

Achieving Good Worklife Ergonomics in eHealth Co-Creation

- The 'What', the 'Why' and the 'How'

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Abstract—Service improvement ['servitization'] and digitalization are two megatrends that affect healthcare and public services along with other sectors in general. A new model is needed to prescribe how governance in an increasingly changing world of modern healthcare could be undertaken in a successful manner by embracing the power of Co-Creation. The concept of good worklife ergonomics is studied, both as a prerequisite, the 'What', and as a success factor in this context, the 'Why'. This article proposes that the moderating, risk mitigating, factor of broadly-based employee involvement in all phases from planning and design to implementation will greatly improve quality in both innovation-process, and outcomes. A case-study from a public homecare living lab eHealth-project in Norway is visited to highlight some of the challenges ahead. Having established that employee co-creation can contribute to successful digital transformation of healthcare services, the 'How' question is studied. The question of how to enable effective employee co-creation is under-researched. Employee participation in co-creation is stated as an important enabler of digitalization and service improvements. The Nordic Model for employee participation has proven successful for enhancing working life effectiveness and innovation. This article proposes that these principles of employee participation can be further enhanced by using web 2.0 technologies for Enterprise Social Networks. The article concludes with a discussion of consequences of applying such social networks for the digital transformation of healthcare services as well as implications for research and practice.

Keywords-Co-creation; servitization; digitalization; healthcare; eHealth; Worklife ergonomics; Digital transformation; Employee; The Nordic Model; Web 2.0; Enterprise Social Networks; Enterprise Social Media.

I. INTRODUCTION

The purpose of this article is to develop a conceptual process-model for co-creation in eHealth innovation, that also supports a good worklife ergonomics for employees. The article builds further on an eTELEMED conference contribution [1] and is a result of a cross-disciplinary collaboration, between one Doctor of Medicine, specializing in health and work environment, and two Doctors of Philosophy in social science, with management information systems as speciality.

In many industrial countries, people live longer, but habitually with chronic diseases, due to better living standards

and medical treatment advances. These changing population demographics mean there is an increasing demand for healthcare services [2]. eHealth technologies accompanied by changes in healthcare delivery processes and services, offer possibilities for a lower cost healthcare system, needed to meet future increases in demand for services. These changes can be referred to as servitization transformation [3] and put an emphasis on the interaction with customers that requires providers to offer customized and total solutions [3]. Digitalization capabilities support such servitization through employees' involvement and codetermination of what should count as key performance indicators. Digitalization is "the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business" [4].

But such change-projects often meet unforeseen barriers. Objections may be raised by the various professional groups themselves. Poor rooted changes risks leading to inferior solutions over time, which may work against their purpose. In Norway, primary care and homecare is a concern for the public sector, municipalities. Generally, new technologies and working methods, as well as new service providers, will have to absorb all the "tacit knowledge" inherent in the public organization to add new values to the services in an efficient manner. If employees are involved, they may be more inclined to become a driving force in the pursuit of a servitization strategy, that relies on developing digitalization capabilities, because the process of defining performance criteria promotes organizational learning [5].

In Norway, primary healthcare and homecare is the concern of the municipalities. Local government-initiated eHealth pilot-projects are often unconnected experiments. A shared and common process management methodology for both development and implementation phases, that incorporates employee involvement and collaboration, will arguably be a useful tool for public sector change leaders who want to introduce new technologies and working methods, or invite new service providers that relieve or complete the overall welfare offer to citizens. We will term this as Co-creation governance ['Co-creation' as a term is disseminated further in Section IV]. Such a tool will be useful in the complex task of maintaining quality for both service recipients and service providing personnel – employees in the healthcare

system. Lenka et al. [3] have recently proposed a model for co-creation between a product or service vendor and end-consumers. But in eHealth innovation in the Norwegian context, system vendors, and health care providers are most often separate entities, so the health care provider generally add value through the combination of human services and the application of technology, not technology alone. Seen from the view of the health care provider, the research and development challenge can be put as:

- How employees' involvement is ensured in eHealth co-creation governance?
- How this involvement contributes to ensuring performance quality on all levels of responsibility?

A potential solution to this challenge is the development of a shared digital capability to continually improve service quality. When in place, this capability will ensure that internal and external service producers act through a continuous quality improvement cycle from plan, check, act, and correct that improves service quality over time. This understanding of digital capabilities is in line with Lenka et al.'s model. But this article argues that this capability must be developed along two dimensions of co-creation or collaborative innovation:

- Horizontally along the chain of value co-creation, from ICT-vendor, through service-provider to home care service users, but also
- Vertically along a line of innovation-process governance, from front-stage service-personnel employees to top-management.

These capabilities must subsequently be built "bottom up" with the involvement and participation of all relevant municipal employees, ensuring that new and increasingly more technology enabled work processes still remain employee friendly, and thus improve the quality of worklife of employees as well as patients' quality of life [6]. This article will also show how Lenka et al.'s aspects of digitalization, servitization and co-creation are linked to our highlighted aspects of [worklife] ergonomics, Business Performance Management, and [Information System] governance.

Ergonomics is an applied science concerned with designing and arranging things people use so that the people and things interact most efficiently [7]. Ergonomics is the science of designing the workplace, keeping in mind the capabilities and limitations of the worker and in such way, fulfil the goals of occupational health and safety, and productivity of employees [8]. The implementation of new digital services in healthcare involves several new work tasks, and thus represents new work processes and potential risk factors at the workplace. Knowledge of this should be addressed to prevent potential negative health effects among employees. This article proposes the term worklife ergonomics as a holistic term that encompasses the system of

service production that spans over workplaces and involved employees. As such, worklife ergonomics as a concept considers the whole information system with people, processes and technology. Employee engagement and involvement brings a new and needed perspective into co-creation servitization, and digitalization.

Effective Business Performance Management, and [Information System] governance are important factors in achieving successful innovation, and the authors will show that such management tools need to be activated in parallel with the system- and service development processes. Employee involvement in the creation and execution of such management tools will serve to ensure the goals are met, and risks for failure are mitigated.

The co-creation literature [3, 9] has shown how the involvement of customers and partners in all stages of innovation and process transformation can add value to new products and services. But there is a gap in this literature regarding the role of employees in innovation and process transformation in large service-organizations like healthcare-organizations. This article will also show the 'How'; how the process of digital transformation in healthcare services can benefit from employee co-creation, and how this can be achieved, using web 2.0 technologies. The propositions put forward here may contribute to both the digital co-creation model, and to healthcare innovation management practice.

Despite the recognition of the need for co-creation, there is a general lack of research that can guide the utilization of the concept in healthcare. The gap is characterized by scarce knowledge about the factors that enable co-creation [9, 10]. Few studies describe the role of employees in co-creation [11]. This gap is of particularly importance in the research on digital transformation of healthcare, due to the important source of knowledge that employees represent. Employees have first-hand knowledge of service demands, they know the process of service production from provider to client, and they have in-depth knowledge of the organization where new technologies and redesigned service production processes will be implemented. What is more, employees know their colleagues and can influence their behavior and acceptance of technology [12] and related changes in work processes [13]. By including and stimulating employees in the process of co-creation, the organization can stimulate and utilize a new driving force in innovations both horizontally and vertically. Horizontally, this knowledge is utilized in the development of service innovations where employees know the service production processes from providers to customers and clients. Vertically, employees' knowledge and influence are utilized when innovations are implemented in the organization as both a technical- and a social system. This vertical dimension, the co-creation between top management and all employees in the healthcare provider organization, thus adds a new source of value creation to the co-creation model.

In healthcare organizations, nurses and other employees who are in direct touch with the patients, e.g., in homecare, accumulate detailed knowledge and experience about clinical practices. This detailed knowledge and experience is arguably of critical significance as input to the process of digitally

transforming the same practices or creating totally new clinical practices. Likewise, employees can be instrumental in the redesign and implementation of new services. Employees can point out critical errors in the service design, seen from a caregiver to patient-relation point of view, that can overthrow otherwise beneficial changes.

Hence, the overall aim of this paper is to close this gap in the literature by exploring how employees can be involved in co-creating new healthcare services. Specific objectives are to extend co-creation literature to healthcare; defining employees' role in digital transformation and co-creation in healthcare, and to show how web 2.0 technologies can enable such employee co-creation in practice.

Background

The so-called Nordic model describes a working life arrangement that not only allows, but in fact requires by law, that employers and employees are cooperating on a regular basis. The authors agree with Ramaswamy and Gouillart [14] in that by giving all stakeholders more attention and influence in the development of a "co-creative enterprise", it is likely insight, revenue and profit will increase. However, how this can be done in an appropriate and feasible manner is not explained in the literature. To describe the organizational significance of employee involvement in co-creation, we will refer to Scandinavian literature from different areas including system development, leadership and innovation, especially the article "Capabilities for Innovation: The Nordic Model and Employee Participation" by Nielsen et al. [15]. The Nordic Model consists of: "First, a comprehensive collective agreements system with coordinated bargaining between the partners at multiple levels; next, employee representation, participation, and cooperation on decisions at various levels; and third, a surveillance system for improving the work environment [15]".

This opens for high employee involvement and describes a potential mechanism for enabling co-creation in the context of service innovations. In this model, employees are important for innovations, based on their education, experience and contacts upstream and downstream of the value chain. They also know their own organization with its culture, leadership, processes and technology. This model applied to the context of service innovation in healthcare will point at mechanisms that enable employees to contribute both to proposals for new service requirements. Employees can also give input on how these innovations can best be implemented in their own enterprise. Innovative projects will have arguably had extra strength when employee's knowledge of service innovation [horizontally] is combined with their experience with service implementation [vertically], and when the goal and rationale of the project is effectively communicated by management.

Although healthcare consists of highly specialized and complex work tasks and patient pathways, and is highly labour intensive, little have been done to research co-creation in healthcare in combination with employee involvement. In countries like Norway, primary healthcare and homecare is the responsibility of local government on a municipal level.

Employees are often involved in testing new types of welfare technology. But systematic employee involvement in problem analysis and -definition and deciding criteria for accepting or rejecting new technology pushes, seems absent in the eHealth [healthcare technology] literature. Perhaps are management hampered by the practical difficulties of involving all interested parties in large distributed service organizations?

To the rescue comes web 2.0, the use of social media within enterprises, also called Enterprise Social Media [ESM]. ESM can facilitate an Enterprise Social Network [ESN], ESN being perhaps the most widely used term in information systems research, in this area [16]. This article thus seeks to inform leaders and practitioners, as well as research, on the rationale for how enterprises can leapfrog into involving and engaging employees on an enterprise-wide platform, using emergent ESM platforms like Workplace [by Facebook], Yammer, and likewise technologies. These technologies offer new opportunities, but also new challenges for eliciting employees' proposals for new service requirements within eHealth, and inputs as to how these innovations can best be implemented in their own enterprise.

The problem formulation thus becomes:

1. How can the co-creation literature be extended to include employee involvement, in the context of healthcare?
2. How can web 2.0 technologies enable such employee co-creation in practice?

Oldham and Da Silva [17] argue that three conditions are necessary if employees are to generate creative ideas:

- Access and exposure to new and diverse information
- Full engagement in the work role
- The experience of socioemotional or instrumental support.

Oldham and Da Silva [17] briefly mention social networking platforms, alongside other types of information and communication systems; electronic communication tools [e.g., email, instant messaging, voice mail, faxing, and paging], electronic conferencing tools [e.g., data conferencing, voice conferencing, videoconferencing, discussion forums, and chat systems], and collaborative work management tools [e.g., file sharing, group calendars, events and polls].

The structure of this article

Having set the background for worklife ergonomics in eHealth co-creation, the rest of this article is organized as follows. In the next section, Methods, criteria for two different literature reviews and a Living Lab case-study are disseminated. In the Section III we disseminate the 'What' of co-creation and the role of employees, and also the rationale for such involvement, the 'Why'. We also present the 'How' [Section III.C] both based on empirical study of a small-scale

Living Lab-concept, and the scaled-up version [Section III.D]. Based on these finds, we propose a model and framework for employee co-creation in Section IV Propositions. Here is also provided a framework for structuring and digitizing an Enterprise Social Network for eHealth co-creation. In Conclusion, the authors show how these articles can contribute to closing the gap in literature on employees' role in eHealth co-creation.

II. METHOD

The methods applied consists of two different literature reviews and a case-study in a Living Lab project. To devise a conceptual model of worklife ergonomics, we first conducted a literature review to explore how ergonomics are used in relation to the concepts of eHealth, digitalization and co-creation. The authors were looking for state-of art principles in the literature that could guide us conceptually in designing a system that would encompass good worklife ergonomics in eHealth co-creation. A lot of research projects have gone into the different elements needed to enable employees' role in co-creation processes. What this articles authors have set out to do is to contribute to a more holistic approach, binding the different elements together to a coherent roadmap and relating it to the special context of eHealth; see Section III, results.

A. Literature reviews

A first literature review to map the 'What' question, was thus performed in October 2017. Using Google scholar, the literature was searched for articles containing the criteria [search string]; ergonomics AND digitalization AND servitization AND health AND employees. By using such Boolean-logic operators; 'AND', the authors ensured that the findings where narrowed to only articles including all the key-terms, thus covering the desired context. This search and screening, resulted in three articles that provided concepts with substantially new insight [the rest of the articles screened, only briefly touched the key criteria].

Next, to look closer at the 'Why' and 'How' – questions, this article bases its proposition on the guiding principles of the Nordic Model [15], and web 2.0 technologies, enterprise social media, used in innovation management in organizations [16].

To shed light on how Web 2.0 platforms can involve and positively engage employees in eHealth digital transformation processes, the authors performed a second literature review on the University of Agder's electronic library, February 2018. This library is connected to, and includes, the major search engines like Ebscohost, Scopus and Elsevier. The search criteria's chosen where simply "Workplace", "Facebook" and "Yammer", as these names are some of the most known social media-platforms for use within enterprises. The search was modified to peer-reviewed articles. The search gave 69 hits: screening these, the authors found 24 articles that could shed light on the research problem. In the screening we included articles from other sectors than healthcare, as we perceived that other industries use of enterprise web 2.0 may also inform

the eHealth area of concern. The articles that were excluded from the research, revolved around the use of social media platforms within the educational sector, something we perceived to be a special case, outside our scope. Most of the found, and deemed relevant articles are relatively recent, i.e., from the last three years, showing that this is an area of growing interest to social science and information systems researchers.

B. Case study in a eHealth Living Lab

The identified concepts from the first literature [see Sections III.A and III.B], were compared with findings from discussions from awareness-workshops in an eHealth Living Lab action research project in a municipality in Norway [see Section III.C] [18]. In this project, the research team [including the authors of this article] held six awareness workshops together with representatives from the municipality [a joint project manager, ICT manager, management and employee representatives from municipal homecare and nursing services]. The workshops focused on these topics:

- Stakeholder analysis
- Service design and 'design thinking' methods
- ICT-business as innovation partners [ref. co-creation with ICT-system vendors]
- Capabilities and organizational learning
- Enterprise performance management, and
- Scaling up innovations from a Living lab.

Two of the authors also visited design workshops where front-line personnel employees in home nursing, together with municipal healthcare-department managers and eHealth researchers, discussed issues and requirements related to a specific service innovation, the use of digital night surveillance for patients in need of this, staying at home, with use of cameras with video conferencing functionalities. This particular part-project is still ongoing research, but now, it is part of an EU-research project [as there are unsolved issues concerning, e.g., privacy]. The Living Lab project went on to study and implement other eHealth applications; home visits by video, and Global Positioning systems for tracking dementia-patients. Issues where detected and solved by using potential users as testers in a user panel, roleplaying care-giver and care receiver in a test lab and living lab setting.

III. RESULTS

The results are presented in relation to the key terms of the literature search. The identified articles offered design principles that can govern good worklife ergonomics in eHealth co-creation processes.

A. 'What' - Ergonomics in co-creation – the role of employees

Neubauer and Stary [19] describe ergonomics as acknowledging the role of employees in innovation as leading

to both improvements and financial benefits, through human-centred design.

Human-centred design for interactive systems promotes the following key principles [19]:

- The design is based upon an explicit understanding of users, tasks and environments
- Users are involved throughout design and development
- The design is driven and refined by user-centred evaluation
- The process is iterative
- The design addresses the whole user experience
- The design team includes multidisciplinary skills and perspectives.

Of advocating policies that could improve on this, Lopez-Gomez et al. [20] suggest:

- Promoting the access to highly qualified personnel to develop new concepts and service innovations in-house
- Developing training methods for personnel to be able to adapt innovations acquired from external sources
- Need to better adapt curricula in education and training schemes to the demands of service economy
- Recognizing informal learning so as to increase the attractiveness of continuous training for employees
- Promoting modern innovation management approaches that better support creativity and autonomy of service workers [20]

B. 'Why' - Operationalizing these principles in eHealth

While the forgone citations are from industrial contexts, Beaumont et al. [2] focus on service-design in eHealth, and propose that socio-technical, human-centred design approaches are better alternatives to techno-centric design. The article promotes joint innovation tools like service blueprints [21, 22] and stakeholder analysis [6] in the form of Systems Scenario Tool [SST] [23] as a basis. SST combines stakeholder, and system gap-analysis.

The key points in the article are [2]:

- Telehealth equipment and services offer opportunities for bridging the future gap between available health resources and demand created by an increase in life expectancy.
- Current use of telehealth is limited by inadequate business models and service designs that fail to generate successful partnerships and value for customers and suppliers.
- Traditionally, healthcare providers have taken a techno-centric approach to the implementation of new technologies, which often results in unforeseen barriers to success.

- Design and implementation of new services can benefit from a socio-technical approach, which gives equal consideration to both social and technical aspects of a complex system.
- Co-creation of value requires new tools, such as the System Scenarios Tool, which provides stakeholders with a holistic framework to help model the implications of service offering and business model choices.

C. 'How' [1] - Design principles applied on a Living Lab project

Comparing these organizational design principles with experiences from the Living Lab project workshops, methods such as stakeholder analysis [6], and service blueprints [op. cit.], as devised in Beaumont et al., found in the literature review [2], proved to be useful in designing new services. To the known service blueprint template for process notation [swim lane diagram] we found it useful to add a band for step purpose and key performance indicators, see Figure 1. In addition to showing the process following a timeline or sequence [steps], the process diagram shows activities at different levels of the information system. The levels include both those parts that are visible to the end-user and the processes back stage, below the "line of visibility" [22]. Adding the purpose of each step purpose makes it possible to extract user stories to form a system requirement documentation for hand-over to Information Technology Infrastructure Library methods [ITIL] [24-26] or agile system development [27], and refined further to precise technical architectures and instructions to ICT-system engineers. At the same time, adding key performance indicators can be a starting point for defining inputs to a joint enterprise process and performance management system. By adding the iteration of a workshop with all involved front-stage and back-stage personnel-employees, like in the Living lab-case [see Section II], more aspects of a proposed innovation can be explored, before expensive investments and changes are made.

Although our process modelling exercise showed the proposed camera-surveillance case to be technically feasible and may give potential benefits to homecare patients, it also showed that such an innovation also has major implications for the worklife for, e.g., home nurses, as well as legal and privacy-issues in general, that needs to be examined and discussed further. The status, as this article is being written, is that implementing the camera-surveillance case has been postponed awaiting more ground research into the needed technology security and quality aspects, while other innovation-paths are now explored in test labs and living labs; e.g., replacing physical home-visits to patients with video-meetings.

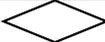
Service Blueprint diagram	Pre service	During service		Post service
Step name/no.				
Step purpose				
Key performance indicators				
Service evidence				
User action				
Front stage personnel action	↓ "Visibilityline"			
Back stage personnel action				
Infrastructures (legal, standards, technical)				
Legend				
	Event	Process	Decision	Connection

Figure 1. Service Blueprint diagram template, with "lanes" for purpose and performance indicators added

Here, in the case of video-meetings, service blueprints and other service design-methods have been successfully applied, and pilots for new services may go live soon [in Fall, 2018]. Testing the user's journey through new services, using low or high-fidelity testing [roleplay] gives informed users a pre-experience of the benefits from new improved services. Experience from the Living Lab show that participants in such lab test can contribute with both real-life problem narratives as input to design of new eHealth measures, and later as "ambassadors". Test panel participants can thus positively influence patient groups and colleagues, and help ease eHealth technology adoption, validating the general finds of Taylor and Todd [12], and Eikebrokk et al. [13] in this context.

D. 'How' [II] - Scaling up participation using web 2.0 technologies

We used Webster and Watson's [28] method for conceptualizing and grouping the finds of the second literature review. The results of this literature review are presented here. The literature review gave us insights within the following concepts and conditional factors:

1. Customer satisfaction
2. ESN adoption
3. Gamification
4. Human resource development
5. Innovation ecosystems and urban planning
6. IT governance
7. Knowledge sharing
8. Management
9. Online design processes
10. Organizational learning
11. Risk factors
12. Avenues for future research

Below are these finds with references to the [group of] reviewed articles that offered new insights into these concepts.

1. Customer satisfaction:

Pintos study [29] shows that customers' [patients'] positive attitude toward social media can be an effective method to enhance PCM [patient-centred medicine] and, ultimately, satisfaction.

2. ESN adoption:

Chin et al. [30] illustrate that the likelihood of ESN use is significantly influenced by technological, organizational, social and individual factors. Sharma and Bhatnagar [31] state that it takes a lot more than mere investing in social media work tools; organizations need to build a "culture of openness and transparency", where employees not only "feel free" to share ideas and opinions but also "feel happy and involved" with high-touch points in their entire employment experience. Doing this, ESN can be utilized to build social capital [trust] within a company [32]. In Razmerita et al.'s study [33] drivers for user adaptation are identified as:

- Environment of helping others
- Monetary rewards
- Management support
- Management encourages and motivates knowledge sharing behaviour, and
- Knowledge sharing is recognized
- Barriers to adaptation of ESN-ESM are:
- [The perceived risks of] Change of behaviour [from hoarding information to sharing information]
- Lack of trust
- Lack of time

3. *Gamification:*

The Li et al. article [34] identifies gamification as an important driver for making ESN [and ESM] work. They exhibit four case-studies; Google, Apple, Procter and Gamble, and Ace Hardware. Ace hardware uses the network to solve problems, and exchange ideas and experiences. Google allows employees to spend 20% of their time on their own-defined projects. These ideas are voted for on an “ideation white board”. On the Google Intranet; “MOMA” all information is compiled in to a searchable database, available to all employees. Procter and Gamble includes the employees of partners in their extended ESN, for ideas to new product-lines. Apple have gone further and have built a whole ecosystem for revenue generating services [34].

Gilbert et al. [35] advocate establishing an idea-capture mechanism, using rewards and “Design Thinking” [36] competitions. Although monetary mechanisms and career advancement are important, the “power of fame and franchising should not be underestimated”. Gamification can also be used to enhance learning from enterprise training [37].

4. *Human resource development:*

Allowing employees to “brand themselves” will create enterprise winners in the emerging economic environment for the information age, using social learning or e-learning tools [38].

5. *Innovation ecosystems and urban planning:*

The innovation eco-system thinking can be extended to whole cities with their residents and businesses. This could be of interest also within an eHealth innovation context, as local governments, in charge of primary healthcare, as in Norway, also have the double goal of stimulating business development, alongside solving healthcare needs. San Francisco city founded the ‘tech chamber of commerce’ sfcity.org. “An important stated goal of [sfcity.org] was to encourage member firms to make pro-bono interventions in the city’s urban infrastructures. The first public statement consisted of a short video circulated via social media [39]”.

6. *IT governance:*

Alimam et al. [40] highlight the need to integrate ESM with the enterprise’s existing mechanisms for IT governance and architecture. As the enterprise wants to promote desirable behaviours like collaboration and innovation, integration of these behaviours into an enterprise wide framework seems necessary.

7. *Knowledge sharing:*

Knowledge sharing is an important asset to an organization. Especially in distributed organizations, e.g., multinationals, the expatriates rely on ESM for teamwork [41]. Social mechanism of a lighter nature, sharing humour and other kinds of relief, may encourage use of ESM [42], and thus also for more directly productive work.

Many organizations have social responsibility goals and strive to be able to hire and include employee-groups with special needs [43].

8. *Management*

ESM needs to be managed, but there are no clear rules as to the level of management needed, it depends on the circumstances, according to Guinan et al. [44]. The article advises three approaches; top-down, from middle management [middle out], and bottom up, depending on the context. In a context with many silos [relevant to, e.g., a healthcare setting and its many stakeholder-groups], middle out may perhaps prevail as the best approach.

Niell and Moody [45] identified nine strategic roles and the associated responsibilities [involved in social media management] including policy maker, internal collaborator, technology tester, communications organizer, issues manager, relationship analyser, master of metrics, policing, and employee recruiter.

e-Leadership may be a lot different from ordinary hierarchical management. Avolio et al. [46] produce a model that shows that the transition management will go through as enterprises become increasingly digital. In general, technologies tend to “flatten out” leadership, and decision-making. There will be a need for leadership development. ESN can be used to enhance such development [47]. Other studies; Korzynski [48] show “that online social networks are more useful for participative and consultative leadership style on social networking platforms than for directive leadership style [op. cit.]”. According to Korzynski [48] the more employees are empowered; the more benefits can be realized from ESN-ESM.

9. *Online design processes:*

One article presents a solution for implementing social media functions into a software development project. Alvertis et al. [49] report from an EU-funded project, resulting in the site named CloudTeams [50]. The solution also entails connectors to third party services, and reward end-users for their participation in “campaigns”.

10. *Organizational learning:*

The organizational learning aspect of ESN-ESM is disseminated in several articles found in the review. Increased emphasis on ESM may represent a new stress-factor for many employees. So, the organizations should facilitate programs to improve employee’s digital literacy [51]. Increased intensity of collaboration in many environments, like press-work, creates the need for more fine-grained tracing of everyday activities [52]. Using quantitative survey-evaluation methods, Qi and Chau [53] have tested the positive consequences of ESN-site [ESNS] usage, and confirm that “ESNS usage is an important antecedent of knowledge creation and knowledge sharing. ESNS usage is also an important contributor to organizational learning. Knowledge creation and knowledge

sharing both mediate the path between ESNS usage and organizational learning [op. cit.]”.

11. Risk factors:

ESN-tool use is not without its risks, both reducing potential, and for direct economic loss. Comparing with the Excellence theory [54], Verheyden and Cardon [55] finds that management ideology may hamper the information producing abilities of employees and also the realization of benefits from using social media. Employees’ use of ESM could potentially compromise business secrets: Väyrynen et al.’s [56] conceptual article proposes eight questions to ask regarding what roles and authorities’ different categories of employees have. Based on this, strategies to meet knowledge protection challenges can be devised.

12. Avenues for future research

ESN is a topic in need of more research, according to Ellison et al. [57]: “As ESNSs are introduced into a wider range of organizations, it will become increasingly important to study, theorize, and design for the ways in which use of such tools is transforming knowledge sharing and other organizational practices [op. cit.]”.

IV. PROPOSITIONS

Going from elicited principles [from literature] to propositions, the authors here conceptualize propositions by analysing the principles using the framework of Design Thinking methodologies as lens, as advocated by, e.g., Gilbert et al. [35]. Based on the authors analysis of finds the literature reviews and the case study, propositions are here made for:

- a) Governance principles for co-creative processes involving employees
- b) Realising scaled up-participation using web 2.0 technologies

A. Governance principles for co-creative processes involving employees

This article proposes that enterprises that want to succeed with eHealth innovation and co-creation over time, need to secure the involvement of their frontline personnel, because they are key to establishing a Business Performance Measurement system. There are numerous definitions of what a Business Performance Measurement system contains. In a literature review, Franco-Santos et al. [58] identified these main features:

1. Performance measures
2. Objectives/goals
3. Supporting infrastructures [including data acquisition and analysis]

4. Targets [gauges – does the enterprise meet its targets]
5. Causal models [what are drivers for successful performance]
6. Hierarchy/cascade [organization, delegation of concern]
7. Performance contract [negotiated contractual relationships with stakeholders]
8. Rewards [incentives]

Co-creation is a relatively new term. It has become part of the slogan and strategy of many universities. But what does it mean in practice and where does the term come from? A recent review by Galvagno and Dalli [11] traces the term back to three theoretical perspectives including service science, innovation and technology management, and marketing and consumer research. The literature on co-creation operates on two levels of analyses: company centred vs. customer experience centred. Apparent themes in the literature include co-creating value through customer experience and competence, service innovation, including digital customer involvement. Today, service science and marketing play a major role in the literature and refer to the involvement of customers in the supplier's product- and service development. In information systems research and management research, the term co-creation has been used by, among others, Grönroos and Voima [9], and Lenka et al. [3].

Lenka et al. have provided a model that will explain the connection between "megatrends" in industry and working life; digital development and change ["digitalization"] and development of a service culture in production-oriented environments ["servitization"] through co-creation processes. As authors, we agree with Lenka et al., that an important prerequisite for success is the development of digitalization capabilities in service-based organizations. These digitalization capabilities in turn, will govern the "Value Co-creation" mechanisms; consisting of two main mechanisms; one linked to needs analysis [perceptive mechanisms] and one linked to design and construction cycles [responsive mechanisms]. Between these two [from observation to design and construction], knowledge about measurement points is transferred to goals and values that form the basis for implementation of the service [in design and construction]. Both mechanisms must be repeated for each overlapping link in the value chain.

Moreover, we propose that the change work done in these overlapping links in the value chain can be expressed [including the core, the actual digitalization capability] as Deming Cycles [Plan-Do-Study-Act], see Figure 2.

Iterative development-cycles like this allow the time for involvement of both external and internal stakeholder groups and should include discussing goals and measurements. The saying “You can’t manage what you don’t measure” [1] is attributed to both Edwards Deming and Peter Drucker.

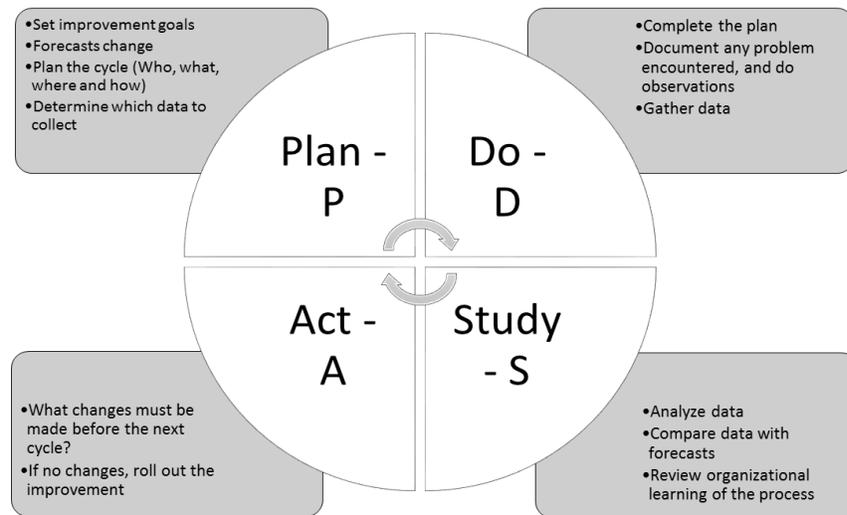


Figure 2. Deming cycles

Focus in achieving worklife ergonomics will be the relationship between the observational input and response outputs from the service co-creation and system co-creation cycles as a prerequisite for successful eHealth co-creation governance. Lenka et al. states, that value is added at each part of the chain, as new actors bring in new experiences, see new opportunities and add new value to the service. This includes the service consumers themselves, and their next-of-kin. The measurement system will be a trigger for new innovations, while being a missed "GPS" guidance system, to find the way [59]. Such a system will also act to spur organizational learning, providing incentives that motivate and intensify innovation [59].

To stay relevant, since the frames, and context, of the eHealth area is rapidly changing, we believe that the overall quality system [Process and performance management system] itself must be agile and subject to at least annual evaluation [a slower Deming cycle], while the services that the system controls, go through its many and fast Deming cycles. Together, these form a proposed conceptual process-model for co-creation in eHealth innovation, that also supports good worklife ergonomics. The concept is illustrated in Figure 3. The thickening of the arrows in the value-delivery chain in bottom of the figure illustrates how value is added with each chain in the delivery from new technology to improved services, in accordance with Lenka et al.'s model.

The users both add value and gain value. Finds from the case study [Section II.B] indicate that new eHealth technologies successfully implemented can improve quality of worklife, the feeling of self-efficacy; mastering work task in a better way with less unnecessary waste of time and

acquiring new skills. Healthcare users can also add value to the service, in even unforeseen ways, using new technology to solve more problems at a time. When it comes to the Plan-Do-Study-Act cycles in the value-chain [system co-creation, service co-creation] – different process modelling tools, like swim lane diagrams, can be used to visualize, convey, and discuss the consumer journey with stakeholders, using, e.g., "Service Blueprint" or similar [21, 60].

All in all, the goal is that the entire ecosystem is set in a state of continuous improvement and value innovation, and that a shared and improved service culture in the municipalities and their partners, [servitization], develops through digital transformation. This secures the ability to go back and start again, if necessary.

B. Realising and scaled up-participation using web 2.0 technologies

Based on the finds from the second literature review and analysing this through the lens of the general literature on co-worker co-creation, we can list several healthcare innovation capabilities provided by a broad participation in digital transformation and eHealth innovation processes, open to all involved employees in healthcare [illustrated in Figure 4.]. This figure also illustrates the main benefits:

- Increased knowledge base
- Enhanced digital worklife ergonomics [digital systems that are better adapted to real life work-processes]
 - Increased involvement and implementation
 - Support from employees in designing and implementing change

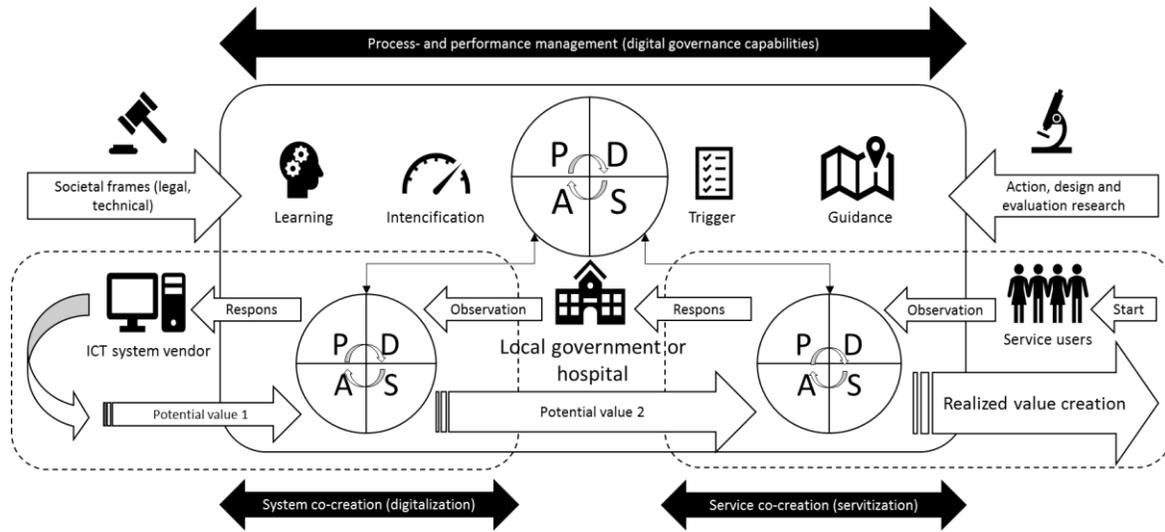


Figure 3. Process-model for co-creation in e-Health innovation; The ecosystem [Based on Lenka et al., 2017].

Based on the review on web 2.0 concepts we will here present some propositions for how employee involvement can be secured, to achieve these desired benefits and capabilities. We propose that the effect of employing ESM can be enhanced by adding a plan and structure to the co-creation process. When looking for a framework that can provide plan and structure, the authors have used the Design Thinking philosophy [60, 61] as a guide. Design thinking is a human- and needs-centric approach to innovation [op. cit.] that is well aligned with the needs of the very labour-intensive healthcare sector. Arguably, Service Design Thinking [60] is the new model for collaborative Business Process Management [62] and addresses and simplifies some complexity issues in business process modelling [6].

The British Design Council’s Double Diamond – model [63] can thus be used as a framework for casting several of the ideas and concepts from the literature review as steps in a design process or roadmap; see Figure 5. The Double

Diamond – model in its many variations has rapidly become a standard for guiding design processes in a user- and problem centric manner, associated with the Design Thinking philosophy [36]. The Diamond shape symbolizes activity levels through a time-line, and due to activities and material collected or produced peaking midway in each Diamond.

The Double Diamond’s two parts revolve around problem and solution respectively, with decision milestones at start, end and in between the two “Diamonds”. The Problem-Diamond is divided in two distinct phases:

- Discover [the features of the problematic area, and its stakeholders], giving insights into the problem
- Define – the area to focus on. Questions to ask are: “Which area matters most? Which area should we act on first? What is feasible?”

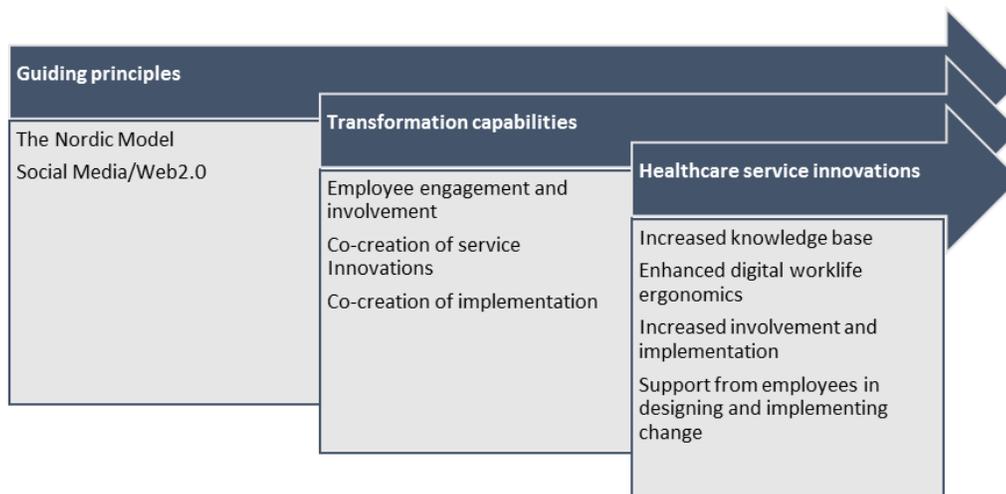


Figure 4. A conceptual model for sequential and overlapping process steps and impacts in co-creating digital transformation in healthcare

Starting joint problem-solving with the problematic situation, can widen the frame for [co-]creation [61]. Arguably this opening of a discourse should encompass all employees to achieve the added value that the enterprise is striving for [op. cit.]. The British Design Council states that; “One of the greatest mistakes is to omit the left-hand diamond and end up solving the wrong problem [63].” This can underpin the concepts of knowledge sharing, organizational learning and the online design process. Having defined the problem, a brief for the design can be formed, thus starting the Solution-Diamond, where the focus is to:

- Develop – potential solutions [in plural; testing different alternatives]. “This process of trial and error helps designers to improve and refine their ideas [op. cit.]”
- Deliver – solutions that work, this tie narrowing the field based on decision criteria from the brief, and evaluations done underway.

This should be comprehended as an iterative process. “This means that ideas are developed, tested and refined a number of times, with weak ideas dropped in the process. This cycle is an essential part of good design [63]”.

We propose that this “wisdom of crowd”, especially using the inherent knowledge and wisdom of employees, can be mobilized throughout the process using ESN – ESM, for:

1. “Service innovation”; choosing the right problem; defining a new service blueprint [22]
2. “Implementation”; including new eHealth measures; choosing the right solution

The process-structure should also include a joint process for digital governance, as the literature review has shown a need for management of ESN/ESM and the whole design process; measuring and ensuring other concepts found in the literature review [like customer satisfaction, human resource development and risk factors], ref. Figure 5:

3. Process management, IT service transition governance [25], consisting of:
 - 3.1. Setting goals [based on problem]
 - 3.2. Decision criteria [quality measures; based on problem definition and design brief, following the “Service innovation”; 1. above]
 - 3.3. Evaluation [evaluating the total solution, following the “Implementation”; 2. above. Also evaluating the whole design process]

Polls on ESM [gamification] can be utilized for advising top managers, as to what measures should be prioritized, and how. If necessary, all steps and phases can be iterated until the aspired level of confidence in the measures and potential values are reached. Leveraging the increased knowledge base, and support of all employees, with defined criteria’s and milestones for decision-making, chances for successful

implementations are optimized, and the potential risk for failed investments may be mitigated.

Adding the support process of process management, allows for having a holistic governance of parallel innovation projects and involving employees in the performance management of the whole segment of healthcare, as well in individual welfare technology projects [64].

V. CONCLUSION AND FUTURE WORK

This articles literature searches have shown that for the purpose of establishing a holistic eHealth innovation ecosystem-concept, and achieving digitalization and servitization throughout the organization, the following elements are necessary [but perhaps not sufficient]; digital governance capabilities, process and performance management methods and systems that align new technologies with high quality work processes [worklife ergonomics], and appropriate tools to visualize and communicate processes and services with end-users, as well as different professional employee groups involved, front stage and back stage. By involving employees though iterative project-cycles and achieving a general consensus on what goals and measures should count, the necessary sorting and maturing of ideas is achieved, so that failed changes can be avoided before too great investments are made and lost.

Other factors that are necessary are processes that align local service strategies with central government legal and technical frames [compliance]. More research is needed on how these different eco-systems [central, local] can be efficiently combined.

More research is needed into future innovative means of capturing both qualitative and quantitative data about end-users or patients’ using “Big data”; combining social media and transaction data from the service systems. More action, design and evaluation research are also needed for devising how the proposed model [Figure 3] can be implemented and operationalized in a manner that ensures both employee and end-user involvement and commitment for achieving a high quality, lower cost health care system, while maintaining a high quality of worklife.

This article has also shown digital transformation and -innovation in healthcare with employee involvement in the co-creation process, can be further enhanced through the help of web 2.0 technologies. The article contributes to the growing co-creation literature [3, 9], by adding the vertical dimension of internal co-creation between healthcare management and all employees. This contributes to answering our first research problem-area; the ‘What’ and ‘Why’ of how can the co-creation literature be extended to include employee involvement, in the context of healthcare?

Further research could deal with the question of how such use of digital technology in the co-creation process, can enhance and clarify the role of employees.

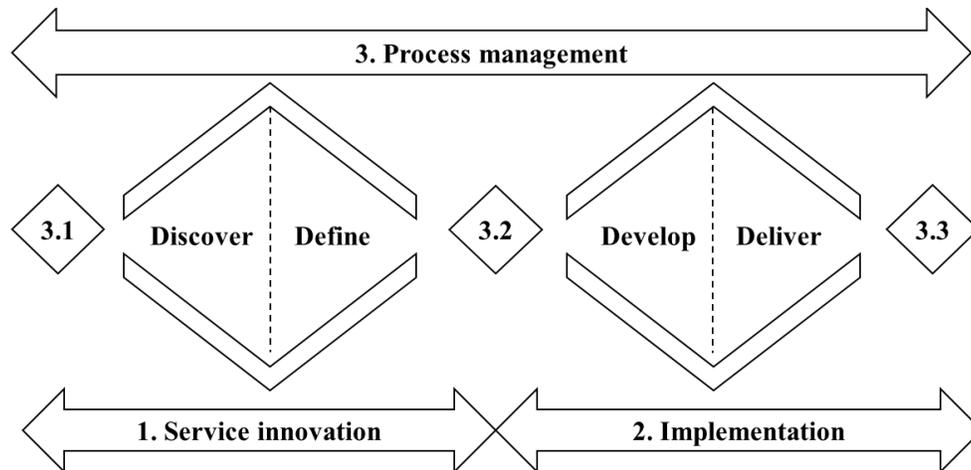


Figure 5. "Double Diamond" framework for Web 2.0-enabled eHealth design process or roadmap

The clarity of roles and tasks for employees in introducing new technology at the workplace is also a necessary workplace environment factor, which prevents adverse health effects among employees; so-called technostress [65].

A model-test of the proposed frameworks could show if successful implementation and outcomes are enabled, and risk-management of adverse health, safety and environment effects when introducing new technologies are improved.

Some healthcare organization have programs for encouraging open innovation [66] or capturing ideas from employees' inventions, and some organizations use software for this, like Spigit [67], Ideation360, Inductsoftware or the research-based CloudTeams [50]. Further case-studies; e.g. action- and design research could show how such software could involve and engage the whole organization in digital transformation and co-creation in combination with web 2.0 technologies. However, caution is needed, as our case-study [ref. Sections II.B and III.C] has indicated, some social engineering may be a necessary step before introducing technology.

One of the findings from this case study, as recognized by the responsible municipality project management, is the great value the users [both internal users, and home care receivers] have in the innovation work. The user panels are not passive testers, they contribute ideas and input. Often the participants in the user panel have taken a role as ambassadors for other employees in the municipalities [those not directly involved in the lab tests] and other potential users. Thus, they have played an active role in the creation of new products and services.

All in all, this Living Lab approaches the principles of co-creation. But getting there was a process long in the making. Finding suitable first uses as well as the persons suited to man up the user panels for pilot studies required a lot of effort by the municipalities project management. There may still be issues concerning to the scaling up of implementations, from small scale pilots, to large scale service production. Applying web 2.0 technologies may be helpful here.

Limitations

Our conclusion is partly based on search in scholarly literature within fields like information systems and management [with emphasis on the first; information systems research] using specific search criteria. Our search and screening are surely not exhaustive. Other criteria might have given other finds of relevance to this article's scope. Within strategy and management research disciplines there may be relevant sources of studies, e.g., within the Workplace Innovation-literature [68] not reported here. There may also be instances of web 2.0 and ESN practice of interest to this research and reported in scholarly literature that have not been found by this article's authors.

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