

# Determining Value in Welfare-Technology: The Need for a Multi-Perspective Framework

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**Abstract:** Background: Stakeholders in health and social care are implementing digital solutions to facilitate person-centred care for citizens. One problem is choosing which digital solution to implement. Ordinary cost-benefit analysis implicates the measurable parts of the value, leaving the immeasurable without any trace in an analysis. Results: We used design thinking to design a framework that implicates what to add as valuable factors on individual, organisational, and governmental levels. The design is based on empirical material from workshops and literature reviews on systems thinking, quality management, and value factors. The valuable factors at an individual level could include independence, autonomy, and empowerment, and the factors at the organisational level accessibility, competence, and independence. On a central level, the factors are related to person-centred care and its value proposals, such as autonomy and independence. Conclusions: While conducting a cost-benefit analysis, focusing on a standard definition of the value concept is essential. The designed framework needs to be dynamic due to the broad range of welfare technology. The created rubrics cube model, including strategic, organisational-operational and individual levels, should be used by decision-making groups as a flexible foundation. Forthcoming research will test this framework, including the proposed scale for measurement and focusing on welfare technology for older citizens.

**Keywords:** Value, Measurements, Person-Centred Care, Welfare Technology, Immeasurable

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## 1. Introduction

The paradigm shift to the person-centred care (PCC) model of health and social care is stimulating innovation in the organisation, delivery, and management of health and social care services and changing the relationship between individuals and their healthcare worker based on collaboration [1]. The PCC model is replacing the assembly line-disease-oriented model of care. The World Health Organisation (WHO) [2] defined people-centred health care as “an approach to care that consciously adopts the perspectives of individuals, families, and communities, and sees them as participants as well as beneficiaries of trusted health systems that respond to their needs and preferences in humane and holistic ways” (p. 1). The eight dimensions of PCC are: (1)

respect for patients’ values, preferences and expressed needs; (2) coordination and integration of care; (3) information, communication and education; (4) physical comfort; (5) emotional support and alleviation of fear and anxiety; (6) involvement of family and friends; (7) transition and continuity; and (8) access to care [3]. These dimensions reflect the importance of involving the patient and their family in planning and delivering care.

Transformation to a PCC approach is supported by digital technologies guided by both a pragmatic and value-based intent. Pragmatically, digital solutions aim to reduce costs for health and social care, improve diagnostic procedures, management of health, communication between patient and caregiver, and support independent living [1]. Value is added through digital solutions to make services more accessible,

collaborate, and provide individuals with tools and services to support independent living, thereby enhancing the quality of life [4].

Simultaneously, WHO has noted the need to strike a balance between technological solutions and human social connection. WHO has stated that digital health interventions should complement and enhance health and social system functions through mechanisms such as accelerated exchange of information, but will not replace the fundamental components needed by the health and social systems, such as the health workforce, financing, leadership and governance, and access to essential medicines [2]. Therefore, it is of high interest to understand which health and social system challenges can realistically be addressed by digital technologies and an assessment of the ecosystem's ability to absorb such value.

The complexity of evaluating welfare technology<sup>1</sup> – the basis of which is experience, behaviour change and valuation such as equality – makes it challenging to measure the value of the investment. Voices from municipalities echo concerns for expansion of assignment (for example, when a person's independence is supported, then health or social care workers' responsibilities are increased, but so is the value) and the need to increase knowledge and competence to apply welfare-technology successfully [5]. Thus, reinforcing the reality that achieving (and measuring) value through welfare-technologies is multi-dimensional, and not merely about the use of digital solutions. This complexity raises new questions about how to define and assess the value of welfare technologies that reflect a holistic perspective that includes the individual, the organisation and the system of care.

Measuring value requires knowledge, routines, accessibility, and being effective and useful. Ahlin and Snyder [6] emphasised the importance of understanding the value of welfare technology from a more comprehensive perspective in which all can seem outwardly similar, even though features may vary, adding complexity when it comes to the purchasing process. Health and social care agencies need to increase their understanding of included components in the term *value* and how to measure the value of welfare technology to compare products and features [7]. Traditionally, a measurable indicator has most often been used to explain and prove the quality and value of an investment, service or product [8]. However, this is just one part of the value equation, as digital solutions can also contribute to effective management and delivery of care, reduced stress on care workers, and cost-reduction for health or social-care systems.

In any health or social care system, resources such as staff or equipment are scarce [9]. Consequently, choices need to be made concerning the optimal use of resources, such as by considering the resources required and potential effects of different courses of action. When considering whether to implement a digital tool as an alternative to compensatory home care, the choice must take into account whether it is more costly than the usual approach and put that in relation to the effects that it may produce. Health economic methods can

guide such choices by considering the effects of different<sup>1</sup> interventions and their related costs. A health economic evaluation can ultimately guide clinicians and decision-makers on which intervention yields the most health benefit, given the existing resources. Therefore, to guide policy making, practice and future research, it is important to critically reflect on effects and costs to identify knowledge gaps.

Recognising this complexity, the Resolution on Digital Health [2] suggests a categorical framework in which to examine and develop e-health. The two broad categories – *digital health interventions* and *digital application* – frame six primary areas of development: client-to-provider telemedicine, provider-to-provider telemedicine, targeted client communication, health or social care worker decision support, digital tracking of the person's status, and provision of educational training. This WHO Framework (ibid) makes visible the complexities underlying the system of health or social care and reinforce the need to develop a more comprehensive framework to determine the value of welfare technologies. Such a framework should be designed to examine the interconnectedness of the components to achieve a greater understanding of designing PCC from a systems perspective.

The purpose of this paper is to propose a comprehensive framework for health and social care agencies to measure and assess the value of welfare technology to support person-centred care. The framework assumes a systems orientation in which value is determined at the individual, organisational and overall system of care levels. The proposed framework is intended to serve health or social-care agencies and governing bodies to determine quality of care against the economic investments made to support a shift to PCC.

## 2. Methodology

The framework presented in this paper is based on an interactive research design, using Design Thinking as a methodological approach. Interactive research [10] is a collaborative approach that partners researchers and practitioners to address complex questions to support innovation. Design Thinking [11] is a process for developing solutions to problems through a systematic iterative approach that invites exploration and exploitation of new ideas through five phases: empathising, defining, ideating, prototyping and testing.

The research group consisted of two university-based researchers and two representatives from the partnering

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<sup>1</sup> welfare technology is a broad term to reflect the application of digital solutions in the health and social care setting. Other terms are used and presented in research under state of the art, which reflect different approaches or dimensions in technology's use. *E-health* refers to using digital tools to exchange information to foster and maintain health, including physical, mental, and social well-being. *Telemedicine* and *Mhealth* are terms used when mobile devices support service delivery at a distance. In Sweden, the concept of "welfare technology" has been adopted to reflect a more comprehensive approach in which digital solutions are used to maintain and improve a sense of security, active engagement and independence for persons in high-risk groups or with functional disabilities.

municipality. Among the university-based researchers, one is a professor in quality management, and the other is a post-doctoral researcher in information systems. Representing the municipality was a development leader for health and social care services and a research and development director for health care service development. The university-based researchers provided theoretical insights and knowledge to develop the measurement framework and the municipality-based members provided insights into current needs and practices in the public sector for measuring and assessing value of services and investments related to welfare-technology and health and social care.

### 2.1. Research Questions

Three questions are explored in this study to inform a comprehensive framework for measuring and assessing value in welfare-technology-based person-centred health and social care: (1) What are the specific needs and challenges in measuring total value of solutions in welfare technology? (2) How is value in welfare technology determined and measured at present? (3) What factors need to be included in a comprehensive approach to measuring value in welfare technology?

### 2.2. Research Design

The study was carried out in two phases following the first two phases of Design Thinking. Design thinking is an interactive process carried out in five phases [11]. During Phase 1: Empathise, the intent is to observe, listen, and engage with the context or problem of interest. Data can be gathered from sources including documents, focus groups, interviews, and observations. In Phase 2: Define, the focus is on framing the problem by synthesising what is understood and observed in Phase 1. In Phase 3: Ideate, the focus is on brainstorming and formulating solutions that can be developed and tested. During Phase 4: Prototype, small-scale versions or parts of a larger solution are developed, and in Phase 5: Test: the prototypes are tested in real-life scenarios.

### 2.3. Data Collection (Empathise Phase in Design Thinking)

During Phase 1 of the Design Thinking method (empathise),

four workshops were held by the university-based researchers and municipality partners to develop an understanding of the current approaches used to determine the value of welfare technology, as well as to identify limitations in the existing practice. The format for the workshops was based on a focus group dialogue in which the two external researchers asked questions about the current models for measuring value, and the limitations and the ways in which a new system for measuring should be applied. Notes from the dialogue were written and saved in a Word document. A large whiteboard was used to visualise current practice and future needs as part of the interactive exploratory nature of the focus group design. Formal documents, including strategic plans, mission, goals and quality indicators, were examined as well. A benchmarking analysis was conducted to identify and examine additional models for measuring the value of welfare-technological solutions existing in other municipalities. Additionally, a literature review was conducted by three members of the research group to examine research on determining the value of welfare technology in health and social-care.

### 2.4. Data Analysis and Analytical Framework (Define Phase in Design Thinking)

Data from the four workshops held during Phase 1 were analysed by the four-person research team. Two analytical frames were used to bridge the gap between theory and practice: systems thinking and quality indicators and target-goals for PCC. Systems theorists have emphasised the interconnectedness of all parts in the organisation or organism that make up the whole [12, 13]. Within an organisational context, systems theory is expressed as a way of thinking about the relationships among people, resources, products, services, customer needs, and leadership, for example. Through the interaction of the parts, the entire system is guided and affected. As one component changes, the rest are affected accordingly.

In the present study, systems thinking was used to identify value-based factors at three levels: individual, operative and strategic. Examples are provided in Table 1.

*Table 1. Systems-level determinants of value.*

SYSTEM LEVEL	OPERATIONALISED
Individual level	The individual's health care plan
Operational-Organisational level	Health and social- care services and delivery organisational structures and routines and the organisational culture
Strategic Policy level	Policy frameworks, Program of care, Economic governance directives

*Table 2. Target goals and Quality Indicators for Social Welfare Programming.*

TARGET GOALS	QUALITY INDICATORS
Satisfied citizens	Accessibility
Proud employees	Fair and equitable treatment
Sustainable development	Influence
Balanced economy	Competence

The overarching target goals for the municipality are

presented in Table 2 and include satisfied citizens, proud employees, sustainable societal development, and a balanced economy. The quality indicators for social services are presented, including accessibility, fair and equitable treatment, opportunities to influence the care plan, and competence.

Data were analysed from the formal documents, literature review, and benchmarking analysis, using the case site as a reference point to understand and determine the feasibility of a

new potential model to measure value in e-health from a systems perspective. The three following research questions served to delimit the analysis: (1) What are the specific needs and challenges in measuring the total value of solutions in welfare technology? (2) How is value in welfare technology determined and measured at present? (3) What factors need to be included in a comprehensive approach to measuring value in welfare technology?

### 2.5. Case Description

The study is based on requirements from a mid-sized Swedish municipality with approximately 64,000 citizens. The sparsely populated municipality includes one city, with two smaller communities and a vast rural area. In addition to the responsibility for social care, including home care and special housing, the municipality's health and social care administration is also responsible for home healthcare for citizens with a high level of care needs, such as for citizens with extensive home care or special housing. Since 2019, the municipality has been a member of the global network of age-friendly cities and communities, which include a systematic approach to improve accessibility and inclusion covering areas such as housing, outdoor environments and societal services. In addition, the health and social care administration has had a strong focus over seven years on shifting from reactive to proactive approaches (such as health promotion and prevention) to promote health and social well-being among citizens. One facet of this work is e-health with a focus on digital solutions for older citizens.

As part of Sweden's goal to be a world leader in e-health by 2025, the municipality has developed implementation plans for digitisation, including for health and social care. There are many digital solutions on offer, so decision-makers need to have evidence to be able to prioritise among these solutions. The municipality has implemented several digital tools for citizens using home health care. Examples of solutions that the municipality is interested in are digital supervision (in contrast to personal home visits), digital calculation of nutritional intake and increased opportunities for social participation with the help of digital technology, such as GPS alarms. A focus for the digital development work in the municipality is that it is important to invest in solutions that can raise the quality of care and care for the citizen and the staff's working environment in a cost-efficient manner.

## 3. Results

The results from this study are presented in Part 1, derived from the first phase of Design Thinking (empathise), and address the first two research questions: (1) What are the specific needs and challenges in measuring the total value of solutions in welfare technology? (2) How is value in welfare technology determined and measured at present? In the second part of the results, we present a proposed comprehensive framework that addresses Research Question 3: What factors need to be included in a comprehensive approach to measuring value in welfare technology-supported PCC?

### 3.1. The Need for a Comprehensive Model to Assess Value in Health and Social-Care

The application of digital technologies in health and social-care has both a pragmatic and a value-based intent. Pragmatically, digital solutions aim to reduce costs for health or social-care [14], improve diagnostic procedures [15], improve the management of health [16], improve communication between individual and caregiver [17], support independent living [18], increase access to services [16], and help to engage individual more autonomously in their own care.

Digital technologies are also said to provide greater possibilities to meet the complex nature of health, which includes the physical, mental, and spiritual. From a value-based perspective, digital solutions aim to strengthen human connections and self-efficacy. However, as Ahlin and Snyder [6], have shown, digitalisation is complex, and technological challenges often get in the way of human connections. That study found the need to develop a social presence as an important factor in achieving a complete transformation and quality in health and social care through welfare technology that balances pragmatic aspects with value-based intent.

When examining models that reflect the areas in which digital technologies are impacting health and social care, it is interesting to note that the categories identified potentially maintain the current silo model of healthcare delivery. For example, the WHO framework [2] identifies four areas of application: the client, health workers, health systems managers and data systems. Studies such as those of Fadhil [19], Susło, Paplicki [20] and Hermann [21], as presented later in this section, focused on specific applications of technology as related to one of the primary target areas: client, health and social care workers, and management information systems. Fewer studies have focused on understanding what is needed for digital solutions to transform the system of health and social care that is pragmatic, social and value-based.

Elg, Gremyr [22] suggested the need for a systems perspective and argued that digital solutions impact internal structures, systems, and processes, as well as interactions between external factors making the "measurement" of value more complex. They recommend that measuring value should necessarily include the following levels of interaction: process level, organisational level, business domain, and societal level [23]. Olson and Olson [24] and Star and Griesemer [25] also demonstrated that collaboration through digital technologies requires knowledge and competence to achieve quality collaboration.

Snyder, Ingelsson [26] also pointed to the need to expand the models for performance measurement systems that are used in organisations to determine value and quality. The dominant performance measurement models are designed to measure efficiency and effectiveness. Such models are based on point-in-time analysis outcomes and focus on quantifiable factors. Such models ignore the processes used to carry out services, the norms and behaviours associated with the

organisational culture; and the relationship between knowledge, competence and quality of delivery. In a person-centred model of care in which welfare technology is a contributing factor to determining quality, it becomes imperative to consider the knowledge and competence of end-users of technologies as a measure of value. If one lacks the skills to access or use technology, then the deeper values of collaboration and empowerment are set up to fail. It is this balance between the hard and soft measures that challenges the need to move beyond “measuring the unmeasurable”.

Ahlin [27] described different strategies to measure unmeasurable quality factors, such as transforming the immeasurable value into a measurable value. The theoretical model in Ahlin [27] emphasised three steps in this transformation: (1) input, (2) rule and (3) output. The input step focuses on finding the quality factors, like pre-determined individual quality factors or areas of quality factors or

interpretations of quality factors. A scale can be used for this purpose when it comes to measuring PCC, such as a five-point Likert scale ranging from 1 to 5, implying the goal satisfaction that ranges from a very low degree to a very high degree. Other ways to approach the second step is by using theories, like boundary object [28]. The result from the transformation can be viewed in either financial or non-financial terms, according to Ahlin K [27].

### 3.2. Existing Approaches to Measuring Value in Health and Social-Care

A number of existing measures are currently used to measure value in health and social care. Table 3 provides examples of the more commonly used measures today. Among the measures, particular focus is given to quality of life and cost-benefit.

**Table 3.** Examples of measures of health developed for use in health-care services.

Value proposition	Instrument	Proposed by	Calculation
<b>Benefit</b>			
Health-related quality of life (HRQoL)/quality-adjusted life years (QALYs)	EQ-5D	Herman, Hopman [29]	EQ-5D includes the items mobility, self-care, daily activities, pain/discomfort and anxiety/depression, all self-rated on a three- or five-level scale, with higher scores indicating a worse health status.
Health-related quality of life (HRQoL)/quality-adjusted life years (QALYs)	SF-12	Jenkinson and Layte [30]	Includes questions related to whether activity restrictions are due to physical and/or mental health factors.
Health-related Quality of Life (HRQoL)	Quality-adjusted life years (QALYs)	Drummond, Sculpher [9]	Data on HRQoL and a time interval are combined (e.g., one year in full health is equal to one QALY)
Capability-adjusted life years	CALY-SWE	Månsdotter, Ekman [31]	
Equity-adjusted life years	No specific instrument	Lindholm, Rosén [32]	

Table 3 presents a range of instruments that exist to measure HRQoL, such as the EQ-5D [29] or SF-12 [30]. In health economic evaluation, HRQoL is often used as a basis for calculating quality-adjusted life years (QALYs) [9]. In the calculation of QALYs, data on HRQoL and a time interval are combined (for example, one year in full health is equal to one QALY). Thus, when comparing two alternative methods, the difference in HRQoL over time can be expressed as the amount of QALYs gained. Whereas any given instrument used to measure HRQoL or to calculate QALYs has its unique foci, including some facets of HRQoL, other facets may not be included.

As an example, EQ-5D includes the items mobility, self-care, daily activities, pain/discomfort and anxiety/depression, all self-rated on a five-level scale, with higher scores indicating a worse health status. In contrast, the SF-12 includes questions related to whether activity restrictions are due to physical and/or mental health factors. In contrast to both EQ-5D and SF-12, which are focused on HRQoL, examples of other approaches include capability adjusted life years [31], in which the quality of life measure is based on capabilities such as health, social relations, financial situation; and equity-adjusted life years [32], in which the distribution of health gains in a population needs to be considered in contrast to focusing only on health maximisation. Whereas equity has received substantial

interest in the literature, there is no clear methodology for how to address equity in decision making [33].

In health economic evaluation, different health measures are used in combination with economic analysis to determine the cost-effectiveness of services. For example, when two interventions result in the same effect on the health outcome evaluated (such as improved independence in carrying out daily activities) and the only difference is the cost, a cost-minimisation analysis can be undertaken. Thus, how the cost is identified, measured, and valued is a critical feature that needs to be clearly described in all types of health economic evaluations.

A range of costs can be included for this type of analysis, such as (a) direct costs related to the provision of the intervention, (b) other health and/or social care-related costs (admission to hospital, home care use, medications, etc.), (c) private costs (transportation, equipment, etc.), and (d) productivity that is the value of formal or informal work or caregiving). A variant of cost-effectiveness analysis is cost-utility analysis. The specific feature of a cost-utility analysis is the use of quality-adjusted life years (QALYs), including a combination of the time perspective and health-related quality of life (HRQoL). Some commonly used instruments to measure HRQoL are EQ-5D and SF-12. In the calculation of QALYs, data on HRQoL and a time interval are combined (for example, one year in full health is equal to one

QALY).

The above-mentioned approaches and measures currently used in health or social-care systems to determine value reflect an effort to balance individual gain with economic costs. The growing complexity of designing health and social care services using digital technology now calls for a more comprehensive approach. The inherent characteristics of patient-centred care, which include participation and empowerment of the patient, render the equation of determining value complex, and multi-perspective determined. The co-creative relationship between patient, caregiver, and health and social-care system suggests that value needs to be considered from all stakeholder perspectives. This raises the question, “is a standard cost analysis combined with the quality of life sufficient to determine the value of services for enhanced empowerment, participation, and self-of autonomy among patients?”

### 3.3. Concretising Value from a Systems Perspective

Understanding the concept of value as a measurable construct and variable in determining quality is a complex process. In this section, we explore different definitions and approaches to conceptualising value from multiple perspectives, including monetary, human-social, service quality, and customer satisfaction. In some cases, value is presented as a single entity, an “it” that can be calculated mathematically. In other cases, value is suggested as an interdependent variable whose meaning is given in a context. Thus, measuring value within this perspective suggests the need for a different approach than a purely mathematical one.

#### *Approaches*

Ahlin [7] suggested that there are several ways to understand the value as a concept in relation to digital solutions. The *first* is the monetary value of a resource, related to how to measure its benefits. Those measurements are often made in the difference between its estimated benefits and its costs and named return-on-investment, or net present value. As viewed, for the monetary value, the term benefit is often used interchangeably with the term value.

The *second* way of understanding the term value is the price you can value a resource at compared to the price you paid for it. Here, one way is to determine the intrinsic value, which is the value of the resource as is, omitting its market value [34]. Another way to understand worth is that the value in the eyes of the beholder; this is called subjective value theory [35]. Different beholders intend to pay different values, resulting in a resource that can have several values. This theory puts the power in the hands of the customer [36].

The *third* perspective is that of standards of behaviour or the judgement of good behaviour. The behaviour can be expressed in terms of values, norms, and routines [37]. Therefore, value depends both on the individuals as well as the organisation when it comes to creating success or barriers. One barrier to standard behaviour is individuals’ behaviour, which can create barriers to implementing digital solutions and diminish the financial value of such an implementation.

### 3.4. The Subjective Nature of Value

Carnwath and Brown [38] reinforced subjective value theory and stated that “value is not inherent in objects or events but is attributed to them by the beholder” (p. 55), suggesting there is an intrinsic component to the value that needs to be considered. Others share this view, such as Brown and Novak-Leonard [39] and Holden [40]. Carnwath and Brown [38] suggested that value is in part a time-based concept to which meaning can be given over time. Their framework would suggest that exploring the value at the organisational level may require an element of time in order for the individual users to go through different levels of potential impact. Their work is developed within the context of arts-based practices; however, the concept of time and intrinsic value are universal.

Others have reinforced the subjective nature of value as experienced in relation to the factor of time. For example, value can be long-term and occur years or even generations later [41, 42]. The greater the changes, the more difficult it is to predict the effects and the value. Furthermore, it is not just a change that happens on a single occasion, but one that has just begun and continues [41]. For example, the value can be completely different in the long term due to a learning and adjustment curve [42]. This can cause the fair value to be missed and the information to be deemed useless, leading to incorrect decisions. Therefore, one way to describe value is to split it into the actual and future values to give foresight and adaptability [43]. Chircu and Kauffman [43] also mentioned that describing future values is difficult due to the time perspective. Akkerman and Bakker [44] declared that welfare-technology is used differently by the stakeholders at various periods, adding to time complexity.

Meynhardt, Chandler [45] argued that “value” as an ontological construct requires a different approach where measurement is concerned. In their thesis, value is seen as a system component experienced and expressed in the interplay between the micro and the macro. In their proposed framework for studying value, they applied synergistic theory to explore “the dynamic interplay between individual and collective value” (p. 2983). Carnwath and Brown [38] explored the interplay between intrinsic value and instrumental value, suggesting that these two components interact to form a systemic transfer of the experience to transformation. This reinforces the notion that defining and measuring value at the organisational level is complex and needs to take into consideration the interplay between individuals, teams, and organisational structures and processes [40], recognising them as a system.

Meynhardt, Chandler [45] also argued for the need to understand value as a construct within a system. Using synergistic theory, they suggested that value is situated and is simultaneously an individual and collective phenomenon, an interplay between the micro and the macro within a system. Thus, understanding value requires that any exploration takes place within the situated context. This perspective suggests that the value of something cannot be measured in isolation or

at one level. Using an ecosystem model, the researchers suggested that there is an important relationship between the micro-level in which a value is first identified (that is, through experience, emotion, affect), which is reinforced or “destabilised” through feedback. When feedback on an experience is positive, the value is strengthened and reinforced at both the micro and macro levels, maintaining the ecosystem. When an experience challenges a perceived value at any one level, the value is compromised. It is within this interplay that value becomes a mechanism for change and development.

Measuring and assessing value in welfare-technology-supported PCC potentially involves a paradigm conflict. On one hand, value is driven by new relationships between citizens and caregivers; it is also reflected in the relationship between individual health and societal health. On the other hand, value is driven by economic factors, such as resource allocation, staffing, allocated contact time with patience balanced with completing paperwork, travel and the like. Thus, determining value becomes multi-dimensional, reflecting components of softer elements based on experience and perception with measurable variables such as time and cost for services. This is considered from a systems perspective in which value is perceived as dynamic and contextualised. Conceptualising value from a complex, dynamic perspective provides deeper insights for communities and systems of care to consider when determining how to measure and describe the value of a

welfare technology solution.

### 3.5. Measuring and Assessing Value from a Systems Perspective

In this section, we address the third research question regarding which factors to include in a comprehensive approach to measuring and assessing value in welfare technology-supported PCC are explored. The factors have been identified within a systems perspective that includes three levels: the individual, the operational and the strategic levels. These levels have been identified through the literature and needs assessment presented earlier in the results section. The three levels are described below in relation to Figure 1. Following this, a model is visualised in which value indicators for the various levels are reflected.

Figure 1 depicts different stakeholders grouped within different levels from individual to organisational and the overall governing system. The individual level includes stakeholder groups such as citizens, patients, caregivers, and family members. The operational/organisational level can also be defined as the operative level in which formal programs and structures are designed to meet the needs of individuals and the goals of the strategic planning that is articulated at the systems level. The strategic level reflects both overarching policy documents as well as the guiding principles that surround the programming at the organisational level (that is, welfare technology).



Figure 1. Example of factors associated with different value perspectives.

### 3.6. Strategic Level

This level reflects the overall governing and steering level of the system. Policy directives at the highest level that are

then interpreted and put into practice at the operational level reside at this highest level. At this level, types of impact on systems of care and society are also represented, including environmental impact, economic impact, and social impact.



These forms of impact have been derived from policy documents that articulate the goal of PCC and welfare technologies to contribute to improvements in sustainable development challenges, both environmental and social in nature. As part of the goal of welfare-technology there is also an articulated aim to reduce economic burdens to municipalities while enhancing the quality of care.

Dimensions related to the strategic level in the proposed framework to assess the value of welfare-technology-supported PCC are derived from the national policy that was subsequently articulated by the partnering municipality. Four main strategic goals were identified as presented in table 4. The four include satisfied citizens and patients, proud workers, environmentally sustainable solutions, and a balanced economy. Combined, these four goals reflect a system's view that is required to achieve quality in PCC. Services need to be designed to satisfy patients, as well as society. In other words, their improved patient outcomes should have a positive impact on the quality of life for citizens in general. To achieve this, it will be important for workers to be healthy and proud of their work and feel that they are making a difference in the lives of individuals. Solutions for care should also consider the environmental impact in the short term and the long term. All this should be connected to a balanced economy.

**Table 4.** *Strategic level goals and indicators for quality.*

Satisfied citizens and patients
Proud workers
Environmentally sustainable solutions
Balanced economy

### 3.7. Organisational-Operational Level

This level of the model represents the organisational infrastructure around which services are designed and delivered. In this study, we use a model from total quality management to identify key factors necessary to achieve quality of product and service delivery. Quality Management is an approach to organisational development based on a systematic process that connects customer needs, organisational values and goals, with strategic planning and

organisational culture and structures to continuously improve services and products for customers and stakeholders [46]. Quality management is guided by a set of core principles that work interdependently to ensure customer satisfaction and goal attainment [47]. Among the fundamental principles are: 1) customer satisfaction, 2) leadership-driven change, 3) systems theory and action, 4) strategic planning, 5) continuous training, 6) continual improvement. A quality management system functions as a support mechanism for organisations in which information is documented systematically and used as a basis for identifying strengths and areas of improvement.

In recent years, digitalisation and service design have expanded traditional approaches to customer satisfaction to focus on value co-creation. Rather than designing services to meet customers' needs, service design aims to engage the customer in identifying needs and designing service solutions that best fit their needs [48]. Galvagno and Dalli [49] define co-creation as the joint, collaborative, concurrent, peer-like process of producing new value, both materially and symbolically." (p. 644). Creating conditions for collaborative innovation, is according to Leavy [48] "the new imperative" emphasising among other things value co-creation and the importance of engaging people as active collaborators.

Significant for developing a framework for assessing the value of welfare technology-supported care with the PCC model will be how the organisational infrastructure is designed and supported by the organisation's culture (values, norms and behaviours). This includes the alignment of processes, resources, knowledge goals, work functions, behaviours, attitudes, and values.

In table 5 below, examples of dimensions associated with the organisational level are identified. In the left-hand column the dimensions relate to key functions, processes and cultural dimensions from total quality management. In the right-hand column four value-based goals are included derived from the municipality. These are intended to serve as an example of the type of values and goals that can be included. Measuring value based on this table would include an examination of the organisational practices that are implemented to achieve accessibility of care, fair and just treatment, competent workers, and independence for individuals.

**Table 5.** *Quality parameters: Organisational level.*

Quality parameters: Organisational level	Organisational level Value-based goals
Identified customer needs (internal/external)	Accessibility
Strategic plans, vision, goals and values	Treatment
Decision making process	Competence
Information systems	Independence
Work processes and infrastructure to support participation and engagement	
Competence development	
Worker health	
Leadership	
Processes for continuous improvement	
Quality culture	

### 3.8. Individual Level

Our starting point when valuing welfare technology is the

perspective of PCC, described as an approach and way of working. The individual is then actively involved in his care, self-care and the decision-making process. The starting point is that the individual has feelings, wishes and needs and



should be involved in his care and treatment. The individual is an expert on their health and should also be seen as people, not just their illness. This expertise should be used, especially when it comes to decisions. Each individual has their resources, interests, needs and responsibilities in situations that concern them. Therefore, the care staff must adapt the services to the individual's resources, needs, and goals.

PCC involves a shared understanding and agreement: 1) about what is essential for the individual, to set goals that include what health and quality of life mean for the individual,

2) the professional assessment and guidelines for care that include evidence-based care and national/local routines. The individual's story is crucial for PCC when identifying personal goals, needs, preferences, values and resources, and the perception of their role in care (SIS, 2020). The care staff's responsibility is to understand the individual's goals, knowledge, self-ability, and self-confidence. According to the table below, personal involvement can occur at different levels.

**Table 6.** *Quality parameters for the individual level.*

Quality parameter	Individual	
Independence	Stand on your own feet, A goal higher than practicalities, Control and influence, understands and is able to participate in society and its situations, Quality of Life and active choices, The experience of getting help, Doing things on your own	Nero and Svensson [50], Corbett [51], Dworkin [52], Socialstyrelsen [53], Erikson and Blanck [54], Danielsson and Lovisa [55]
Autonomy	Free, independent, own life, act without influence from others, independence, manage without anyone / anything	Nero and Svensson [50]
Participation	Participation in society, Participation in activities	Gustafsson and Sandsjö [56]
Dignity	Something given in the situation, Live according to your values, access to choose and self-determination in everyday life	Soldatos, Kyriazakos [57]
Safety	the condition to be protected from or unlikely to cause danger, risk or injury, The feeling of being protected	Zander, Johansson-Pajala [58], Stokke, Melby [59]
Empowerment	older caregivers' authority and demands to increase their independent autonomy and control, Control, awareness and participation.	Frennert [60], Wass and Safari [61]

In Table 6, key quality indicators have been identified through a literature review that represents core dimensions for developing a value-construct within PCC. This is important to inform a more comprehensive framework for measuring and assessing value in welfare-technology-supported PCC. Six main quality parameters impacting the individual are identified: independence, autonomy, participation, dignity, safety, and empowerment. Determining quality in PCC necessarily needs to include a measure of the perceived value experienced by both patients and caregivers. For example, if the presence of digital technologies does not enhance a patient's independence and sense of autonomy, the value of the digital solution may be determined invaluable. Others may perceive an increased sense of independence and at the same time a lack of participation due to a sense of being disconnected.

These potential scenarios suggest that determining value also requires an understanding of the knowledge and competence of technology use, as well as other operational level factors such as communication, access to technology, and routines for delivery of care for example. Recent studies have focused on value-based drivers in health and social care, such as accessibility [62], improved quality of communication [63], and digital literacy [20]. These studies reinforce the complexity of factors that need to be integrated into a model for determining the value of welfare-technology from a systems perspective. This is in line with other research in quality management and health and social care that argues for more holistic frameworks to examine value and value creation from a variety of roles and the dynamic interplay between

internal and external factors [22, 23].

### 3.9. A Proposed Framework to Measure and Assess Value in PCC

In this final section, we propose a way to think about measuring value in the complex landscape of welfare-technology supported PCC. The intention of this framework is to unleash mental models for measuring value in the current complexity of health and social care. In so doing, it becomes possible to measure the once "unmeasurable". This proposed framework makes visible the different levels of value that are important to include. The framework is intentionally dynamic to make room for each municipality to determine the contents of a useful system for measuring value based on their unique goals and context.

Figure 2 is presented as a three-dimensional cube, envisioned as a rubiks cube. The contents in each of the cube's squares are value factors associated with each level. The framework is envisioned as a rubiks cube to suggest the dynamic and complex nature of measuring the value of welfare-technology supported solutions for PCC. Each one of these factors can alter the way in which value is measured (the measurement tools and methods), and is therefore also flexible to meet different decision-making needs.

For example, there are environmental and economic value-based considerations to include. When combined with organisational factors such as communications systems to enhance access to services for persons in rural communities, the measurement model also needs to consider the infrastructure for communication and how it is implemented.

Competence among both workers and patients using the services will also need to be considered. As well, the perception-based value of a sense of participation or independence, for example, should also be considered. Identifying the areas within each level that are included in the definition of “value” for a particular initiative, service, or

intervention, can help decision-makers to identify an appropriate measure that should be included in the approach to determining the value in question. One way to illustrate appropriate measurements is the table 7, which could a foundation for stakeholders when it comes to welfare technology.



**Figure 2.** A systems perspective framework for determining the factors to be included to determine the value of welfare-technology-supported PCC.

**Table 7.** Template for stakeholders for measuring value of welfare technology.

	Quality factors	Economy in balance	Environmental sustainability	Proud co-workers	Satisfied citizens	Measurement
Strategic level	Healthy communities Improved health care Sustainable society Improved economy					
Operational level	Information driven decision-making Customer-oriented services Competent health care workers					
Individual level	Quality of life Independence Participation Accessibility Safety Competence Dignity					

While many decision-makers may request a simpler approach to measuring value, we suggest this is unrealistic if aiming to determine the value of welfare-based technological solutions for PCC. The very nature of these two objects (welfare technology and PCC) renders the need for a multi-measurement approach to determining value; one that is also dynamic. For example, when using the framework presented in figure 2, If you change the value for one component how does it impact the value for the other dimensions? It is a dynamic, system orientation that is affected.

It is perhaps too challenging to address all elements of a system at one time, which means that at certain times components are selected. It is then the responsibility of the decision-making group to determine which factors should be included at any one point in time.

## 4. Conclusions

In this article, we addressed the complex question: how the value of welfare-technology-supported services can be assessed

within a person-centred model of care? This question was provoked by the phrase “to measure the unmeasurable”, which was to suggest that a paradigm shift for measuring value in health and social care in an age of welfare technology and PCC is essential. If health and social care systems continue to measure the value and effect of services, programs and interventions by simple quality of life measures, perhaps combined with cost measures, vital information will be missed.

The paradigm shift to PCC changes the equation for determining both outcomes and value. No longer are units of assessment based on the number of days in a hospital or percentage of prescription medications sufficient as indicators of quality health or social care. PCC calls for a new relationship between patient and caregiver, which introduces factors such as perception, behaviour, and experience as components of quality of care that are added to the equation. As well, new organisational infrastructures that are supported by digital technologies introduce the need for digital competence among both patient and caregiver.

To address this complex picture, it is important for the concept of value to be defined and understood within a system view in which multiple perspectives are integrated. In so doing, factors that make up the multiple views of value and what is quality in health and social care can be more easily identified. The framework proposed in this article identifies critical factors from three broad levels of the system in which multiple perspectives are reflected. Among the levels are strategic, organisational-operational and individual levels. The framework is just that, a framework whose content can be adapted to different contexts. Significant to the framework is the dynamic nature reflected in a rubrics cube model, and the possibility this invites decision-making groups to determine appropriate forms of measuring depending on the focus. Creating a “one-size-fits-all” model for determining value in a complex system that is characterised by both hard and soft measures is unrealistic. Of importance is to provide a framework and a way of thinking about assessing value to make it possible to “measure the unmeasurable”.

## Declarations

### Competing Interest

None of the authors have competing interest.

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### Authors Contribution

K. A., K. S., and M. Z. wrote the main manuscript text, and KS prepared the figures. H. S. contributed with all domain knowledge. All authors reviewed the manuscript, and all have read and approved the final version of the manuscript.

### Data Availability Statement

The datasets generated during and/or analysed during the current study are available from the corresponding author upon reasonable request.

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