

Person-Centered Data Model in social and health care customer management: Creating value through the Quintuple Aim

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Abstract

In Finland, social and health care information management has been harmonized over the past ten years, especially with the development of recording patient and client information. However, the client and patient information systems in use by the organizations do not sufficiently support the information needs of customer management or guide individual but consistent client and patient processes.

This case study examined customer management and value creation using the Person-Centered Data Model (PCDM) developed in the Finnish wellbeing services county of Kanta-Häme. The aim of the research was to understand the usability of a data-based customer management model and to identify the factors affecting value creation. In this study, customer management includes both the utilization of available information, and the practices used to identify customers' service needs and organize services suitable for them.

The research findings are based on semi-structured expert interviews conducted in the case organization, documents from the case organization, and a survey administered to the interviewees. The interviewees were gathered with snowball sampling in such a way that the interviewees suggested other interviewees who were experts in the subject area. The interview data was analyzed using theory-driven content analysis and the survey data was examined using the means (M) and standard deviations (SD) of the responses.

This study found that a model based on PCDM is central to the organization's information management and customer management. The model collects the information needed to provide the services and connects it to the individual customer, supporting customer management in the customer relationship management system (CRM). The CRM system uses PCDM and works to support professionals, improving customer experience and the allocation of resources. This study identified factors both promoting and hindering value creation. Promoting factors were, for example, the importance of strategy and available information, while hindering factors were, for example, operational models and lack of data. PCDM can support effective social and health care in accordance with the Quintuple Aim principles.

Keywords: patient care management, data aggregation, data systems, systems integration, value creation

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Introduction

Value has become the most important development and evaluation target in healthcare [1]. Along with the widely used concept of Value Based Health Care [2], the Triple Aim model [3] emerged in 2008. The Triple Aim emphasizes three principles for improving healthcare: improving patient experiences, improving the population's health outcomes and improving cost effectiveness. The Triple Aim model became the Quadruple Aim model in 2014 [4] by adding the fourth theme, employee well-being at work, and the latest version, Quintuple Aim, was born in 2022 [5] when the fifth factor, equity, was added to the model.

In Finland, social and health care information management has been harmonized over the last ten years, especially with the development of patient and client information recording and the introduction of national information recording structures. With the mobility and availability of social and health care data, it is possible to streamline the work of professionals, develop services, free up the workforce for more productive work, and achieve significant cost savings [6]. Especially with the well-being services counties, the social and health care database that can be utilized has improved and organizations have gained better opportunities to use data for different needs [7,8]. The dimensions of information management and information utilization can be considered to include, for example, national coordination and regional cooperation, regional organizations' own decision-making and cooperation between professionals, and data-driven planning of service chains [9].

Recent studies [10-12] have shown that the shortcoming in the information systems in use in Finnish social and health care is that they do not sufficiently support the needs of professionals working with individual patients and customers. For example,

social services client information systems serve poorly in terms of providing professionals with the tools they need to understand cases in their entirety and form comprehensive knowledge for their practice [10]. The client information systems used in social services do not support the flow of information [10], the roles of customers or do not offer decision-making support [11]. In the healthcare field, the nurses feel they have little support for co-operation and information flow [13] as well as for the ability to view patient information in a summary view [12].

The starting point of this study is the assumption that the utilization of existing data in the organization's customer management supports effective social and health care and value creation in accordance with the Quintuple Aim principles. However, this might require information systems especially developed for customer management. Technology is important in supporting work processes, but it is also essential to pay attention to critical interplay between tasks, structure and people integral to this transformation [14].

Key concepts

In this study, the factors affecting value creation were investigated while utilizing the Person-Centred Data Model (PCDM) [15,16], which is based on previous research [17] and publication [18]. PCDM was developed in the case organization in the interaction of people, data and technology, in support of efficient customer management.

The key concepts used in the study are customer management and value creation. Customer management is used as a key concept for patient and client management in an integrated social and health care organization. Customers here mean patients of health services and clients of social services. The individual person can be at the same time

a patient and a client. A customer is “a body acquiring or receiving services” [19]. Customer management is implemented in public social and health care organizations at different levels [11]: in monitoring, directing and planning the organization of services (management level), in the planning, implementation and evaluation of processes specific to customer segments (segmentation level), and in the management of individual patients and customers and the organization of their services (individual level). Customer management includes both utilization of available information and practices for identifying customers’ service needs as well as organizing services suitable for customers in the best possible way. Customer management systems, usually called customer relationship management systems (CRM), can be used to support the service processes of individual patients and clients, but also for improving experiences, optimizing workflows and advancing business intelligence [20,21].

Social and health care organizations can be interpreted as socio-technical systems [22]. These systems include the people, structure, tasks, data and technologies of organizations. One of the goals of the socio-technical approach is to enable the organization to learn and adapt a flexible way of working in a constantly changing environment [23]. The adoption of a socio-technical approach has had implications for the development and evaluation of IT applications in work practices and for the way healthcare uses information systems in its organizations [24]. According to the socio-technical

systems theory [23], value is created in the joint interaction of the social and technical systems.

Socio-technical system development includes three phases [25]: 1. design, 2. implementation and 3. operation of socio-technical system. This study concentrates on the value creation processes of the design and implementation phases. Value is interpreted as being generated in accordance with the Quintuple Aim principles [5] through interaction of the social and technical subsystems. The Quintuple Aim is based on five core interdependent aims: 1) improving patient experience, 2) improving population’s health, 3) reducing per capita healthcare costs, 4) improving professionals’ well-being and 5) improving health equity.

When planning and implementing new systems, it must be considered that the design is an activity that extends over time and continues beyond system implementation and throughout use [26]. After the system is implemented, its development to meet the needs of operating models that support value creation must be continued [27]. Value is created or hindered by the interaction of social and technical factors because the social context of work is critically related to the technical component and, as a result, these two subsystems constantly influence and change each other [24]. The concepts used in the study and their relationship to each other are presented in Figure 1.

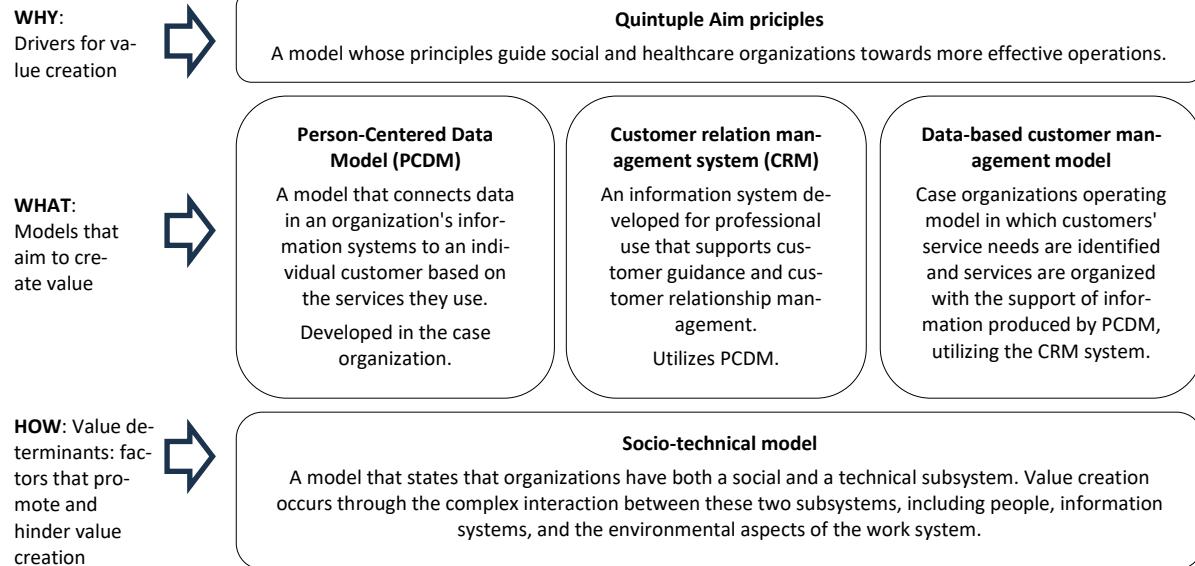


Figure 1. Concepts used in the study and their relationship to each other.

Aim and research questions

The aim of the study is to understand the *usability* of a data-based customer management model and to identify the *factors behind the creation of value*. The research questions of this study were:

RQ 1 How is the PCDM used in the organization's customer management?

RQ 2 Which value determinants, promoting factors and hindering factors of value creation are identified regarding customer management that utilizes the PCDM?

Material and methods

This case study examined the utilization of a PCDM in customer management, developed in the well-being services county of Kanta-Häme. This is a unique way to use the organization's data register on the different levels of customer management. The well-being services county of Kanta-Häme has the responsibility for organizing healthcare, social welfare and rescue services for about 170 000 citizens

of the region [28]. This case organization was selected for the study because it's strategy is highly customer-oriented. The goal is to offer equal services to customers and utilize customer data better so that customer needs can be understood and met more efficiently [29]. However, as is generally the case in Finnish public social and health care, the information systems and operating processes used by the case organization do not sufficiently support a smooth customer process, which makes it difficult to achieve the goals recorded in the strategy.

To implement the strategy, the organization has developed a unique PCDM (Annex 1), which will act as a key factor, especially in support of customer management. The idea of the PCDM is that all information recorded and produced in the social and health care organization can be combined with the ID (personal identification number, Social Security ID) of an individual citizen in the data lake: social and health care client and patient data as well as related service data, such as visit and department cycle data. The data also includes cost data and quality data related to the provision of services

such as customer satisfaction surveys (for example Patient Reported Outcome Measures, PROM, and Net Promoter Scale, NPS).

In Kanta-Häme, customer understanding is mainly based on individual professionals, which leads to uneven and delayed service. In addition, the organization's operations have various information needs that current systems cannot fulfill. Operational processes must be harmonized so that services can be offered with uniform quality and efficiency. The organization's goal is to introduce a customer relationship management system (CRM) that uses PCDM data from the data lake on a large scale, which supports the harmonization of customer management operational processes. With the help of the data model, it is possible to divide the customers into segments, to view the transactions and service paths of an individual citizen, and to compile data for reporting on a broader level.

Data collection and data analysis

The research material is based on five semi-structured interviews, case organization documents and a survey for the interviewees. Interview was chosen as the data collection method because it is a flexible and efficient way to gather information about the phenomenon under study [30]. The interviewees were gathered with snowball sampling [31] in such a way that the interviewees suggested other interviewees who were experts in the subject area.

The interviews were carried out in September 2024. Five interviewees from the organization's management and development services, who stand out for their knowledge, participated. The duration of the interviews was 30-60 minutes each. The themes of the interview covered the organization's goals and strategy regarding customer management, the use of a PCDM in customer management, and the role

of CRM. In addition, promoting and hindering factors in reaching the goals were discussed.

The interviews were transcribed, and the material (343 codes) was analyzed using theory-driven content analysis [30]: reduced, clustered, and abstracted, conceptualized and connected to theoretical concepts. Secondary sources, the organization's documents [15, 16, 28, 29], were used to supplement the purchase of interview material. In the interpretation of the data, the themes and categories were derived from the data, and in the analysis phase, these themes and categories were mirrored in the Quintuple Aim model and socio-technical systems concepts.

After the first analysis of the data, the data was supplemented using the triangulation method, that is, a survey was sent to the interviewees to obtain clarifications and additions to the original interviews [32]. The survey aimed to gain insight into whether there are significant differences between the various factors influencing value creation in terms of the significance of the factor and the likelihood of its impact. Both were examined in the short term (0-1 year) and the long term (1-5 years). All five interviewees responded the survey. The survey results were examined using the means (M) and standard deviations (SD) of the responses. The results were summarized by using Force Field analysis, which is used in particular in organizational change situations, strategic planning and decision-making [33]. It can be used to map which factors support or oppose the change and what measures can be taken to change the balance to support the change.

Results

The role of PCDM in the case organization's customer management

It was found that the role of PCDM in the case organization's information usage and management according to the strategy, especially in customer management, is central. Based on interviews and organizational documents PCDM collects the information necessary of the production of services and connects it with the individual customer. This information is used to support customer management in the CRM system in assessing the customer's service needs and organizing services. The data model also produces data for the business information system that is used in the management of the organization, and data can be submitted to national data collection.

The role of CRM in the case organization's customer management

The CRM system uses PCDM data and functions as an enterprise control system that supports the

professional's activities and guides the professional responsible for the patient or client. Common tools are the snapshots of the customer's situation, summary views, notifications and the segmentation information. The professional can serve the customer more smoothly and in a timely manner with the help of the service catalog in the CRM and by using the consulting functionalities. The system supports both customer and employee experience, when the customer gets the right guidance and wasteful work is eliminated. This supports the allocation of resources and the continuity of service and care. Both individual needs and equity can be supported with the help of available information and uniform operating models controlled by the system.

As a result of the study, it seems that customer management utilizing a PCDM can support effective social and health care in accordance with the Quintuple Aim principles. The importance of the CRM system in the operation according to the Quintuple Aim principles is based on the support provided by the CRM's functionalities (Figure 2).

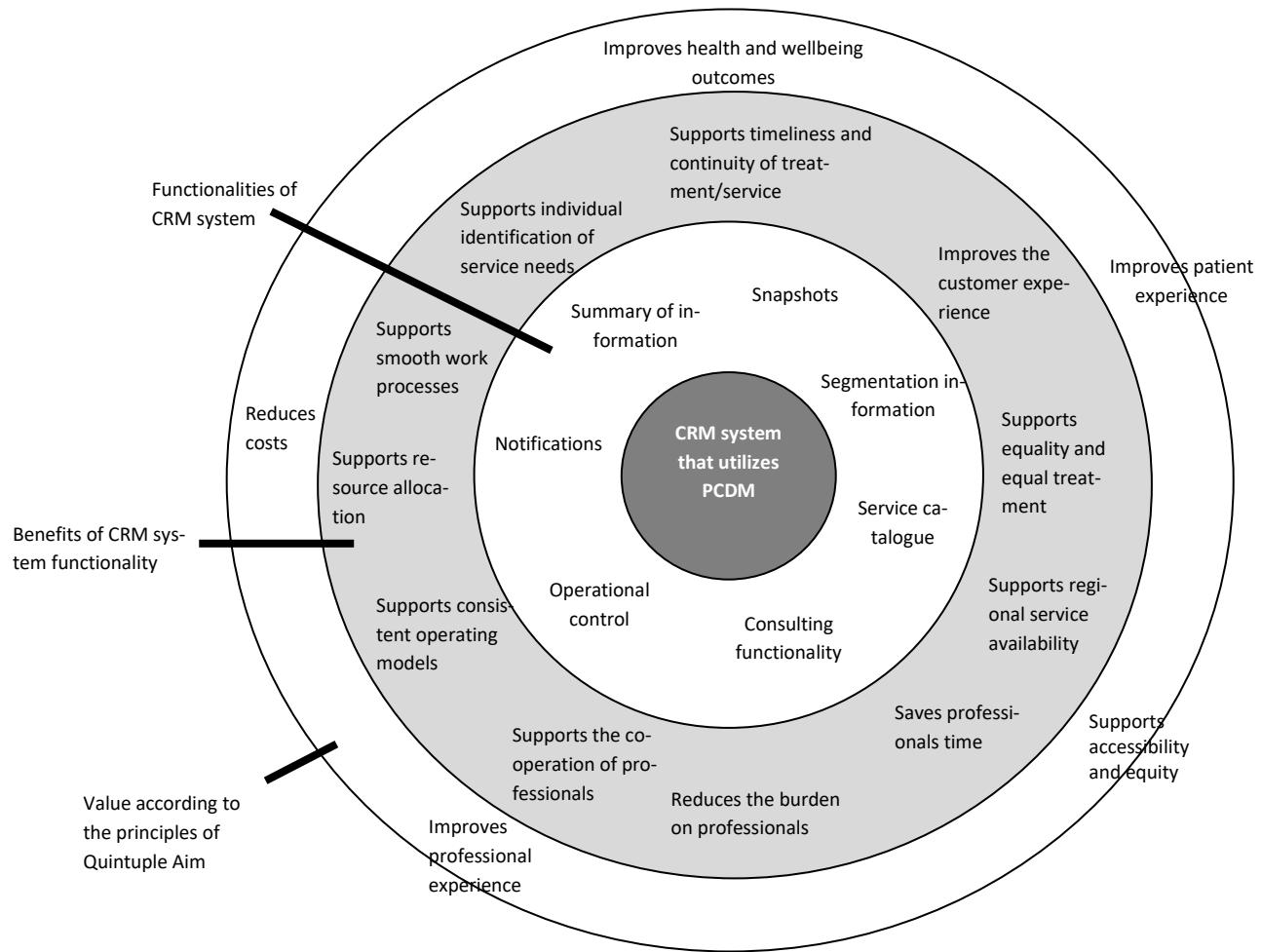


Figure 2: The importance of the CRM system and functionalities in the operation according to the Quintuple Aim principles.

The value of using PCDM and CRM in customer management

Operational capabilities for value creation were found on different levels: individual customer service, service paths of customer segments, professional orientation and operations and organization resource allocation and evaluation. The benefits of using a PCDM in customer management can be seen in relation to the principles of the Quintuple Aim according to the different roles of the actors. These are shown in Annex 2.

At the individual level, the value creation is connected to the customer's service process. With the help of the CRM, a booth is taken from the customer on a one-stop basis. In customer management, operational management and process control of service chains are needed in addition to traditional CRM. Value is created when customer information can be compiled in a single view for the professional. CRM produces a summary: basic customer information, risk information, the customer's care team, responsible professional, existing services and contact information, such as phone calls and chats. The professional sees the

customer's overall situation from the CRM, for example, if the customer has raised the matter in different channels. This can reduce the duplication of work. The data utilization permissions and consents given by the customer are also imported into the system. Based on the segment data, fetched from the database, a service path that meets the customer's needs is selected.

Value determinants for data-based customer management

The results from the analysis of the interview data found both promoting (54) and hindering (14) factors connected to the usage of the data model in customer management. These factors are described by the Force Field analysis model as connected to the social and technical subsystems in Figure 3.

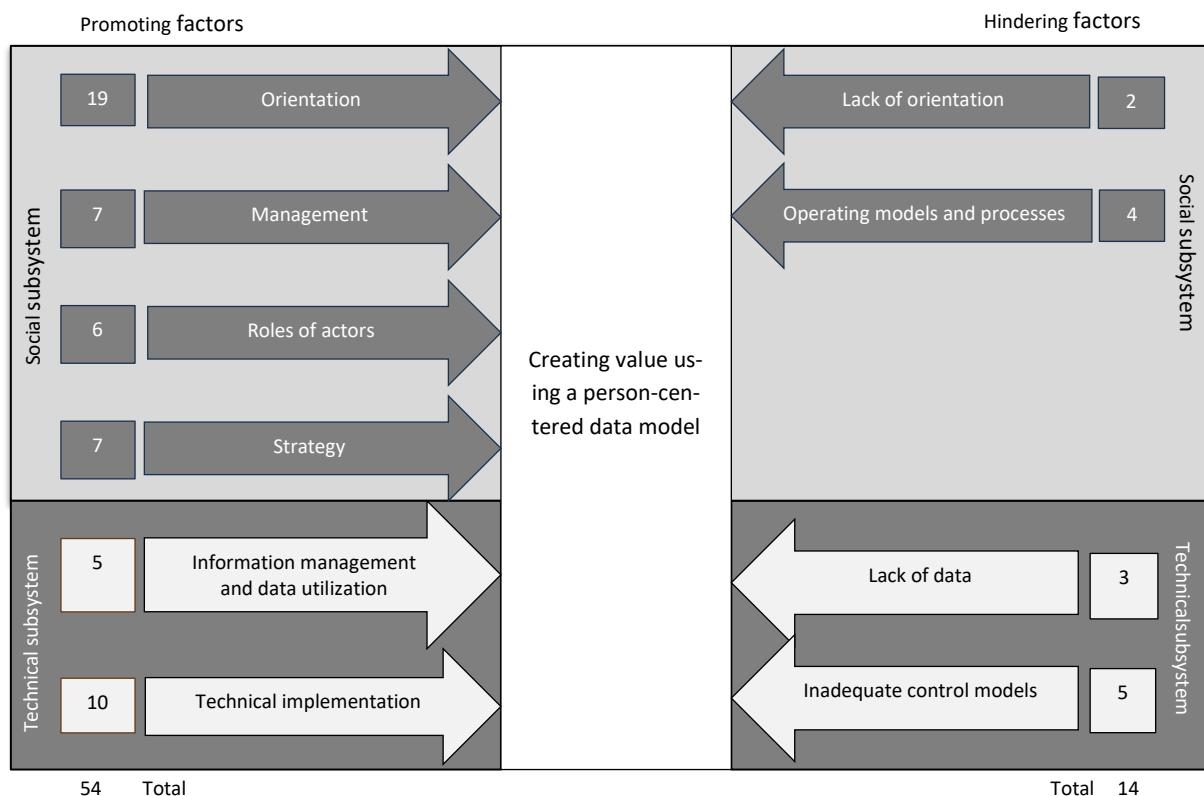


Figure 3. Promoting and hindering factors of the usage of the data model in customer management by the Force Field analysis model.

When the factors are examined from the perspective of socio-technical systems, it can be observed that a larger proportion of promoting factors is related to the social subsystem and especially to the orientation of the organization's professionals. Promoting factors were identified in six categories and hindering factors in four categories.

The short- and long-term effects and probability for value creation were assessed based on the survey's results (Table 1). The mean score (M) reflects the average level of agreement or response on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), while the standard deviation (SD) indicates the degree of variation in responses among the five participants. Lower SD values suggest greater

consensus among respondents, whereas higher SD values indicate more diverse opinions. When the factors are examined in the short (0-1 year) and long term (1-5 years), no significant differences were found, but in the longer term, the impact of orientation, operating models and data gaps as an inhibiting factor would be slightly reduced. The importance of the promoting factors, especially the importance of strategy and available data, is emphasized in the longer term. In interpreting the results, a mean score of 4.3 or higher is considered indicative of a strong agreement, while a standard deviation of 1.0 or lower is interpreted as reflecting a relatively high level of consistency among responses.

Table 1. The effect and probability of promoting and hindering factors in the short (0-1 years) and long (1-5 years) term (M/SD).

Categories of factors	Effect (M/SD), during		Probability (M/SD), during	
	0-1 years	1-5 years	0-1 years	1-5 years
Promoting factors				
<i>Social subsystem</i>				
Orientation	3.62/0.63	4.11/0.66	3.65/0.84	3.74/0.49
Management	3.51/0.90	4.11/0.73	3.51/ 1.00	3.56/0.70
Roles of actors	3.56/0.75	3.79/0.69	3.57/0.82	3.57/0.41
Strategy	3.60/0.53	4.11/0.54	3.60/0.74	3.51/0.90
<i>Technical subsystem</i>				
Information management and data utilization	3.28/0.59	4.35 /0.52	3.28/ 1.06	3.56/0.71
Technical implementing	3.65/0.67	4.00/0.74	3.65/0.69	3.69/0.59
Hindering factors	0-1 years	1-5 years	0-1 years	1-5 years
<i>Social subsystem</i>				
Lack of orientation	4.30 /0.89	4.30 /0.99	4.30 /0.79	4.00/0.96
Operation models and processes	4.55 /0.86	4.25/0.84	4.55/0.95	3.65/0.48
<i>Technical subsystem</i>				
Lack of data	3.26 / 1.00	3.30/0.80	3.27/0.80	2.87/0.66
Control models	3.32/0.69	3.48/0.67	3.32/0.47	3.33/0.44

Discussion

The goal of the case organization is to organize social and health care services in a customer-oriented and effective manner. The organization's data model that focuses on the individual patient/customer, is intended to be used in customer management, both as support for management and decision-making when examining the use of services by customer groups and the use of the organization's resources, as well as in the daily processes of customer guidance and customer management. This need for comprehensive person-centered information and the ability to utilize information using new methods has also been recognized nationally in Finland [8].

When examining the use of PCDM in the operations of a case organization, reflecting it on the dimensions of information management described in an earlier study [9], it can be seen that it focuses on the micro level in terms of operational everyday life. It can support collaboration between professionals and promote the planning of service chains that utilize data at the individual level. However, the model also has potential for other dimensions of information management at the macro and meso levels. Even though PCDM is built around the individual [16], it can support the Quintuple Aim principles more widely than the individual customer's service path, but also in the organization's information management and as a support for effective and equal service production.

The data summaries, operational guidance functionalities and decision-making support functionalities that the CRM system utilize provide the information professionals need to the professional handling the customer's case. These functionalities, the information flow between professionals and the possibility of utilizing information generated by

citizens themselves are missing at the current client and patient information systems [10-13].

The results confirm the value of combining information contained in different IT systems, which has been highlighted in previous studies [9,13,14]: in order for information to serve the increasingly integrated production of social and health services, both organizational leaders and professionals working with individuals must have access to systems that enable information exchange across organizational boundaries. PCDM supports the organization's information needs at different levels.

To manage organization's operations more efficiently, both the requirements for producing value and the mechanisms for producing value must be understood. This study provides one perspective on the principles and opportunities for creating value by examining the data-based customer relationship management model developed by a case organization [15,16] against the Quintuple Aim value creation model [5]. The strategy of the case organization [29] emphasizes equality, customer orientation, effectiveness and courage. The study revealed that by supporting the work of professionals with better utilization of existing information, the organization can improve customer access to services, identification of service needs, service smoothness and service process efficiency. Operating in accordance with a data-driven customer management model can support customer equity, reduce service costs, and support the employee experience. This study found that this can promote Quintuple Aim principles 1, 3, and 5, but may also have positive impacts on principles 2 and 4.

According to socio-technical model [23,24], value is created in the interaction between social and technical subsystems. This interaction can be influenced simultaneously by both promoting and hindering factors, of which a total of 68 emerged from the

research data. The amount of promoting factors is higher than hindering ones. When examining the importance and impact of different factors on value creation, no significant differences were observed. Based on this, it can be concluded that the organization has good opportunities to promote its goals in accordance with the strategy from the perspective of customer management and organizing social and health care services based on effectiveness. It may be helpful to identify and consider the promoting and hindering factors identified in this study.

When developing and implementing IT systems, one must be aware of the critical interactions between tasks, structure, and people within the social and technical subsystems, as noted in previous research [14]. Social and health care managers and directors' understanding and vision of value creation and the Quintuple Aim principles are key factors in managing change and strategic development. The results highlighted the role of managers' orientation in change management.

The availability and adequacy of personnel for the increasing need for social and health care services creates pressure to support smooth work processes. Utilization of existing data and technology could enable positive personnel experience for the support of work processes at best. According to this study the primary goal of the development of PCDM and CRM system has not directly been to support the well-being of the personnel. But by utilizing the data model in management and by using the CRM system in customer guidance processes through the goals of professional communication and perception of relationship with customers, customer satisfaction, and patient-centeredness, also personnel well-being and work satisfaction could possibly be achieved. This is an interesting topic for further research.

Limitations

The limitations of the study are the limited size and context-specificity of the data, which means that the results cannot be directly generalized to other environments. The material was collected from a limited number of the organization's experts, who had key roles in the organization's strategy implementation program, especially in the utilization of the PCDM and the development of customer management. The reliability of the study is based on systematic data collection and analysis and a transparent description of the research process. The results have been mirrored in previous research and theory.

Conclusions

Based on the findings of this study, it can be concluded that PCDM provides significant opportunities to support customer management and the organization of social and healthcare services. The use of PCDM enables the integration and utilization of individual-level customer data across various organizational levels, thus supporting both customer-oriented service production and organizational information management. The strength of PCDM lies in its ability to combine data from different systems, which enhances service continuity and customer orientation, especially in a multi-actor environment.

The study revealed that PCDM aligns with the Quintuple Aim principles, particularly enhancing customer value and experience, service efficiency, and employee experience. However, the model has the potential to contribute to broader service system objectives, promoting equitable and efficient service production while potentially improving organizational operations at multiple levels. The joint use of PCDM and CRM systems can streamline customer service processes and support professionals'

work, while also potentially improving employee well-being and job satisfaction. Value is created through the interaction between social and technical subsystems, and this study indicates that organizations have strong opportunities to advance their goals in customer management and social healthcare service organization. However, it is essential to recognize both promoting and hindering factors that may influence the success of the system's implementation. In particular, the commitment and understanding of managers and professionals regarding the intended changes, their value generation, and the Quintuple Aim principles are critical for successful organizational transformation.

Conflicts of interests

The authors declare no conflict of interest.

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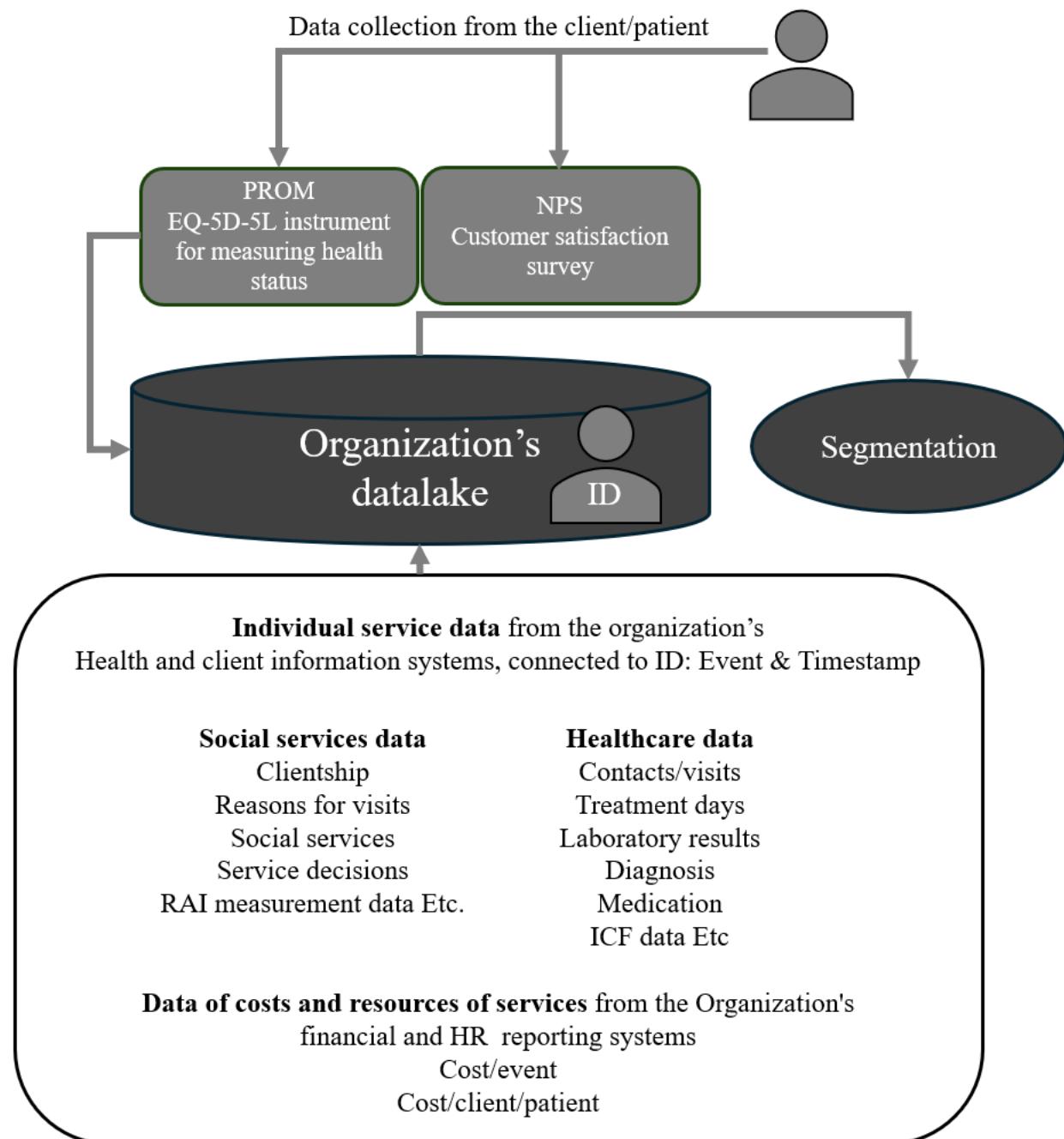
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Appendix

Annex 1. PCDM of the case organization.



Annex 2. The benefits of PCDM in customer management in relation to the principles of the Quintuple Aim.

A Quintuple Aim-based principle for improving social- and healthcare Actor/role through which the benefit is realized	Improving health and wellbeing outcomes	Improves customer experiences	Reduces costs	Improves professional experience	Supports accessibility and equity
Customer (individual patient/client)	The services can be assigned to the customer in a timely manner	The customer experience improves when the customer receives the right guidance, and her/his needs are known	Service needs can be identified at a sufficiently early stage, when services with lower costs can be sufficient	With the help of customer-specific summaries and reminders, the professional's work process becomes smoother	Consistent and timely service for all customers in the area
Customers (group/groups/segments)	With the help of segment information, risk factors and the need for preventive services can be identified	The support of uniform service paths for the most important customer groups enables a uniform service experience	Segment information can be used to prevent disruptive demand and waste in operational processes	The customer management system enables connecting the most suitable professional to the customer's needs	Distribution of resources correctly to those who need them by utilizing segment information
Professional	With the help of the information, it becomes possible to understand the customer's overall situation and it is easier to organize the services	With the help of customer information, summaries and reminders, it is possible to offer the customer an individual and smooth process	With the help of customer information, services can be arranged at a sufficiently early stage, when services with lower costs can be sufficient	The professional's memory load is reduced, the work process becomes smoother	The customer relationship management system directs the professionals' activities to consistent operating models and processes that support equality
Organization (service provider)	System-level visibility into the most effective interventions is obtained	Customer experience information is obtained to evaluate and develop services	System-level visibility into cost effectiveness is obtained	It is possible to allocate personnel resources appropriately to different service channels	Operation based on uniform processes supports regional equality in the organization of services