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# Meaningful Technology for Seniors: Analytical Framework for Elderly-Care Service Systems

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**Abstract.** This paper introduces a framework to evaluate the impact of technologies in the elderly-care service systems. The subjective preferences of seven stakeholders in the service systems are considered as evaluation criteria in the framework.

**Keywords.** Elderly-care, Service system, Multi-actor framework

## 1 Introduction

Growing aged population causes serious impacts toward social welfare systems of multiple countries. The long-term sustainability of elderly-care has been questioned and a new model in elderly-care service systems is anticipated. Recent technological development for the elderly and elderly-care services in ICT and robotics domains is being considered as an effective solution toward this situation [1]. However, it is required to understand different, even conflicting technological / non-technological requirements of stakeholders and to adapt the technology to service systems, for successful technology implementation in the elderly-care setting to innovate services [2]. In addition, technological solution for elderly-care is required not necessarily for one country but also for the other countries with similar challenges. For global distribution of the technological solution, a comparative analysis scheme for technology implementation is expected.

In this paper, we introduce an analytical framework of elderly-care service systems. This framework is to analyze expected impacts and required processes to implement technologies for elderly-care. We aim at international comparison of different elderly-care service systems. This comparative study could contribute to technology development and implementation for different countries and innovation in care services to increase their sustainability.

## 2 Theoretical Background

In our study, we adopted service system perspective and multi-actor framework as the theoretical background. Service system generally consists of multiple stakeholders who relate and interact mutually to create value for them [3]. Technology is considered as one of resources to activate overall service systems [4]. In the socio-technical view, better fit between human activities and technological functions is expected [5].

Multi-actor framework refers to the nature of service systems including multiple stakeholders [6]. It focuses on understanding the dynamics and impacts of service innovation from the perspective of the different actor groups participating in service development. Particularly important are the characteristics and preferences of the actors. Especially for elderly-care services, the role of public sectors such as political organizations and non-governmental organizations is important in the innovation process [7].

In our study, we analyze the impacts of new technologies and services for the elderly, from the perspective of multiple different actors taking part to their development. We propose a framework which illustrates the relationship among service characteristics and each stakeholder's preferences. This framework provides an evaluation scheme to emphasize subjective values for each stakeholder, which could illustrate the impact of technologies to elderly-care service systems in a diverse manner.

## 3 Analytical Framework of Elderly-Care Service System

In this section, we illustrate the analytical framework of elderly-care service systems. Figure 1 shows a schematic image of this framework. This framework is based on the previously reported model by Määttä et al. [8].

Using this analytical framework, we will analyze the following points.

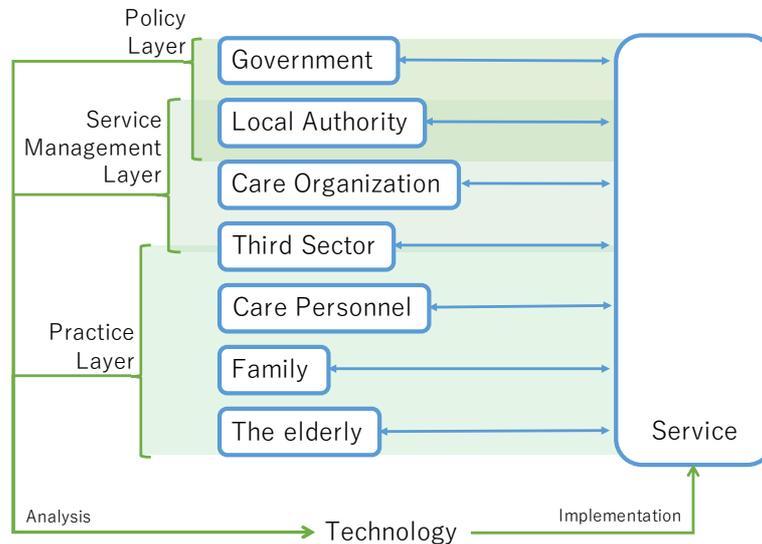
- Impact of technologies to services and following influences to the stakeholders
- Requirements for technologies according to their preferences
- Implementation process to innovate elderly-care service systems

### 3.1 Stakeholders

This framework consists of seven stakeholders. The previous model includes four of them (the elderly, family, care personnel and care organization) [8] and we extend three more stakeholders mainly for analysis of elderly-care policy.

#### **The Elderly**

The elderly are main beneficiaries of elderly-care service systems. They are also considered as main users of technology to sustain their independent lives [9].



**Fig. 1.** Analytical scheme for elderly-care service system

### **Family**

Family of the elderly supports them from various aspects. They have a variety of roles in care, such as emotional support, direct help and management of care [10]. They could also affect decision making in applying technologies for the elderly.

### **Care Personnel**

Care personnel is a professional worker to provide care services to the elderly. Care personnel is also considered as a main user of technologies for elderly-care.

### **Third Sector**

Third sector includes any voluntary or communal group to support care services or daily life of the elderly. Recently, the role of the third sector is emphasized under the concepts of community-based care [11] and some relevant ideas. Third sector can be considered as the third care work resource in addition to family and care personnel. Well-organized groups could have even significant impact on service management and policy making processes.

### **Care Organization**

Care organization represents a management position to provide care services to the elderly. Care personnel usually belongs to care organizations and provides services according to the care organizations' management decisions. Care organization can be public organization, for-profit company and non-profit organization. Although care or-

ganizations are responsible in their services and their financial results, their management decisions tend to be restricted by municipal and governmental law, regulations and other kinds of rules.

### **Local Authority**

Local authority such as municipality is responsible in elderly-care for citizens in its region. However, its role can be significantly different in each elderly-care service system, according to the previous report [2]. Local authority's role and activities are strongly influenced by government.

### **Government**

Government (and ministries) is responsible in the overall elderly-care service system and service provision to all the elderly and relevant stakeholders. All the other stakeholders in the service system are more or less affected by government decision-making.

## **3.2 Analytical layers**

In this analytical framework, all the stakeholders are correlated and influenced among one another. However, the strength of each influence can vary according to proximity and intimacy of stakeholders. We set three analytical layers to investigate direct interactions among certain stakeholders. Based on studies for each layer, we will integrate the overall influences among every stakeholder.

### **Practice Layer**

Practice layer corresponds to actual service provision at home or care facilities. The main stakeholders are the elderly, family, care personnel. Care organization's and third sector's roles are also taken into account. Technologies are directly implemented into this layer, so that the impact of technologies to the main stakeholders and their acceptability are major issues to investigate.

### **Service Management Layer**

Service management layer corresponds to management activities for care services in care organizations. The main stakeholders are care organization and especially in case of public care organization, local authority. The elderly, family, care personnel and third sector should be also counted in this layer. Technology implementation is usually determined by this layer. The impact of decision-making for the main stakeholders can be the main issue to analyze.

### **Policy Layer**

Policy layer corresponds to policy-making and execution process concerning elderly-care service system. The major stakeholders in this layer are government and local authority. Care organizations and the other stakeholders are also affected. This layer

mainly concerns overall elderly-care service systems rather than each individual technology. Therefore, the main focus is on how technology is positioned in the service system and how to disseminate its impact.

### **3.3 Research Methods**

Based on this analytical framework, we are conducting the following studies in both Japan and Finland.

#### **Practice Layer**

- Questionnaire study
  - Target: active seniors, informal caregivers and professional caregivers
  - About expectations toward care services and technologies
- Work study of care personnel
  - Interview study to clarify their way of work
  - Time-and-motion study of care personnel to collect their behavioral data at work
- Field test
  - Workshops / field test of care support devices / robots at care facilities
  - Tested devices / robots

#### **Service Management Layer**

- Interview study toward care organization
  - Interview about managerial view on current services, expectation toward technologies and current / future challenges

#### **Policy Layer**

- Literature study
  - Comparison of social welfare systems and institutions
- Interview study toward local authorities
  - Municipal / governmental view on care service systems and technology's role in them

Based on collected data, we will compare elderly-care service systems and requirements of stakeholders from the aspect of each analytical layer in both countries. Then we will clarify expected technologies and how to introduce them in the service systems to create innovation for sustainable care services.

## 4 Conclusion

Elderly-care in the era of super-aged society requires innovation for its sustainability. In this paper, we introduced analytical framework of elderly-care service systems to implement technologies for elderly-care in harmony with the requirements of stakeholders. We also introduce how we collect data based on the proposed analytical framework for the comparison between Japanese and Finnish elderly-care service systems.

We will report the analysis results based on collected data in the forthcoming report.

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