective, no schedule, or no budget, and hence no plan to follow. The nature of work is experimental and unstructured. Despite the fuzziness of this phase, some common elements of the FFE have been identified. According to Koen et al. (2001) FEI – as they call it – consists of five elements, which are idea genesis, opportunity identification, opportunity analysis, idea selection and concept & technology development. Idea genesis can precede opportunity recognition or vice versa. What comes out from the FFE is not certain, since not every idea – and not even every novel and useful idea – gets implemented and utilised in a profitable way (Amabile et al., 1996; Fillis; Rentschler, 2010). Hence, only some creative ideas turn into innovations. Therefore, uncertainty is characteristic for the fuzzy front-end of employee driven entrepreneurial renewal (Smith; Reinertsen, 1991). The end product of the renewal process is still unknown at that stage and the uncertainty of the process is quite similar to business start-up process (Phan et al., 2009) even though the amount of risks and employees role as a risk bearer is different (da Costa; Brettel, 2011).

Effectuation theory (Sarasvathy, 2001; 2008), which was originally created to describe start-up process, offers a useful tool for our study to understand the entrepre-

neurial behaviour of employees under uncertainty. Effectuation is a “*general theory of decision making in uncertain situations*” (Sarasvathy 2008, 227). It is a way to proceed in a situation with a given set of means and focus on selecting between possible effects that can be accomplished with that set of means (Sarasvathy 2001). Effectuation logic and causation logic have been contrasted. Some of the recent studies show that they are more complementary than contradictory (da Costa; Brettel, 2011). In the literature four dimensions of effectuation have been identified. Those are means, affordable loss, partnerships, and acknowledging the unexpected (Sarasvathy, 2008). What that means, is that means available determine potential outcomes more than conscious and explicit planning, potential losses are kept in affordable level, other actors are regarded more as potential partners than competitors and contingencies are seen as valuable opportunities. The characteristics of effectuation - such as process driven by given means and contingencies are seen as source of opportunities - are better suited to the FFE of the innovation process, whereas the characteristics of causation logic - like process steered by given targets and expected returns, and the avoidance of contingences - are more in line with the new product process development. (Brettel et al., 2012.) In our case it is interesting to see, if the staff of the ward build their ideas and proposals based on existing resources or do they use causation logic by setting an aim and then thinking what is needed to achieve that aim.

Effectuation logic, fuzzy front end and corporate entrepreneurship are closely linked with each other, as well. **Corporate entrepreneurship (CE)** has been seen as a method of stimulating innovation and utilizing the creative energy of employees in benefit of the organization (Åmo; Kolvereid, 2005). There are several definitions for CE (Hornsby et al. 2002). Simply put, CE can be seen as entrepreneurial activities within an existing organization, or as Sharma and Chrisman (1999, 18) define: “*the process whereby an individual or a group of individuals, in association with an existing organization, create a new organization or instigate renewal or innovation within that organization*”. What does entrepreneurial behaviour look like? How can we recognize entrepreneurial behaviour of teams or individual employees? Entrepreneurial orientation (Lumpkin; Dess, 1996, Dess; Lumpkin, 2005) is one conceptual tool for that. There are some patterns of action that can be identified as entrepreneurial. Those are autonomy, innovativeness, proactiveness, competitive aggressiveness, and risk-taking. There are some organizational factors fostering CE. Those are work discretion, time availability, management support, rewards or reinforcements, and organizational boundaries (Hornsby et al. 2002), some of which are quite scarce in hospital environment. Even if corporate entrepreneurship is often grass root level action, it has mostly been studied from the managerial perspective (Heinonen; Toivonen, 2007). This study aims to partly fill that gap.

As well as there are organizational factors fostering CE, there are **work environment factors** that affect the level of creativity. Commonly mentioned are encouragement of creativity, autonomy or freedom, resources, pressures, and organizational impediments to creativity (Amabile et al. 1996). Motivation for work and creativity was also noticed as an essential factor behind collective creativity already in the seminal work of Teresa Amabile (1988, 1996). In recent years, the interconnectedness of innovation and creativity has been studied on several levels: individual, team, and organizational level. Team level creativity has been shown to be dependent on team climate and processes and leadership style used. However, recent studies have shown no clear dependence between team structure and composition and innovation. (Anderson et al., 2014.) In their review, Lämsä et al (2006) point sever-

al internal factors that facilitate innovations in healthcare organisations. These include: strong leadership, shared and clear objectives, task orientation, participative safety, reflective team practices, active internal marketing, correct timing, motivation and participation of personnel, lack of stress, and sufficient resources.

2.2. Co-creation and co-realisation as a part of FFE

Collective creativity and co-creation as a manifestation of collective creativity are needed in the FFE. Sanders and Simons (2009) define co-creation “as any act of collective creativity that is experienced jointly by two or more people”. But first, in order to be able to co-create, some creativity is needed. There are several definitions for creativity. Fillis and Rentschler (2010, 51) define it as “*showing imagination and originality of thought in moving beyond everyday thinking*”. Hence, creativity entails an ability to ‘think outside the box’ and combine diverse information from different domains. As one element of EDI, the concept of bricolage is relevant when looking at innovations which arise from the daily practises of employees. According to Fuglsang (2010) bricolage can be seen as a ‘do it yourself’ problem solving that creates structures out of events and opens spaces for new ways of doing things. Saari et al (2015) states that ‘bricolage is the process of co-shaping an emerging path: various actors offer inputs to generate virtuous learning circle’. Learning by doing and through interaction, recombining previously unrelated knowledge, building skills and expanding routines are all at the core of bricolage. In this respect the IdeaWindow works well, since it enables multi-professional co-creation and supports cross-domain learning, which is regarded important for collective creativity (Hirst et al., 2009).

According to Elizabeth B.-N. Sanders (Simonsen; Robertson, 2013) “**Co-creation** puts tools for creativity and communication in the hands of the people who will be served through design. It is only through collective thinking and acting that we will be able to use design to help address the challenges we face today. All people are creative and can participate in co-designing if they are provided with relevant tools and the settings for use.” This view refers to participatory design that has recently paid more attention to long-term collective thinking and acting, and collaborative development processes where jointly designed tools enable dialogue between designers and users and give power of the tool and process development to the users.

In **participatory design** technology is seen as a potential mediator interweaving meaningful connections within wider socio-material system between people, objects and processes (Suchman 2002; Björgvinsson et al. 2010). Recently, the particular attention has been paid to application of participatory tools and techniques in the front end of the design process. Co-creation has been found to be even more relevant at the early front end of the design development process, where probes and generative toolkits operate well (Sanders and Simons 2009).

Co-realisation (Hartswood et al. 2002; 2007) is a concept stemming from information systems development, where it means continuous co-creation between designers and users. It aims to create a shared practice between users and designers that is grounded in the experiences of users, and where users drive the process. The key issue in co-realisation is to support ‘design-in-use’ (Henderson; Kyng, 1991), and in recognising that the information technologies and work practices co-evolve over time and that new technical artefacts require effective configuration and integration with work practices (Blomberg; Karasti, 2013). Traditional approaches to technical

systems design assume that systems are designed by technology professionals, and that at the end of the design process the implementation is finished and the properties fixed, and finally they are ‘handed over’ to users (Blomberg; Karasti, 2013). Thus the requirements somehow pre-exist, as something that can be ‘captured’ through appropriate ‘requirements-gathering’ methods (Jirotko and Goguen, 1994; Woolgar, 1994). *Rather, requirements are seen as being constantly evolving and in need of being ‘worked-up’ and regularly revised in the light of the situation at hand* (Blomberg; Karasti, 2013). Co-realisation is well in line with our approach both for IdeaWindow development as well as EDI processes supported by the IdeaWindow – with an exception that in EDI processes the ‘designers’ and ‘users’ are the employees themselves.

Case-based prototypes convey design ideas while maintaining their relation to work practices. In addition to providing for the possibility to iteratively gain user input throughout implementation, assessment and redesign; the prototypes also offer the context for discussion and mutual learning. The case-based prototypes allow potential future directions to be assessed in relation to other technologies-in-use, as individual technologies are seen to ‘add value’ to the extent they work together in effective configurations (Blomberg et al., 1996; Trigg et al., 1999). IdeaWindow is developed through case-based prototypes, which are co-created in various work places in different industries.

3. Method

3.1. Case: IdeaWindow at the hospital ward

The empirical study is based on a multidisciplinary action research project realized in a large public sector health care organisation in Finland. The case study was realized at the gynaecological ward of Tampere University Hospital in the Pirkanmaa Hospital District in co-operation with the group of personnel of three units chosen to the research project in the hospital, and with the Development Director of FinnMedi who was responsible for the co-operation during the action research.

The ICT-based co-creation tool called Idea Window was developed in a previous project in 2012-2014 at this very same hospital ward. It was designed to be a grass-root level open communication and development tool for employees’ concrete ‘doing’ from real needs of the workers and patients, aiming to empower the grass-root level professionals as developers and innovators of their work and domain. In the previous study, where the Idea Window was co-designed with the group of nurses and doctors, the prototype was preliminary targeted for employees to detect the invisible side of their work and to observe their experiences and ideas relating to services, and to pay attention to the customer's service experience and behaviour. It was to be a tool for tackling the unknown – customer needs, user understanding, tacit knowledge in work, hidden possibilities and initiatives in work context – and to collaborate in a more systematic way. (Lahtinen et al., 2014.)

In busy environments such as hospitals, it is difficult to get personnel to break away from the everyday work for example for bringing up new ideas and views on a variety of development challenges they face in their work. In the project, the IdeaWindow

was tested as a prototype to find out if a simple and easy-to-use kind virtual co-creation tool could 1) help employees to see their work more from the developer or designer point of view by providing them with a channel for sharing their ideas when possible along with their other work, and 2) to be initiative in the work even though there wouldn't be any clear objective or plan to follow for bringing up and sharing their ideas, experiences and thoughts for improving work life. (Lahtinen et al., 2014.)

The previous action research indicated that health care professionals are motivated to participate in designing and using service development tools and methods 1) if the process is based on meaningful and practical frames which matter to health care professionals, 2) if the process fits with contextual restrictions of health care organisation, 3) and if employees have possibilities to modify the process and monitor the impacts and to apply the results in multiple ways. (Lahtinen et al., 2014.) In the current study the situation where the data and results are obtained is a bit different, now the employees can use ready-made instrument for recording their own ideas and proposals for improvement and so starting their own co-creation process.

The project team made a decision with the contact persons in the hospital to widen the use of the virtual co-design tool IdeaWindow in the units chosen for the first experiment. The employees of the units hadn't used the IdeaWindow before although the tool was originally created in collaboration with personnel working in the same department in the previous research project. Therefore, they might have heard something about the device.

This time the IdeaWindow was taken into use in the units without any precise guidance or control. The personnel had relatively free access to try the device and come up with different ways to use it. No certain purposes or objectives were given to them. The only limiting thing that was told concerned the hope that the prototype would be used for developing both individual and co-operative work in the units. The project team allowed personnel to decide topics for their shared ideation and creation.

From the perspective of the 'design-in use', the main objective in the experiment was to explore how the virtual tool could work if the employees are let to use it experimentally and in unstructured ways for their own idea genesis, opportunity identification and opportunity analysis, the three elements typically existing in the front-end of innovation. The experiment would also indicate how well the tool fits with the contextual restrictions of health care professionals. Thus, the research focus would be on how the employees are using the tool alongside their everyday work routines and hectic working hours without exactly defined development case or topic, and without ready-made processes and methods triggering ideas and thoughts into actions.

The Idea Window has been designed to be easy-to-use touch screen computer with simple user functions on the graphical user interface which would be easy to find and available all the time (see Figure 1). It was designed as a platform for workers' findings, initiatives, ideas and solution proposals to develop services. In the Idea Window, employees can enter their observations and ideas on the screen. In addition, an employee can propose solutions and experiments related to the findings and observations of the service experience. All the items can be combined together to form a variety of topic clusters on the screen. Employees can modify and store the clusters in the user interface according to what is meaningful to them. Any employee can anonymously leave a proposal in the Idea Window and read and move the items on

the screen. The Idea Window was originally designed to put the patient at the service path clearly visible and to open the view into the customer's service experience. (Lahtinen et al., 2014)

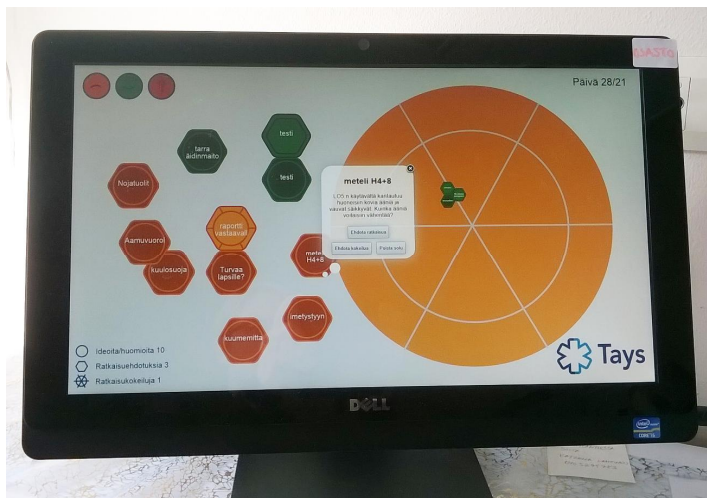


Fig. 1: The IdeaWindow screen and user interface with the idea and proposal items when the tool had been used about one week.

The IdeaWindow was placed in the coffee room of the personnel at the gynaecological ward, on top of the cupboard by the window. The site of the IdeaWindow can be seen in Figure 2. The screen was positioned so that it was facing the diners at the table. The coffee room was chosen as a location for the IdeaWindow because all the other places for work duties were full of other equipment and supplies and the personnel suggested this one for a place. The staff's coffee room seemed to be the place where they had gathered a lot of work-related notes and information papers, which was detected on the numerous documents on the info board (Figure 2). Therefore it was interpreted as a place where the personnel might have some time for thinking and reflecting their work from the development angle.

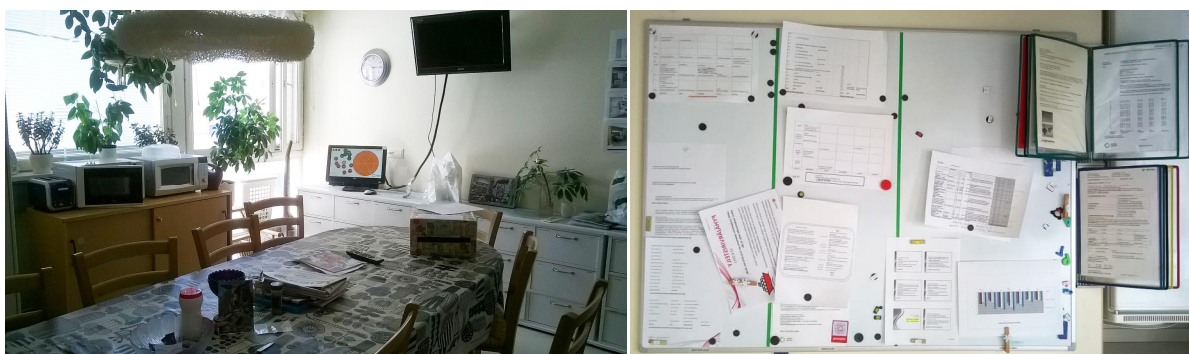


Fig. 2: The staff's coffee room where the IdeaWindow was located during the experiment. And the info board in the coffee room with some notes and documents on it.

3.2. Data collection and analysis

The research data consists of two kinds of material: first, of 43 idea or proposal items in the IdeaWindow written by the employees during seven week period in the gynaecological responsibility area at Tampere University Hospital between April and June

2015, second, of 16 responses to the inquiry which was mailed to the personnel in July 2015 immediately after the IdeaWindow experiment.

The Idea Window data has been read through carefully and categorized under four different themes according to the subject they contain. Themes are placed in ascending order by number of items they contain. Thus, it was possible to survey, for what kind of perspectives and topics the employees used the IdeaWindow and what kind of issues were more common or rare in front-end of service development experiment where the jointly tackling issues were not limited to certain topics.

The IdeaWindow items were also categorised in three different types according to the choice user made on the screen when leaving an item in the IdeaWindow. In the current version of the IdeaWindow there are two types of items/inputs: ideas and proposals. Ideas are categorised as orange, green or red. A proposal can be marked either as a solution or an experiment related to the idea in the IdeaWindow. The idea is orange if the user thinks it is based on a negative finding, or green if it is based on some positive experience, and finally red if the idea is presented as open, as if it was a question. Ideas can exist independently in the IdeaWindow but the proposals are always attached and connected to minimum one idea or maximum five other proposals. In other words, the idea items are like the initial cells in which these proposals are associated with. In our study we also looked at in what kind of groups the ideas and proposals appeared and how the ideas and proposals formed the chains.

Our research data consists also of the inquiry data that was collected and analysed to get more information about profiles of the personnel participated to the study, and also the descriptions of the situations that were the reason behind of their ideas or proposals. In the inquiry, the respondents were also asked to tell how they would like to see their ideas or proposals been developed in their working environment, and how they themselves could contribute to the development.

At the end of the survey, respondents were evaluating how necessary and easy to use the IdeaWindow has been in their work context. These responses are also part of our data and analysed mainly for further development of the tool but also from the point of how the employees have generally responded to this type of artefact as part of the development of their own work.

In the analysis of the IdeaWindow data, we explored what kind of perspectives and topics the employees brought up when they used a prototype of the virtual co-creation tool in the front-end of service development. We were interested, what kind of situations and things the employees pay attention to so that they want to share them with others and what kind of ideas evoke employees to make their own suggestions for a solution or experiment. More generally, what awakens employees' initiative and entrepreneurial spirit? How do they represent their views and insights for improvements or change? How could the virtual co-development/co-creation tool assist and enable the spontaneous action of workers from starting their own initiatives? What are the features in the tool and what would be needed in addition to it for entrepreneurial behaviour and actions arising in healthcare workplaces?

We have also analysed how the personnel described the reasons to use the IdeaWindow. In analysis we have examined how they describe their motivation, anxiety or frustration behind the idea or proposal they have left in the tool, how the topic of their idea or proposal is in relation with their reasoning, and how they evaluate the Idea Window and its feasibility and ease of use.

4. Findings

The staff took the initiative already at the very beginning of the experiment. Although the IdeaWindow guidance session at the ward took only about half an hour few participants were listening really carefully and they themselves made an A4-sheet of instruction manual that was available on the coffee room table. Noteworthy in the instruction was how clearly and in inspiring way the writers were describing the intended purpose and use of the IdeaWindow. According to them, the IdeaWindow was primarily meant to be a tool for ideation and brainstorming together and to look at the everyday work from the client/patient point of view: *IdeaWindow has been developed for a tool through which employees can brainstorm and comment on the everyday activities from the customer and patient orientation. Situations may include encounters with clients/patients, remarks on the facilities and practices, or equipment and good related ideas or comments. The idea is to look at our environment and our practices from the perspective of the customer service experience. All written ideas are anonymous.* In their A4 guide, the nurses compared IdeaWindow as an interface to smartphones or tablet computers. In addition, they managed to tell step by step the main principles how to use the IdeaWindow in very compact way. The instruction note made by the nurses in in the Figure 3.

Hi everybody

In the coffee room, there appears the Idea Window display screen. The IdeaWindow is part of the service design project that has been implemented in gynecological responsibility area at Tays. IdeaWindow has been developed for a tool through which employees can brainstorm and comment on the everyday activities from the customer and patient orientation. Situations may include encounters with clients/patients, remarks on the facilities and practices, or equipment and good related ideas or comments. The idea is to look at our environment and our practices from the perspective of the customer service experience. All written ideas are anonymous.

The display screen is here six weeks. During the first three weeks we will focus on the hospital department side of things, and during the latter three weeks the issues coming up from the VTO side. Ideation can start immediately. Therefore everyone will feel free to experiment.

The display works by touching and reminds a lot of smartphone or tablet computer. In upper left corner there are three circles. Smiling circles can be used for positive ideas and considerations, sad one for negative ones, and question mark is for open ideas and comments. On the left side of the screen, there is place for active ideas and for describing the idea. The large circle on the right side of the screen is storage for the ideas. From the storage the idea can be dragged back to empty space on the left side of the screen and there the idea opens in bigger size.

Writing an idea requires a title. It is hoped that the titles would be short and concise preferably one word or two short words. Other people's ideas can be read, and it is possible to propose a solution or a trial related to them. Solutions are attached as cells around of the original idea, and they form together the idea clusters. If you try some practical solution, please create a separate idea from it and describe how it worked. The experiment cannot be linked directly to the idea cluster, at least not yet.

If you have any questions related to the IdeaWindow the undersigned and Riitta Ojala are happy to answer to them.

Now feel free to create ideas!

Regards,
Jaana S., Christina and Jaana K.

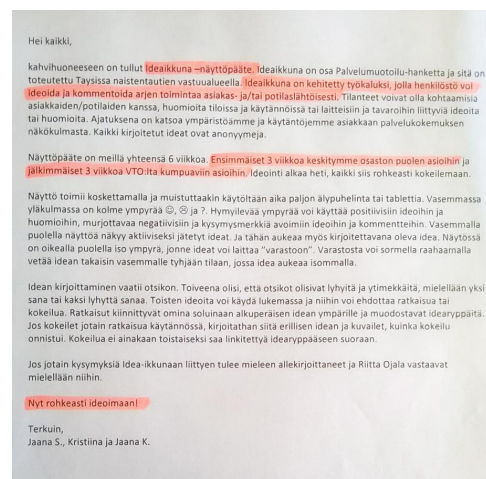


Fig. 3: Instruction for using the IdeaWindow made by three nurses on their own initiative after brief half-hour guidance the research team gave to the personnel in the beginning of the experiment.

During the seven week period 43 items (ideas or proposals) were recorded in IdeaWindow. We categorized all the 43 items in the IdeaWindow into four themes on the basis of the content of the items. The four theme categories are as following and presented in the Figure 4.

1. Technology and tools for work

Within the items in the category of Technology and tools for work, employees made remarks related to renewal and acquisition of the equipment and tools they would need in their work. This category was the largest item group in the IdeaWindow data with 17 items:

- **11 of the 17** items were ideas for renewing or acquiring new tools and material, like acquiring more devices often needed at work. More than half of them appeared in the IdeaWindow as single items that were not attached to any proposals for a solution or experiment.

“There are not so many proper machines that would be used for reliable KTG [CTG, cardiotocography] which would show fetal heart beat and movements, and also contractions, mother’s heart rate and RR-measurement. We have to search for the machines from different rooms and wait in a queue to get the proper machine.” (CTG machines)

- **4 of the 17** items were proposals for a solution related to the ideas. These proposals were like points on the checklists.

“To get Avalon-machines, so that every room would have one KTG [CTG]. In this way the machines would be easier to manage for washing, for adding accessories, and there could be always machines available. They would stay in better condition with less moving from place to place.” (In every room)

- **2 of the 17** items included proposals for an experiment. In these items, the employees were listing down their needs for new tools as proposals for an experiment.

“Our own TV too!” (TV)

2. Reorganising places and equipment

The items in the category of Re-organising places and equipment contained the ideas and suggestions of employees for re-organizing and re-setting the equipment and space of work. This category was the second largest with 14 items:

- **8 of the 14** items were about the ideas for reorganising places and equipment used at work. Typically, these ideas regarded changing the placement of furniture and technology in working area. 7 of the 8 items in this category appeared in the IdeaWindow as single items which were not attached to any proposals.

“There is no air condition in the rooms. The rooms are hot and stuffy.” (Hot, bad air)

- **2 of the 14** items were proposals for a solution, for example the proposals regarding issues like how the goods and materials could be more easily available in new locations.

“Because there aren’t Avalon machines available for every room, bring the machine into a hallway after KTG [CTG] ends so there is no need to seek and disturb the patients.” (Avalons)

- **4 of the 14** items included proposals for an experiment. These proposals included typically some reasons and explanations why it would be good to do the experi-

ment. Or the employees suggested several different concrete solutions for the problem.

“We could place another table at the window? Why it is not possible to have meal in the day hall?” (Tables)

“Would it be possible to put some more shelves in the wardrobe and in there would be some chronics, cleansers, etc. for cleaning the CTG-machines, etc? Or maybe a separate cart?” (Storage room)

3. Organising work

The items in the category Organising work contained the ideas and suggestions of employees for reorganising work routines and practices. This category included 6 items all together.

- **4 of the 6** items were single ideas for reorganising work routines and practices.

“The doctor round in tutkari [research room] works pretty well.” (Doctor round)

“On the department side also, it would be nice if the morning shift would not disappear to coffee room, but would help the shift through.” (Morning shift)

- **1 of the 6** items brought up proposal for a solution related to the work organising issues.

“In the report reading time there is no one else than readers in the office. The earlier shift could have their coffee pause at the same time.” (Proposal)

- **1 of the 6** items brought up proposal for an experiment related to the work organising issues.

“The nurse of the room could give a short report for the nurse in charge, who would plan the working pairs when the overall situation in the department is clear.” (Nurse in charge)

4. Customer service situations

Customer service situations items were as large item group as the items in the category of Organising work. Thus it contained 6 items all together.

- **4 of the 6** items were single ideas related to customer experiences and customer service situations. According to the data login of the IdeaWindow all the items within this category were recorded during the last days in the experiment period.

“A patient came up with the idea that people from canteen could go around the departments and sell magazines, etc. for those who cannot go there by themselves.” (Canteen)

“On the department side also, it would be nice if the morning shift would not disappear to coffee room, but would help the shift through.” (Morning shift)

- **2 of the 6** items in the Customer service situations category included proposal for a solution for improving customer service.

“In the report reading time there is no one else than readers in the office. The earlier shift could have their coffee pause at the same time.” (Proposal)

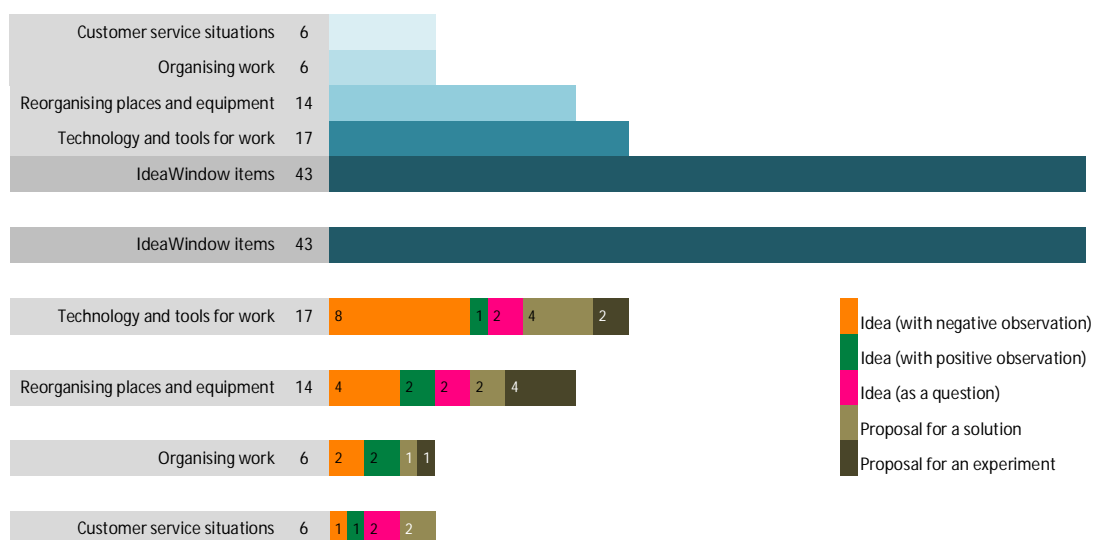


Fig. 4: The items in the IdeaWindow grouped into four themes according to content. The items have been coloured based on the type they appeared on the IdeaWindow user interface.

The themes of the IdeaWindow items were quite similar to the topics that emerged when the IdeaWindow was co-created with the personnel in the previous research project in 2014. Topics such as technology and tools or reorganising work practices were common also then. At that time, the findings showed that the IdeaWindow as enabling open communication, meaningful development, and grass-root level development (Lahtinen et. al, 2014). In both research projects, the IdeaWindow turned out to be helpful in acquiring and sharing knowledge and experiences on new opportunities and ideas more comprehensively than in ad-hoc face-to-face situations in the work community. It can serve as a good starting point for employee-driven development.

Several practical and concrete ideas and proposals in the IdeaWindow showed that employees are interested in each other's thoughts and ideas for improving and developing work life, although the purpose of the ideation wasn't precisely defined and clear in our experiment. However, the staff in the hospital had a need and will to tackle the challenges they face in everyday work. The IdeaWindow was taken into use without bigger resistance or questioning. It seemed to provide the employees a checklist kind of communication tool for their problems and challenges at work, for example for their problems in cooperation or troubles in customer service. It collected and stored the data that mattered to them. The virtual co-creation tool can assist in assembling experiences and thoughts of employees and even other stakeholders, like customers, for a starting point and background for co-creation. But progress from everyday observations and experiences into co-created solutions, reforms, renewed practices and innovations will need some guidance and structure and also trust and transparency from the process and the organisation on a larger scale. The following citations regarding the necessity of the IdeaWindow pave the way for how the tool should be developed in future, but they also underline what should be taken into account when engaging employees in innovation and development.

"To bring up the issues anonymously. For ideas of the personnel for problem solving...Usually the best and easiest way to make developmental change."

"[For subscribing] Deficiencies, in order to remember and wouldn't disappear them among the general complaints."

"If the ideas were implemented the [Idea]window would be more useful. Or if we were at least discussing about the ideas, and the old functions could be called into question, and we weren't only saying that is matter of missing money or that we've always done these issues like that..."

"Maybe the placement [of the IdeaWindow] made it complicated to use. There aren't so many who want to talk about the work issues in the coffee room but instead want to have a very deserved break. Many of the best ideas come up in patient rooms, by the work, and those ideas will not be written down in the coffee room. Ideas will either not been forwarded or they will be presented directly to the supervisors. In a different unit the IdeaWindow could work, but in the intensive care unit the use of it should be reflected more."

Some of the suggestions did not fall in these four categories explained above or suggestions included some words or phrases that led us to conclude that the respondent sees the IdeaWindow to offer an opportunity to express feelings and attitudes of the relationships or overall working climate of the ward. In some cases these kinds of suggestions were easier to interpret but in some cases it stays quite unclear what is the respondent's actual idea or proposed solution. In the first example the respondent's idea and solution is constructed rationally:

"The new and fast thermometers would help the work and save the nerves of the patients and nurses."

The respondent suggested that the department would get the new thermometers to speed up the examination. The respondent seems quite confident that this would also make the job easier not only to the nurses but patients too. In the second example the respondents idea and solution is more challenging to interpret:

"On the department side also, it would be nice if the morning shift would not disappear in to a coffee room, but help the shift through."

The respondent feels important that everybody contributes to the work to get it done. The respondent wishes that the morning shift would help the shift to the end and not leave their duties and go to their coffee break. However it stays unclear why this happens or does it happen all the time and does this concern everybody who works at the morning shift. It is clear that it is reasonable to ask everybody contribute to the work but in this example it stays challenging to recognize the actual solution that would help the whole work community.

Third example draws closer to the second example but it shows some directions where the situation could start to unravel:

"Especially in the afternoon, at the time of silent report, there is lot of noise and disorder in the office. You can't read the report at your peace and you lose your concentration. For the time of silent report the office should be quiet and if the earlier shift has something to report, they could do it just before the shift ends."

The respondent describes the problematic situation where it is hard to concentrate on reading the report. The respondent suggests some new arrangements on the offices

schedule and some new reporting practices for shifts. Although, it would take some time to bring up these suggestions, there is still something one can work with.

In the further use of IdeaWindow, it would be important to find ways to recognize more carefully and categorise these kinds of inputs explained here. These small fragments could easily be ignored as an angry feedback given by employees but we see this as an opportunity for workplace developers to learn more about how employees see the situations and tasks in their own work.

According to the user ratings in the inquiry, the IdeaWindow was considered Quite necessary in the hospital and Easy to use. The Figure 5 presents the user reviews in the table. 9 of the 16 respondents evaluated the IdeaWindow quite necessary, 4 of the 16 respondents found it very necessary, and 3 of the 16 respondents either didn't experience it necessary at all, or couldn't say. 8 of the respondents experienced the IdeaWindow easy to use, 4 of 16 felt it very easy to use, one respondent felt it very difficult to use, and one couldn't say. These results encourage developing IdeaWindow as a low threshold co-creation tool and perhaps particularly as a platform for capturing and sharing knowledge in multidisciplinary collaboration and networks. In the research we tested it as a co-creation tool in front-end of service development but in future the development and testing could be extended also to other phases of innovation. It would be interesting to see how IdeaWindow would work in impact monitoring or in longer-term co-creation.

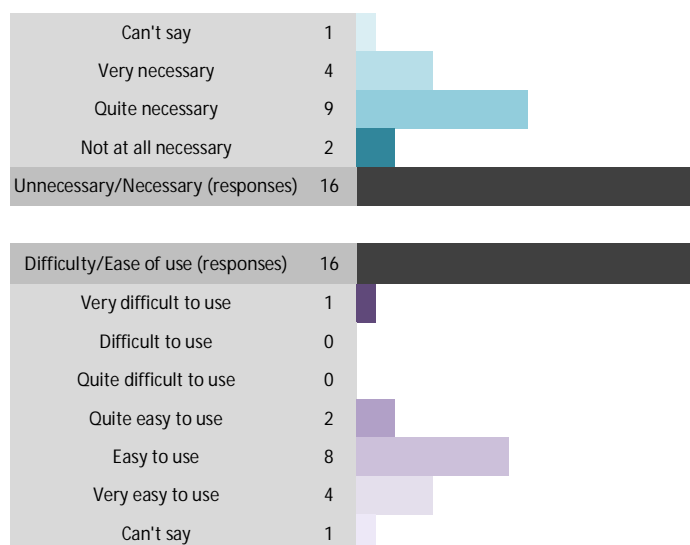


Fig. 5: User evaluations (Unnecessary/Necessary and Difficulty/Ease of use) on the IdeaWindow. Evaluations from the inquiry responses

The IdeaWindow items were also grouped according to how they appeared on the IdeaWindow user interface. In the Figure 5 all items have been placed into groups according to their appearance either as single ideas or as part of the idea/proposal groupings.

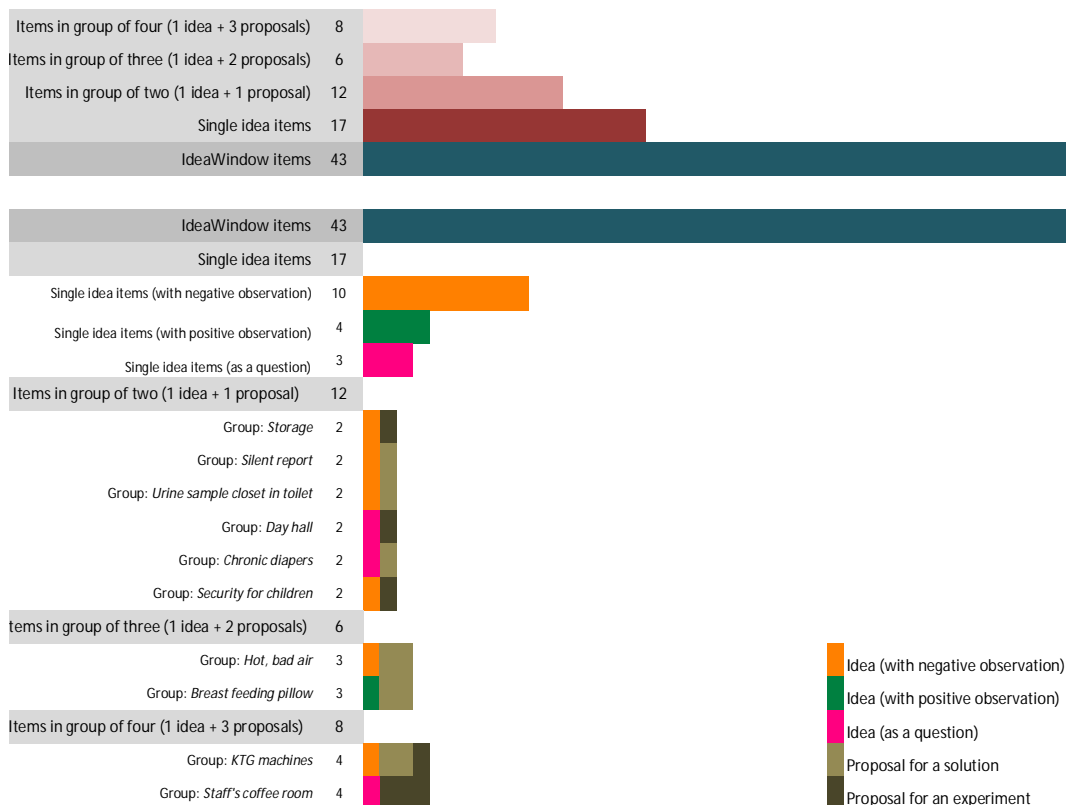


Fig. 6: Ideas and proposals of the employees calculated and grouped according to their appearance on the IdeaWindow screen.

26 of the 43 items in the IdeaWindow appeared in groups. And 17 of the 43 were single ideas. The amount of the groups shows that the virtual co-creation tool enabled employees to bring out their quiet, hidden ideas, and to create thinking paths starting from initiative ideas and continuing as far as proposals for solving problems or proposals for some kind practical test or trial to figure out what could finally work as a solution.

Assumption of the research group was that the single idea would be the most common type of the items in the IdeaWindow. Therefore the result was a little surprise. Surely, the IdeaWindow as an interface directs the users to add new items to the existing ideas on the screen. The dialog in the items provides the user with three options to continue when reading the descriptions of the ideas: 1) user can add a new proposal for a solution to the idea, or 2) user can add a proposal for an experiment related to the idea, or 3) shut the dialogue box and enter a new idea item. However, our result may also indicate that reading the ideas of the colleagues in this visualized form may lure user to take the thinking process forward. The experiment produced surprisingly large number of item groups, even if the process itself was blurred and experimental. This inspires to examine more the thinking paths and chains in the front-end innovation and testing and developing methods which might foster collaboration and co-creation at work.

5. Discussion

The aim of this paper was to increase the understanding of the ways the virtual tool is used in fuzzy front-end of open and unstructured innovation process and what kind of initiatives are raised up and which proceed into brainstorming phase. The ideas raised up in IdeaWindow could be categorized into four groups. Most ideas were about technology and tools for work. Almost as many ideas and proposals concerned reorganizing of places and equipment. Organising work and developing customer service situations were suggested more rarely. The two first mentioned categories got also most of the proposals. There were altogether 27 ideas and 16 proposals. Hence, many ideas in IdeaWindow gathered proposals from co-workers developing a path of discussion. This is a good example of knowledge sharing and learning in organisation, which both are important elements of innovative environments (Martins and Terblanche, 2003).

Behind the ideas or proposals left in IdeaWindow can be found concerns about the patient safety and well-being, frustration about the time spend in searching for proper equipment and other things needed in nursing, as well as wishes to serve the patients better. Also items that are linked to technology and tools for work or reorganising places and equipment are mainly linked to needs of the patient or improving care. This raises the question should staff members and patients use the IdeaWindow together, and thus complement each other's views and knowledge. The combination of expert knowledge and patient experiences could offer an opportunity for developing new work practises, but also for maintaining good customer service and renewing working culture incrementally more customer-centered.

Those who commented the items in the IdeaWindow were all nurses, except one, although the tool was available for every worker including also physicians and supportive staff in the ward. Because of the relatively low amount of inquiry responses we can not trace how widely the other professions than nurses were using the IdeaWindow. This calls for future discussions and reflection in our research group. Is it important to know how many staff members are using the IdeaWindow? Are the ideas and proposals results of an active but small group of people or is the IdeaWindow regarded as a common arena for all to participate? And what kinds of processes are needed for widening the use of IdeaWindow in front-end of innovation and maybe also in other phases of innovation?

This paper is based on the preliminary findings of the study in progress. Already these findings open up exciting new research opportunities. The preliminary findings indicate that IdeaWindow serves as a good starting point for employee-driven development, but it is not sufficient. As such it does not support corporate entrepreneurship or effectuation. However, many of the ideas that were entered in the IdeaWindow started quite modestly from the resources available, which is in line with effectuation. The flip side of this modesty of the ideas was that there were no totally new, groundbreaking ideas, which would expand the creativity beyond everyday thinking. The self-made instruction sheet by the IdeaWindow can be interpreted as a signal of entrepreneurial attitude. This should be cherished and promoted in case more employee-driven activities are expected from the staff.

Most of the entries in the IdeaWindow were made by the nurses, therefore there were just a few cross-domain learning between professions. In order to better under-

stand how - and if - the work environment in health care or in other domains could generate and foster collective creativity and co-creation, we need more information and studies related to leadership styles, roles of different professions and hierarchical systems and their connections to the employee-driven innovation and corporate entrepreneurship. For that purpose some of the members of the hospital ward will be interviewed later this year and the resulting data will be connected to data and findings of this study.

Results presented here encourage developing IdeaWindow as a low threshold co-creation tool and perhaps particularly as a platform for capturing and sharing knowledge in multidisciplinary collaboration and networks. In the current action research we tested it as a co-creation tool in front-end of service development but in future the development and testing could be extended also to other phases of innovation. It would be interesting to see how the IdeaWindow would work for example in impact monitoring or in longer-term co-creation process. Action-research based studies also in other domains than in health care have been considered in this sense.

When comparing the preliminary findings to the results of the previous research project, some similarities can be found. Based on the results of both projects, health care professionals are willing to create meaningful and practical frames for co-creation at work, and they will participate to the process actively, if it fits to their context. But the employees also show quite clearly that they need to be encouraged and provided with easy-to-use methods and tools, and they wish to be involved in collective processes and decision making that support co-creation at work. Within this palette of means, the virtual insights collecting and sharing co-creation tool could be a kick-start, fuel and side eye on the way.

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