

# Enabling Employee Co-Creation in eHealth

## Propositions for a Methodology

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**Abstract**—This article is a reflection by a team of researchers. After visiting and doing action and evaluation research in a municipal eHealth Living Lab project, the authors find that there is a need for a more formalized approach to the social aspect and fundamentals for employee driven innovation. We find a need for combining the fields of organizational learning and technology innovation. Based on our research, we propose a model for value creation based on new eHealth technology where employee co-creation is stimulated as a resource for the learning organization. Here, employees evaluate existing services as the basis for both designing totally new services and evaluate proposed new solutions. This basis in employee co-creation creates a broad basis for implementing changes that will benefit service users through increased ability and speed of organizational change in such innovation ecosystems. In addition, to the usual agile implementation phase, we induct the need for prior employee-involving mobilization and ideation phases.

**Keywords**- *eHealth; employee; co-creation; Design Thinking; LEAN; Agile, learning organization; innovation.*

### I. INTRODUCTION

Healthcare is a labor-intensive profession and is likely to remain so in any foreseeable future. At the same time, productivity in this sector needs to grow with radical rates each year to meet future demands, due to an aging population in Norway and many other industrialized countries. eHealth – using Information and Communication Technology (ICT) in healthcare - is expected to be an important factor in achieving needed value innovation. The simultaneous reduction of cost or use of scarce resources, and increased productivity and quality [1].

Balancing life-critical operations and the introduction of new technologies requires a sound fundament of continuous improvement of work, high involvement by all concerned employees in the innovation and information system design processes, learning and developing new clinical practices,

and a culture for sharing knowledge and experience [2]. This article will refer to this fundament as the learning organization.

Innovation is by nature experimental and requires risk willingness to find a better next practice. Innovation is a concept for change and is first used when the solution in the form of new services and products is put into use or implemented. The process from the ideas to implementation is a resource-intensive and risky process and means that the organization is in a continuous change. How does the organization master this?

Ergonomics (of Latin *ergon*, work, and *nomos*, law) is defined as the science of adaptation between the working environment, technique and human beings so that work can be done as effectively as possible, and without any adverse impact on health [3]. But whether the results of this science are practiced is often a matter of, *inter alia*, politics and economy in the organization. To avoid illness and strain injuries, both employer and employee must consider what is good ergonomics. Good ergonomics also mean that work processes are adapted to the employees' requirements and ambitions. Therefore, ergonomics also has psychological and social aspects and is closely related to how the work is organized [4]. Modern ergonomics are extended to the overall adaptation of human beings to work processes, the working environment and changes in society at large.

Neubauer and Stary [5] describe ergonomics as a recognition of the role of employees in innovation, leading to both improvements and economic benefits through human-centered design. Human-centered design for interactive systems is something that promotes the following main principles [5]:

- The design is based on an explicit understanding of users [also read employees], tasks and environments
- Users are involved through all parts of design and development (not just testing – authors red).

- The design is driven and refined by user-centered evaluation
- The process is iterative - it is repeated as many times as necessary
- The design addresses the entire user experience (the "travel trip")
- The design team includes interdisciplinary skills and perspectives (authors' translation).

To promote a strategy (organizational policy) that can improve this, López-Gómez et al. [6] suggest that one should:

- Access highly qualified personnel to develop new concepts and service innovations internally
- Develop training methods for personnel to adapt innovations, innovative ideas, sourced from external sources
- Develop better adapted schemes in education and training to fit the requirements of a service-economy
- Recognizing the value of informal learning to increase the attractiveness of continuous training for employees
- Promote modern innovation management approaches that better support creativity and autonomy of service-executing staff (authors translation).

Innovation management is crucial for creating an innovation culture. The research shows that the top management's conscious role in the organization is crucial, as both banner bearers for new ideas and for their development, where follow-up through systematic work with innovation and innovation management is important [7]. Salaman and his colleagues have defined criteria for innovation management: focus on networking, developing the creative talent, promoting learning, and mobilizing through a clear vision of the target image, and creating innovative processes [8]. The ideal leader has thus a direct impact on the development of employee competencies, create space for participation, and helps to make the business more innovative. Such management will not only be able to reduce resistance to new solutions and changed work routines but will influence employees to learn to design new solutions continuously and create arenas for dialogue [9]. This process creates a continuous learning and self-improving organization. The material on this is based on Argyris and others' research on learning, organization and action research [10].

What happens if the process described above is not prioritized in the organization? What are the consequences for employees' working environment and health? Frameworks for employees for doing a good job in the learning organization include that they interact with actors from different levels. These actors can act as support or provide resistance: in management, among product and service users, suppliers, and the media. Incorrect organization of ICT, resistance among employees in the introduction of new ways of working, and resistance to ICT in general, can be decisive in how companies tackle development processes.

Positive results have been achieved for physical work environments in many places, by introducing robots and

similar ICT-supported technology that helps in physically demanding tasks. In this way, musculoskeletal disorders can be prevented. But the use of ICT can also be seen more often in connection with the influence on mental health. Through several research studies, it was defined how the implementation of welfare technology, in general in the market and use in everyday life, influenced employee attitudes and health. When introducing new ICT tools and innovation processes in companies, several factors were reported which had a negative impact on mental health.

It was found that the requirements for accessibility, communication, control, and repetitive technical errors, employee monitoring, unmet need for increased training, expectation of increased productivity, increased responsibilities and workload were associated with work pressure, stress and burnout [11][12]. Only two facets of the welfare technology introduction were perceived positively: individual assistance and customer guidance. In a study among nurses, it has emerged that the fear of "dehumanizing" of human care was dominating [13].

It appears that health personnel are initially concerned that basic values in care can be lost by "technologizing" relationships between people. Care represents for us closeness, while the technology appears to be cold and insensitive [14]. This leads us up to the research problem in this study: What are the necessary conditions for enabling employee co-creation in eHealth? How do we build up the learning organization, and what are the benefits of doing so?

The rest of this article is laid out as follows: In the Section 2 we go through our method and present an action and evaluation study into an eHealth Living Lab. Then in section 3 we disseminate the recommendations given to the principal behind the action research mission after the case-study. Finally, in section 4 we generalize these findings by questioning whether they represent a more structured and formalized approach to the social aspect and fundamentals for employee driven innovation.

## II. METHOD

During 2017 and 2018 a joint research team did a study of eHealth Living Lab [15]. The project was initiated by the city of Grimstad in Norway, as the municipality hosting the living lab.

Agder Living Lab (ALL) is a collaborative project. The Norwegian Directorate of Health has provided The Centre for Development of Institutional and Home Care Services (USHT) in Aust Agder with a contribution to the development of a Living Lab methodology in the welfare technology field. USHT in Grimstad Municipality is supposed to function as a living test laboratory. Here are nurses, patients and relatives involved in finding tomorrow's welfare technology. The University of Agder is a main partner. In addition, the Norwegian Housing Bank has contributed to dissemination.

The methodology for Agder Living Lab was given by the project as a progressive, step model illustrated in Figure 1:

1. Define user demands
2. Regulatory compliance testing
3. Lab-testing of usability

4. Testing in living environment
5. Piloting improved services

These steps belong to the pre-procurement phase, a matter that raises questions regarding transparency in public procurement. The model basically describes a classic agile information systems development plan. What criteria should be followed and who should govern what technology, and which vendor to invite to participate in this development (and gain potential lock-in advantages in the pursuing procurement phase)? If there is a lack of transparency, this may arguably also lead to added stress for all employees, conflicts and potentially political issues, as healthcare is a matter of great public concern. The authors make it clear that this comment is general and does not apply to the municipality named in Section 2.

The project plan for the ALL project states that ALL will contribute to demand-driven innovation and development of health and care services. Needs-driven innovation is about understanding the user's existing and future needs to ensure the development of solutions that are rooted in real needs. The sampling methodology is important in the development and implementation of welfare technology and is also central to this project.

Users are the best experts on their own, and all their knowledge is very valuable in an innovation process. Information from the user should therefore be used systematically for the development of the rich solutions.

Innovation and development through Living Lab must be based on five key principles:

- Value for the users
- User involvement (how can users influence the process)
- Quality with robust, durable solutions that meet tomorrow's needs
  - Openness and accessibility
  - Real life situations.

ALL, according to the client, has a two-sided purpose: ALL must both be a venue for suppliers testing new eHealth solutions. At the same time, municipalities like Grimstad have a great need to move forward with service innovation in eHealth, to meet future needs.

The assignment that the research team received from Grimstad municipality was as follows:

“Through the follow-up research we (ALL, clients) want to answer how we can best achieve the ALL project goals.

1. We want answers to how we can best cooperate with the supplier industry. Several technology vendors believe that they have the solution-but this may not be the need the service and users experience.

2. How can Living Lab methodology ensure good solutions and meet user needs? The user is very central in the living lab methodology. How can we best get users to test and develop new solutions?

3. We want the method we work out in the project to be easily transferred to other municipalities and interested parties. What is needed to ensure spread? (Citations from the tender, translated) [15]”

The way the following results were achieved, were through discussions in workshops with participants from the

Agder Living Labs project group, addressing these challenges. As background for these workshops, the action research team's members had performed independent literature reviews searching for state of art knowledge in the field.

### III. RESULTS

In this section the authors disseminate the findings from the case-study. Basically, the research team advocates the need for an ideation phase (combining the methodologies of Design Thinking and LEAN) [16] before entering into the implementation phase of eHealth development.

In conclusion in the case-study report, the short answers to the questions listed in the previous section were found to be as follows: The following quotation is from project-report from the Agder Living Lab follow-up-research and translated by the authors (Norwegian) [15].

“1. The research team generally do not recommend the municipalities to start here. In the short term, ALL has focused on a combined product and user focus, and that must be respected based on the framework ALL has had as a project. It also has its advantages. Having the focus on concrete product solutions, according to a project manager in ALL, has been necessary as a starting point. It must be concrete, credible and recognizable to be clear to employees. There must be a delineation around the work.

The research team looked the most at the conceptual model, as depicted in Figure 1, the future and how to scale up ALL from serving one municipality to becoming a National or at least important regional center for eHealth innovation. Although not all the ideas we contribute from the follow-up research team in retrospect proved to be equally good, it can form a starting point for further work with frameworks and methodology.

We therefore believe that in the future and in the long run, it is most appropriate to start with users and their needs - not the technology. We encourage municipalities to keep up to date with changes in the technical possibilities room, and we like to see the municipalities participate in technology and eHealth fairs and other venues for professional refills. But start with a service design process instead” [15].

Why should you start according to the model for service design, "Double Diamond" [17]; user, needs and problem solving (also called the “Ideation” phase), before going into solution exploration (the Implementation phase)?

- It creates commitment and mobilizes all system service users (Internal; employees, and external service users; patients and next-of-kin, relatives, or partners).

- It provides a better offer to ICT providers; offers an open innovation [18] knowledge capital around needs. It focuses the efforts smarter.

- It saves a long time in solution exploration; towards comprehensive digital (computer-driven) management, smarter health systems, with more accurate priorities and decisions.

- You also save time, money and human resources in solution research (which becomes more "LEAN") at all stages of the supply chain [16]. Innovation processes are also

a cost carrier, which should be affected in a value innovation perspective [1].

- It all becomes a more open and transparent process (contributing to solving the transparency issue, touched above). Service design explorations, where the results are published, in front of technical (trial) acquisitions places potential suppliers on a more similar line.

- It reduces the inherent risks of technical procurement and the entire innovation process.

- Service design methods [16] helps identify drivers for desired changes. It can provide input to a quality and goal management system (Performance Indicators, Key Objectives), which can be followed up throughout the entire process of innovation. Thus, ALL, in the future, can offer better services to all the stakeholders, including the ICT providers.

2. The research team recommend it would be best to start by ensuring good solutions through understanding and covering the needs of the user. The ALL methodology has elements of this in the use of the user panel [15][19], but has lacked a description of the steps needed to arrive at the correct problem definition:

“As follow-up researches, our role is to give constructive criticism to what we observe. We have sought to remedy shortcomings and advise on possible improvements through our follow-up research project. We recommend that a future ALL concept starts with users, both residents and employees, and their needs, before defining today's and tomorrow's services. Only then will you see what is missing from technology and how this should be specified to new ICT suppliers and other stakeholders. ALL will then also be able to add value to the supplier by providing them with knowledge of the really rooted needs for new solutions and the requirements for these. We come in this report with suggestions that fill the gaps in the methodology, based on, among other things, the International Design Thinking [20] methodology (...)” [15] (translated).

3. The research team outline and discuss different strategic scenarios for how ALL can be scaled up and become a CenterPoint of a vivid eHealth innovation ecosystem and what conditions needs to be met for it to succeed. Generally, these advises are also disseminated in discussion and conclusion in this article.

The municipality of Grimstad has done a pioneering work that potentially has an interest far beyond its own municipal boundary. Those involved have learned a lot of the process so that they are geared better for new rounds later.

#### IV. DISCUSSION AND CONCLUSION

Based on the literature and workshops we have held together with ALL's project group and the glimpses we have received in ALL as a project, we have launched the following ideas about what we believe may be necessary if ALL will become a central focal point for "eHealth-Norway":

The methodology must be further developed and expanded, especially "backwards" so that skills mapping and involvement of employees and service users have been stepped up for problem definition and not just afterwards. Figure 2 seeks to illustrate the missing "steps". Before you can define user needs you need to work on:

- On-boarding employees
- Joint challenges and desired values
- Discovering Service user demands
- Analyzing and designing user journeys

An innovation culture must be created, and new knowledge will be built in the municipalities that will play an active role in a Living Lab concept like ALL.

Becoming "The learning organization" should be the goal of all municipalities and other healthcare organizations. Such learning takes place through active involvement and participation from the planning phase of change processes, transformation management and prioritization and choice of measures. It is this management work that can be systematized, with an overall process management and quality assurance system. It also contributes to an easier "rollout" later. Are everyone on board in the beginning, everyone is included in the scaling too. Here, we answer the questions raised in the introduction: "What are the necessary conditions for enabling employee co-creation in eHealth? How do we build up the learning organization, and what are the benefits of doing so?". Not only do we need an ideation phase, the first diamond in the "Double diamond-model [17], we may also need a "point zero" diamond to mobilize the workforce and achieve all desired benefits and value innovation performance [1].

Involvement of all participant groups in the early stages of the processes can help prevent work conflicts and provide a background for a health-promoting, productive and long-term working method, which should lead to efficient innovation of new processes. The most important group to anchor a new service in, besides the patients themselves, contains the employees in the municipality. In particular, the employees represent the first line; those with whom the patients always interact. They constitute the most important persons since they are resources in connection with the introduction of a new eHealth technology-supported service. Organizational development often lacks focus on welfare technology development. An innovation process in an enduring organization, for example within a care organization that introduce welfare technology, is also a learning process that includes the entire organization. A managerial responsibility here is to provide good frameworks for organizational learning.

Organizational learning is something else and more than individual-oriented learning. Individual-oriented learning can be both positive and negative for the whole. As individuals, we can add both good and bad habits and attitudes, based on our own experiences.

To see past experiences and to see the whole picture, effective mechanisms and processes are needed to share information and knowledge in an organization. It again

requires a plan. It is only when people learn effectively that the organization can change.

The development towards the learning organization is about exceeding the habit of thinking and opposition to thinking new and openly. There are individuals who trade and learn, but the organization provides a framework that can support or inhibit the interaction between individual and organizational learning.

Getting real changes to existing work processes is a complex process. Cooperation on the development and testing of new welfare technology in practice means collaboration on smarter work processes and managerial arrangements related to these, thus it entails both individual and organizational learning. Collaboration provides experience and expertise on how to work together across user groups for continuous improvement in the company, and externally between partners in a value chain.

In this way, motors for mobilizing for development and change (see Figure 3.) are created. Training should be perceived as an aid and not as yet an additional burden. The management and the employees get concrete experiences about the importance of participation and arenas for dialogue. Although, we have shown a need for combining the fields of organizational learning and technology innovation.

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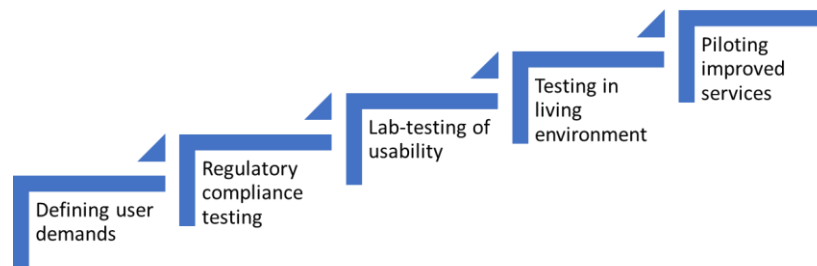


Figure 1. ALL Process model Ex Ante [15]. We find that ideation; the discovery and needs analysis and definition phase, is missing.

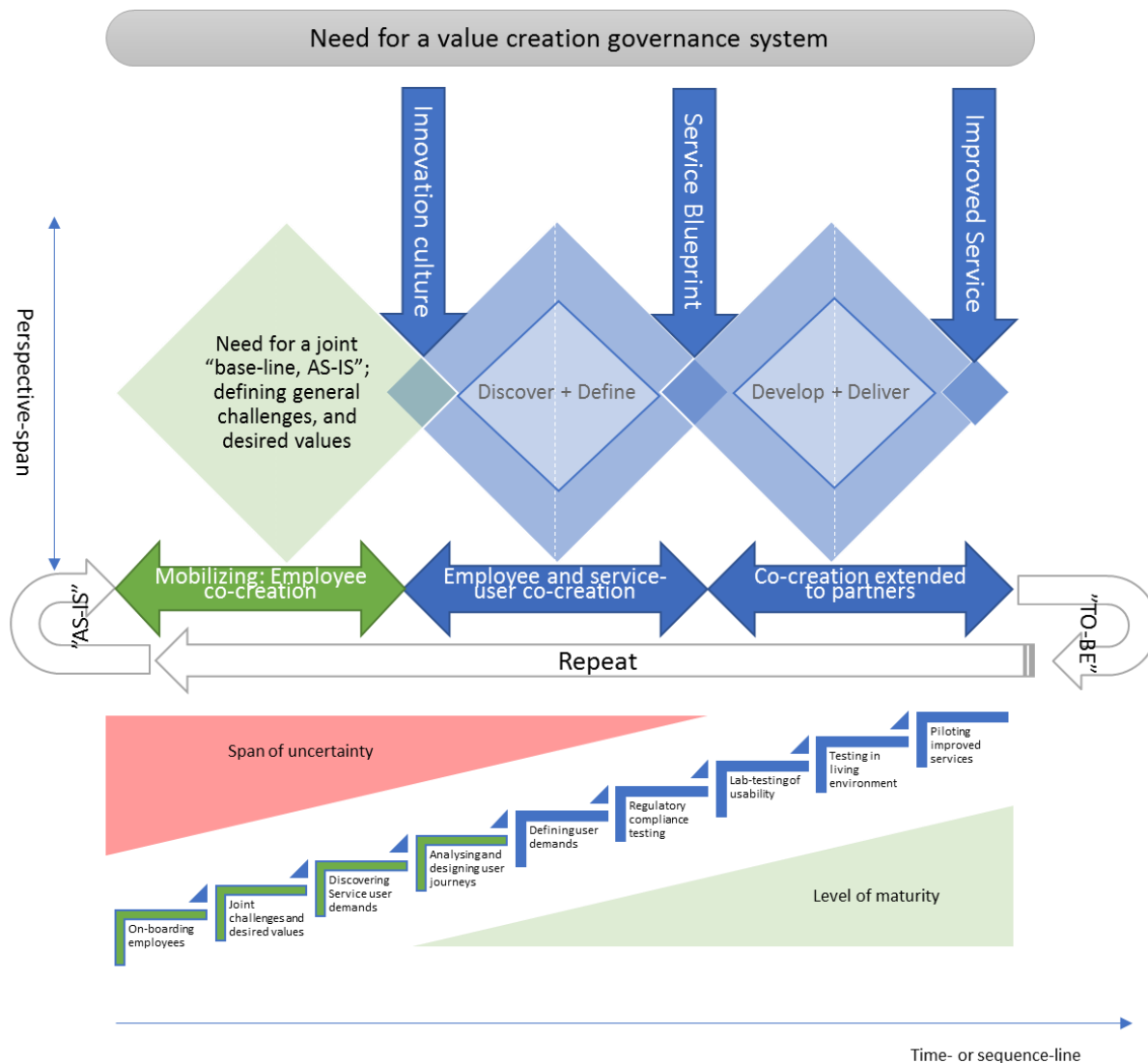


Figure 2. The “steps” model [bottom] expanded backwards, and compared with the “Double Diamond” pattern (top).

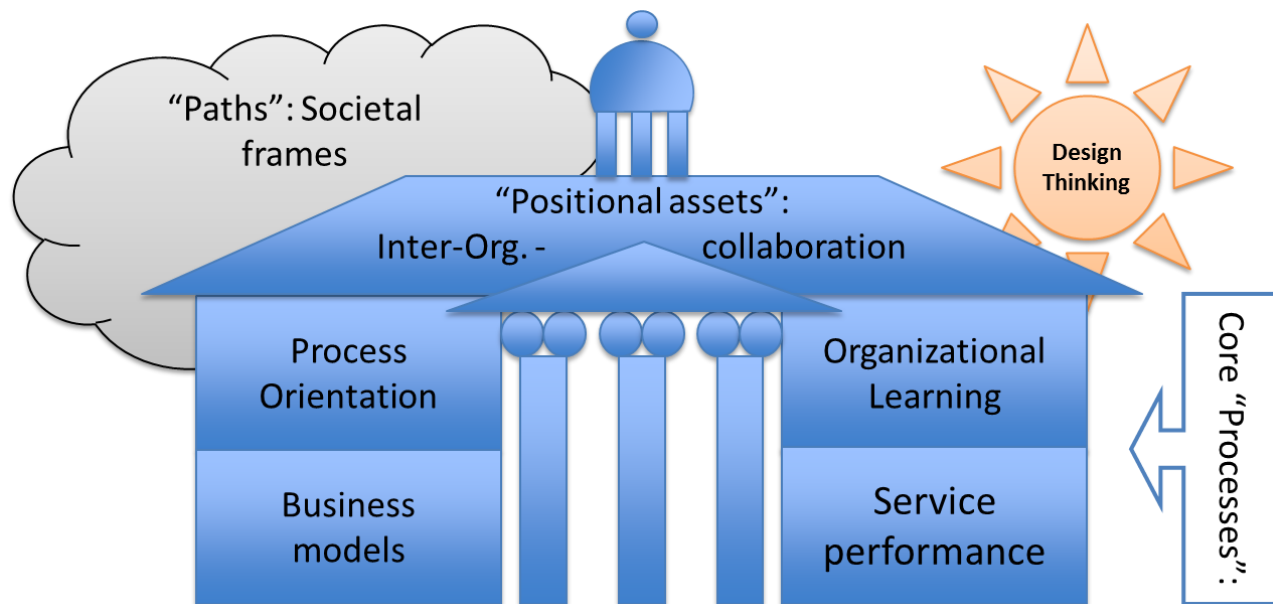


Figure 3. "Service Innovation House" - or "The Learning Organization" - A Model of Continuous Process Change and Improvement [21][22] with Design Thinking [20] as "guiding light".