

# Resilience - A Key Element in User-centred Services?

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Population changes indicates a demographical distribution with even more elderly. The authorities emphasize the importance to stay in good health and being independent as long as possible. Still, some will need some assistance to be physical active by doing exercising and thus preventing incidents and injuries. The paper describes a project in a Norwegian local council aiming at developing a new user-centred service model characterized as public-private-voluntary partnership. The service should be based on the individual user's needs. The development of the service implies changing roles and responsibilities. The local council will take the responsibility as organizer, cocreator and coordinator of the services offered by the involved actors.

The objectives of the research project was to develop key performance indicators (KPI), mapping method, and to measure and evaluate the new service model. The project is a part of a Norwegian research project called "Be the boss of your own life". The method is intended to be used as a tool enhancing learning about effects related to both service user and provider. The KPIs in the new model comprise seven areas: resilience, service provision, user satisfaction, management and leadership, stimulating work conditions, coordination and improvement efforts, and efficiency improvements. The purpose of this paper is to describe the research project, KPIs and how theoretical perspectives may be used to improve the assessment.

*Keywords:* New business models, Key performance indicators, Resilience, Evaluation, User-centred approach, Health services.

## 1 Introduction

Population changes indicates a demographical distribution with even more elderly. However, it seems that the elderly today is much healthier than before, and that this trend will continue. The authorities emphasize the importance to stay in good health and being independent as long as possible. Still, some will need some assistance to be physical active by doing exercising and thus preventing incidents and injuries.

The paper describes a project in a Norwegian local council aiming at developing a user-centred service model. The service may be characterized as a new model of public-private-voluntary partnership, involving both public, private and voluntary actors. The service model may be adapted to other areas and services.

The target group in this case is elderly receiving service from these actors. The work presented in this paper has been part of a more extensive research project, whose Norwegian title translates into "Be the boss of your own life". A new role to the local council is to take the responsibility as organizer, cocreator and coordinator of the services offered by different actors. Together they shall meet the individual user's needs. One central issue was: How should

the service model be in order to best organize efforts from actors with different and contradictory interests? We find that the new business model is brittle when it comes to interests, roles and responsibilities across the partners.

The purpose of this paper is to describe the research project, KPIs and how theoretical perspectives may be used to improve the assessment. The results indicate how to use performance measurement to establish and improve a complex service model, and simultaneously promote win-win situations to all involved partners. The research project has developed a method to measure and evaluate the new service model. The intention with the method is to be a tool enhancing learning about effects both related to service user and service provider. The KPIs in the new model comprise seven areas: resilience, service provision, user satisfaction, management and leadership, stimulating work conditions, coordination and improvement efforts, and efficiency improvements.

## 2 Theoretical perspectives

### 2.1. Resilience Engineering (RE)

The society is becoming more global, complex, and interconnected. Many sectors are facing more

complex due to new technology, new actors and change of the interconnection between them, in addition to new services and changed ways of working.

RE represent a *proactive* perspective to handle surprises and changes. RE is the capacity of systems and organizations to anticipate and adapt to changes and the potential for surprise and failure (Woods & Hollnagel, 2006).

RE has become increasingly used as a theoretical approach to new societal challenges and brittleness in a lot of contexts, for example healthcare, transport, disasters management, safety management and climate changes (Woods, 2015). In a socio-technical system – including humans, technology and organisation – resilience is the ability to sustain required operations and achieve system goals under a large variety conditions, including anticipated and unanticipated events (Schröder-Hinrichs et al, 2016).

*Brittleness* describes how a system performs near and beyond its boundary, separate from how well it performs when operating well within its boundaries (Woods, 2015). Adaptation at the boundaries can be very positive and lead to success, not simply less negative capability. Descriptively and specifically, brittleness is how rapidly a system's performance declines when it nears and reaches its boundary.

*The resilience concept* is broad, a variety of definitions are used, and it is applied in different research areas (Stene, 2019). Woods (2015) discusses four different common usages of the term resilience and argues that the value of the last two are more applicable to produce fundamental findings, foundational theories, and engineering techniques: (1) resilience as *rebound* from trauma and return to equilibrium; (2) resilience as a synonym for *robustness*; (3) resilience as the opposite of brittleness, i.e., as *graceful extensibility* when surprise challenges boundaries; (4) resilience as *network architectures* that can sustain the ability to adapt to future surprises as conditions evolve (sustained adaptability). In the initiation of the RE approach, the two first concepts were most used. However, as researchers have continued to study the problem of complexity and how systems adapt to manage complexity, the two latest concepts have emerged. Empirical results begin to reveal how some systems overcome the risk of brittleness, e.g. the risk of a sudden failure when events push the system up to and beyond its boundaries for handling changes, disturbances and variations.

The yield from first two concepts about resilience, rebound and robustness, has been low (Woods, *Ibid*). He argues that it is important to distinguish resilience from the concept robustness. While robustness refers to systems that are designed to effectively handle known

failure modes, resilience describes how well the system can handle troubles that were not foreseeable by the designer. You can think of robustness as being able to deal well with *known unknowns*, and resilience as being able to deal well with *unknown unknowns*. The third concept sees resilience as the opposite of brittleness, or, how to extend adaptive capacity in the face of surprise.

*A framework for assessing RE* may be used to identifying significantly key factors affecting performance, as a basis for decisions on how to handle normal operational variation and disturbances. Many measuring instruments include both reactive (lagging) and proactive (leading) indicators. Thus, it will identify and report on incidents and learning from mistakes, in addition address predictions and act before an unwanted event.

The development of *early warning indicators* - often labelled predictive - should rest on sound theoretical foundation (Øien, Utne and Herrera, 2011), and where performance indicators should be established for six functional areas: (1) Management, organization, and administration, (2) Design of facility and processes, (3) Training and qualification, (4) Operation, (5) Maintenance and (6) Emergency preparedness planning.

## 2.2. User-centred service models

Even though no literature illustrating or covering a health and welfare service model based on cooperation between both public, private and voluntarily sectors are found, some literature covers either cooperation between private – public or public – voluntary partners. Some aspects are described below.

(1) *Welfare mix* is a new concept used for a longstanding Nordic model. Even though welfare is a public responsibility, ideal organisations and private suppliers have long been a supplement. Various types of private – public cooperation have emerged including social entrepreneurship, enterprises, investments, philanthropy in addition to companies' social responsibility, voluntariness and business (Brejning 2016). When the welfare state is changing or transforming, the civil society may take three new roles: Ideal welfare production, voluntarily work as a supplement to the welfare society, and voluntarily sector as an arena for innovations (Loga, 2018).

Modern welfare mix is to a greater extent a *cooperation* between the different partners than a supplement. The state tries through the municipalities to enable and facilitate good and long lives to all citizens. Further, the users shall have the opportunity to codetermination. Active fellow citizenship implies that the citizens can choose service suppliers, that they are individually adjusted, and can participate in local

democracy to influence on management and allocation of resources (Sivesind et al, 2016).

(2) *Partnership - Strengths and barriers*. In the Nordic countries, various sectors have different strengths. Ideal service suppliers seem to be better in personal adjustment and choices. The difference between commercial and public service suppliers seem to be less than expected.

To ensure natural *balance between the partners*, one should ensure a function to define the premises to the establishment of models. Further, it is important to create ground rules and incentives balancing the cooperation between them. In health caring, this premise function should be related to the municipality top management. leadership and management competence are vital to achieve desired goals (Ølberg, 2014).

Partnership *barriers* may be found in political attitudes and values, having basically different views on which services and responsibility that should be public, private or voluntarily. Another barrier is the management and authority regulated by law.

(3) *Quality management system and indicators*. The quality concept is defined in several different ways. ISO 9000 is a series of international standards which sets out requirements and recommendations for the design and assessment of management systems. The standards specify how management operations shall be conducted. ISO 9000 defines *quality* as "the degree a set of inherent characteristics fulfils expected requirements". A definition influences the development of which indicators is perceived as important.

The municipality and state report system (KOSTRA) defines *quality indicators*. These are presented in Table 1.

Table 1. Quality indicators in Norwegian municipality and state report system

Quality indicator	Definitions
Structure	Relations related to the institution (structure) that produces the service, and the standard on the input factors, e.g. financial framework conditions, employee competence and education
Process	Conditions related to the production processes, and the agility and efficiency that is the basis for service production, e.g. the organization of work, routines, methodology, responsibility
Product	Characteristic of the content and service of the service that are important to the user, e.g. case processing time, activity offers, proportion of users receiving services they have claim on
Result	The impact and results the service have for the user, i.e. the needs coverage that is achieved using the service, e.g. proportion of social welfare recipients coming working

Especially in the health sector it may be difficult to establish significant quality indicators. The indicators have different "distance" to the user. While result and product quality have direct influence on the user, structure and process quality do not tell anything about the delivered service or effects on the user.

ISO 9001 defines the requirements for an organization's quality management system, not for its products and services. It concerns the organization's ability to "*consistently provide products and services that meet customer and applicable statutory and regulatory requirements*". Seven *quality management principles* are described:

- *Customer focus* – Quality management primarily focuses on meeting customer requirements and striving to exceed customer expectations.
- *Leadership* – Helping leaders to establish unity of purpose and direction at all levels and to create conditions to engage members of the organization in achieving the organization's quality objectives.
- *Engagement of people* – Obtaining and maintaining (at all levels throughout the organization) competent, empowered, and engaged people to enhance the organization's capability to create and deliver value.
- *Process approach* – Delivering consistent and predictable results through the use of effective and efficient activities that are understood and managed as interrelated processes that function as a coherent system.
- *Improvement* – Maintaining an ongoing, organization-wide focus on improvement.
- *Evidence-based decision making* – Using the analysis and evaluation of data and information in the decision-making process to produce desired results.
- *Relationship management* – Managing the organization's relationships with related parties, such as partners or vendors, for sustained success.

### 3 Designing a new business model - The senior health program

The new business model concerns elderly people living at their home in Fjell municipality. The health program implies that the municipality takes a new role as facilitator, co-creator and coordinator of services from several actors.

The employer role will be changed, implying changed demands on competence and performance by municipality leaders and employees. Further, regulations regarding collaboration between public, private and voluntary services may be challenged. Lastly, increased locally commercial involvement and value creation must be handled by e.g. contracts, agreements and responsibility.

### 3.1 Vision and objectives

Visions and goals of activities are central foundations for designing performance measuring (PM) systems with indicators. The *vision* of "Be the boss of your own life" is that physical activity affects senior well-being and coping, implying that they may live an independent life.

The main *objective* is that an increased number of seniors are experiencing to receive good services and offers, and that these are in accordance with their needs.

(1) *Program actors*. The project constitutes the following actors: (1) Users and relations, (2) public sector, (3) private sector, and (4) voluntary organisations.

*Public sector* - represented by Fjell municipality - has the main responsibility and has initiated the senior program. Central actors are primary and secondary health service, in addition to the Norwegian Labour and Welfare Organisation. An activity centre is planned as the core factor in coordination and co-creation of activities and actors. One challenge is to develop a user-centred services to elderly, even with a significant increase of the population.

*Private sector* - Central actors are companies offering services regarding physical and social activities, transport and food. The new business model makes it possible for private service suppliers to develop the services, in addition to establish and develop local companies.

*Voluntary organisations* - Central actors are organisations and persons offering physical and social activities, practical assistance and social contact. The program will enable systematic service work based on continuous feedback, utilize resources more adequate by learning and cooperation with private and public sector. Thus, making it possible to recruit retired people and others wanting to contribute.

(2) *Program activities*. Cooperation and coordination should take place in all phases of service delivery of an activity/ service; from establishment, to information and marketing of the activity/ service, and further to planning and accomplishment. Each sector is responsible for every phase. However, the *action centre* should take the responsibility of coordination. The centre was planned to be a central part in the study; however, the centre will be completed during 2020.

The initiated activities may be grouped in six categories: (1) Social and well-being enhancing, (2) Dement friendly society, (3) Everyday assistance, (4) Action centre open 24/7, (5) Traditional health and care services, and (6) Welfare technology.

The research project covers 1, 2 and 4. Activities offered to persons with a dementia diagnosis are: (a) *Active365* (private responsible) is a daytime service to persons with a dementia

diagnosis. The service is offered by a private exercise facility, offering tailor-made activities ensuring safety and well-being to senior living at home. (b) *Active+* (Voluntary responsible) - involving about 10 organisations - is an activity and culture service on Tuesdays including training inside or outside. (c) *Meeting+* (Voluntary responsible) is a shopping and culture service to seniors at each Thursday, e.g. shopping assistance, bingo, data courses, bowling and meetings at senior centres and library.

In addition, the municipality wanted to promote voluntarily contribution by offering education and support related to activities, at institutions or at home. They use a model for public - voluntary cooperation constituting five principles: Start a dialogue, Organize the municipality contributions, Define responsibility, Motivate and Meet challenges. This is accompanied by advices e.g. to ensure political and administrative management commitment, in addition to mapping existing and future services and needs.

## 4 The research study

The research study is performed in the period 2016 - 2019. SINTEF have been responsible, and has collaborated with Fjell municipality, NTNU (Norwegian University of Science and Technology) and Western Norway University of Applied Science. The project has used several *methods* like - workshops and seminars, project meetings, interviews, observations and questionnaires.

The *main problem* to be addressed was: How can the municipality use performance measuring to establish and improve a compounded business model, which facilitate win-win situations to all involved partners?

### 4.1 Designing Performance Measurement (PM) system

The overall research project was using a PM system design (Andersen and Fagerhaug, 2001) containing eight steps as shown in Table 2. The performance indicators (PI) are tested and validated making use of several pilot activity projects. The research project is based on an *action research* approach (see Coughlan and Coughlan, 2009). Action research is not a special method but should be understood as a scientific approach utilizing several forms of action-oriented research methods. The approach is often used in relation to unstructured and complexed issues. Independent on research subject, the goal is to improve processes, and action approach open for continuous reflection. The strength is to gather results with high relevance to practitioners, and simultaneously develop new theory.

Table 2. Research study based on PM System design.

PM system design model	Activities	Approach
1. Business structure, process, stakeholders and strategic choice	Strategical basis	Workshop
2. PI demands	Stakeholder analysis	
3. Existing PM systems	Identify existing indicators	
4. Develop PM	Development of adequate PM	Literature review, case study, document analysis
5. Consider PM data collection methods	Choose research methods	Action research  (Pilots, interviews, observation etc)
6. Consider how to report and present data	Writing reports and dissemination of results	
7. Test and revise PM system	Establish test methodology and adjust indicators and measure system	
8. Implement PM system	Establish mockup for implementing PM system. Communicate experiences and results	

## 4.2 Research activities and methods

Table 3 summarizes the research methods and activities performed during the research project period.

Table 3. Research methods and data

Methods	Data and content
Workshops and seminars	Identification of needs Presentation of results
Project meetings	Fixed representatives from municipality, private and voluntary sector, researcher
Interview/ focus groups	<i>Voluntary:</i> - (Meeting+/- Active+) Managers, board, instructors and participant <i>Municipality:</i> - Employees, middle managers, managers, collaborators <i>Private sector:</i> - (Meeting+/- Activity365+) Participants in Tuesday activities
Observations	The three pilots (Meeting+/- Active+/- Activity365+)
Questionnaires	The three pilots
Document and literature review	Relevant municipality documents, literature, health and welfare documents
Public databases	Public data sources and systems, health statistics Comparison of Fjell municipality and other relevant Norwegian municipalities

The public documents clearly express an expectation that the civil society shall contribute to welfare production, and that private sector and business shall contribute to transformation and maintenance (Brejning 2016). Thus, social responsibility is expected from both civil society and business/ private sector.

## 4.4 User needs – The Customer trip

In the development of the service model and its indicators, understanding the customer's needs became an important basis. Here the travel to and from offered services and activities was important. To the user, the "Customer trip" constitutes six sub-services/-activities:

(1) *Register interest in services/ activities* - Information concerning decision to participate is important. This includes introduction and participation in an activity. Especially when several actors are involved as service providers it is important for users and relatives that he/ she gets sufficient information. This makes the offer predictable at every step and may prevent uncertainty/insecurity among users

(2) *Prepare for the trip* – This includes user needs to be able to participate. It is important to avoid these as barriers. Some will need help, e.g. from a home nurse or a volunteer, and thus an important part of the customer journey for these users. Experiences of getting support will influence the total experience of a service offering.

(3) *Transport* - Access to suited transport makes it easy get to and from the activity / service. To many seniors, this is crucial to be able to participate. Some need door to door transportation and assistance to move to the house or to carry luggage. Different sectors can have responsibility. Flexible solutions may prevent transportation becoming a barrier.

(4) *Exercise/ activity* – The content here is the key motivation and most important factor to have effects on seniors' coping and well-being. This includes the primary activity, physical or social, e.g. exercise in Active +, Activity365 or participation in Meeting +. (5) *Transport* – (same as 3) and (6) *Return home* – (same as 2).

## 4.3 Performance indicator (PI) development

The concept performance measurement (PM) is usually used as the meaning of measuring something, while performance indicators (PI) usually are more specific. PIs may be used of leaders and employees at different levels in the organisation. Some methods and instruments are using predefined subject, e.g. balanced management. In this research we have used a more open approach to decide which subjects to include or not.

The PIs may be reflecting short- and long-term objectives, balancing between financial and non-financial measures, between lagging and leading indicators and between internal and external performance (Kaplan, 2001).

It is four *interest groups* related to the development of the new service model: Users and their assistants/ relations, public sector, private sector and voluntary sector. Table 4 illustrates the groups needs and expectations to execution and effects of a new service model.

Table 4. Interest groups' needs and expectations to the service model

Interest groups	Needs and expectations
<i>Users and their assistants/ relations</i>	<i>Well-being:</i> security in everyday life, an experience of a social community and that of the elderly experience being treated with respect by all service providers within the service model. <i>Own functionality:</i> activities and services are expected to support mastering / self-mastery, and that seniors / elderly can stay at home for as long as possible. <i>Service delivery:</i> services are readily available to all, good transport solutions for users to have easy access to the services, freedom of choice over services and services that emphasize prevention
<i>Public sector</i>	<i>Service model:</i> expectations defined through the concept of Manager in own life with focus on service delivery across sectors <i>Service delivery:</i> good coordination of the various services, improvement of services for learning across stakeholder groups <i>Market:</i> easy to find company that provides current service and that the services have good quality <i>Resources:</i> contribute to good financial operations, that the elderly as a group become a resource for society, that good infrastructure and data security are the basis service model
<i>Private sector</i>	<i>Well-being factors:</i> reputation, community support, seeing the value of the work <i>Service delivery:</i> collaboration and good collaboration with other players, both municipality / public, voluntary and other private actors, cooperation and coordination can be critical <i>Finance:</i> financially sustainable for the business, a larger market
<i>Voluntary sector</i>	<i>Well-being factors:</i> joy in helping, more active everyday life, recognition and respect for the effort being made (by users, relatives and not least the municipality / it public), well-being as the basic motivation and driving force for voluntary efforts <i>The service delivery:</i> collaboration and collaboration with the other players, that one experience help / support from the municipality to find good marketing solutions and establishment of activity offers.

In the development of performance indicators (PM) related to the project "Be the boss of your own life", it was important to register result indicators for the groups that offer the service. To be robust and resilient, it is significant that voluntarily and private actors get positive experiences and reach their own goals. Thus, their

motivation to be a partner and resource maintain over time. This is an important premise to create a robust service model and make it work in practice.

#### 4.5 Proposed PM System

The PM related to implementation of new business models should be based on some key areas. The recommendations related to a new business model for senior health care are based on considerations and result regarding the Customer trip, processes in the service model, vision and objectives, and experiences from the piloted activities. The motivation for including the PMs dimensions/ areas are presented in Table 5. The seven proposed PIs are presented in Table 6.

Table 5. Motivation for including PM dimensions/areas in the service model

PM areas	Motivation
<i>Service offer</i>	<ul style="list-style-type: none"> <li>• To maintain the offer good participation in the various service offerings is important</li> <li>• The service model should contribute to good services to both genders and for all ages in the target group</li> </ul>
<i>Robustness</i>	<ul style="list-style-type: none"> <li>• Robustness of service model depends on the individual services being robust</li> <li>• Necessary expertise is critical and should be available over time for various tasks / services across sectors</li> <li>• How recruitment is carried out is particularly important for the voluntary sector</li> <li>• Framework conditions for both voluntary and private efforts must motivate efforts. Communication and support for voluntary and private suppliers affect quality of services</li> </ul>
<i>User satisfaction</i>	<ul style="list-style-type: none"> <li>• All key user satisfaction criteria should be met for all services within the service model</li> </ul>
<i>Management, control</i>	<ul style="list-style-type: none"> <li>• Sufficient resources should be allocated to individual offers across sectors</li> <li>• Good infrastructure and formalized information structures should support coordination across of stakeholder groups and sectors</li> </ul>
<i>Stimulating work conditions</i>	<ul style="list-style-type: none"> <li>• This is important for job satisfaction, motivation and quality of work regardless of sector</li> <li>• This is a critical factor for the services/ service model in particular, the volunteers and private operators</li> </ul>
<i>Cooperation and improvement effort</i>	<ul style="list-style-type: none"> <li>• Good cooperation and coordination between the actors involved is critical for services and the service model</li> <li>• Systematic work on evaluation and improvement contributes to well-organized offers audience</li> </ul>
<i>Efficiency improvement</i>	<ul style="list-style-type: none"> <li>• The service model must contribute to efficient and good operation</li> <li>• The municipality's costs for elderly care do not increase in line with increase of the elderly population</li> </ul>

Table 6. PM dimensions/areas and PI on services and activity offers

PM Area	Performance Indicators (PI)	Data
Service offer	<ul style="list-style-type: none"> <li>• Number of participants</li> <li>• Age composition and adaptation of offers to different age categories</li> <li>• Gender distribution and adaptation of activity to both genders</li> </ul>	Registration, Subjective
Robustness	<ul style="list-style-type: none"> <li>• Adequate / robust number of volunteer workers pr. activity</li> <li>• Proper expertise available</li> <li>• Necessary expertise available for activity offers</li> <li>• Recruitment strategy (effective/ good procedures)</li> <li>• Formalized procedures for cooperation agreements with municipality</li> </ul>	Subjective judgment
User satisfaction	<ul style="list-style-type: none"> <li>• Availability &amp; framework conditions</li> <li>• Information and communication</li> <li>• User participation</li> <li>• Well-being, security and respect</li> <li>• Results for well-being &amp; mastery</li> </ul>	User surveys, Questionnaire
Management, control	<ul style="list-style-type: none"> <li>• Resources</li> <li>• Information</li> <li>• Established information and communication structure</li> </ul>	Questionnaires Interview and dialogue if needed
Stimulating work conditions	<ul style="list-style-type: none"> <li>• Availability and framework conditions (including resources)</li> <li>• Information and communication</li> <li>• User participation</li> <li>• Well-being, security, respect</li> <li>• Quality of life result</li> </ul>	
Cooperation and improvement effort	<ul style="list-style-type: none"> <li>• The municipality and suppliers have coincided expectations of the offer</li> <li>• Contracts / agreements with the municipality create motivation for further development of the offer</li> <li>• Collaboration with the municipality is crucial to succeed with the service offering</li> <li>• The municipality assists with the organization of services and orders from the municipality are clear/easy to handle</li> <li>• Collaboration includes relationships between: (a) the board and the municipality (administration and politicians) and (b) executive and the municipality</li> <li>• Board and executive</li> <li>• Established routines for improvement work</li> <li>• Registered needs for more or other activity needs</li> </ul>	
Efficiency improvement	<ul style="list-style-type: none"> <li>• Indicators are not directly defined, but here they can a compilation of data from municipal/ national data sources that can show trends overtime</li> </ul>	

## 5 Discussion

### 5.1 Partnership – increased interrelations

When developing new service models affecting partnership between municipality and private actors, it may be adequate to consider the difference between three concepts – competitive tendering, privatization and outsourcing.

In privatization and outsourcing the task ownership is transferred, in addition to transfer of

responsibility and finance to the market. In competitive tendering, the municipality is still responsible for finance and quality. Some studies indicate that competitive tendering varies in quality and effectivity gains. However, Norwegian experiences indicate reduced costs but are unsure about the quality. No evidence can prove that competitive tendering of welfare services implies reduced quality requirements by companies wanting to save costs (Moland and Borgen, 2001). A significant question is how quality is defined, measured and followed up by responsible public authorities. This question is further related to indicators; whether such are right defined, if they are developed and used, and whether they ensure conditions important to perceived quality.

### 5.2 Challenges developing PIs

One central challenge developing indicators was related to the diversity of partners and stakeholders. This may result in very complex indicators. During the research project, the complexity issue is tried solved by focusing on five central challenges when developing indicators and establishing a (PM) system.

(i) Identification of central factors and connections when establishing a service model. This may be human, technological or organisational issues, and/ or regulations of public procurement between public/ private/voluntary actors.

(ii) PM development related to complex systems included in a new service model. The variability of stakeholders implied that PMs had to be developed at several levels: (a) Users – elderly living at home and their relation, (b) Suppliers, and (c) Municipality/ action centre

(iii) Development of systems for data collection and reporting

(iv) Quality assurance and testing of indicators

(v) Implementing processes regarding all actors

### 5.3 Is the new service model resilient?

Which aspect of RE does the defined resilience-KPI measure? AS mentioned, Woods distinguish between four common usages of the term resilience. One question is what the defined KPIs in the presented study on a new service model do measure and anticipate.

The KPI labelled "robustness" is in accordance with how this is describes by Woods, i.e. a system designed to effectively handle known failure modes. It is not clear from the description of the KPI whether the indicator system include the ability to handle changes, surprises and troubles that are not foreseen. On the contrary, it looks like the performance indicators tries to cover known challenges regarding normal operation variations, e.g. competence, enough human service resources

available, in addition to cooperation and communication between actors representing different sectors (private, public and voluntary partners).

However, the service model includes cooperation and interrelations among several actors, and further development of the model and indicators could benefit from using RE concepts like *graceful extensibility* to cover events confronting surprises that challenges boundaries and resilience as a *network architecture*.

From a RE perspective the PM system should consider adding PIs to face crises and disturbances, Emergency preparedness planning, Training and qualification, Operation and Maintenance.

*Can the new service model of interaction cope with challenges, disturbances and surprises?* In adapting to new challenges, systems draw on their past but become something new. Facing current pandemic challenges, resilience may be regarded as the ability to continue operations when facing diverse conditions that may cause disturbances as well as opportunities, from both known and unknown parameters.

Resilient Engineering (RE) approaches on management, strategies and regulations need to be revised in light of disasters, catastrophes and pandemic. The Covid19 pandemic indicate that elderly may be particularly vulnerable. The pandemic is global and different nations, regions and individual companies. One question is how it is possible to increase the companies' anticipated capacity to handle surprises and challenges, e.g. available resources, change of roles and responsibilities, or support from and trust in governmental decisions and guidelines. Another question is how fast different levels of the community and organisations are to identify and quickly modify plans to respond to the changed premises, and further, how do they communicate and inform about of ongoing changes.

Rather than asking the question how or why do people, systems, organizations bounce back, this line of approach asks how systems stretch to handle surprises. To cope with challenges, the services should not bounce back to a normal situation determined by prior conditions. The actors and their interrelations should bounce forward and adapt to new and changed circumstances, and plan to meet new surprise, changes and crises.

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