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Visualizing Benefits of Case Management Software Using Utility Effect Chains

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Abstract: Labor shortages lead to crucial investment decisions, such as selecting software supporting work processes. The healthcare sector stands out because of additional restructuring due to demographic changes. This is particularly true for the care sector; hence, customized case management software (CMSW) solutions for healthcare professionals are being developed. In an increasingly profit-oriented healthcare system, sustainability, cost-effectiveness and quantification of benefits of investments play a major role. We analyzed research dealing with the benefits of case and care management software and, additionally, interviewed case managers who use recently developed CMSW within a case study. We used utility effect chains to visualize and quantify the gathered benefits of an information system (IS) investment along with the healthcare system in Germany. The findings show that benefits from care management software need to be seen more holistically. Utility effect chains can serve as a helpful instrument for the visualization of indirect benefits in healthcare. The most significant benefits of CMSW were found to be various cost savings for each of the participating stakeholders, a reduction in redundant entries of patient data and the prevention of cost-intensive revolving door cases. Additionally, the insight into patient records reduces time-consuming communication among health experts and family caregivers.

Keywords: case management; cost-benefit; elderly care; healthcare; IT adoption

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1. Introduction

The recent progress in IT development has the potential to facilitate and improve job mechanisms, especially in the as-yet neglected area of healthcare. In the healthcare sector, case and care management can profit from IT developments regarding overcoming challenges, such as demographic change and the lack of healthcare professionals [1]. Therefore, it is not surprising that IT solutions for healthcare institutions (eHealth) are especially important in order to increase efficiency and improve the quality of care [2]. These tendencies seem to be especially prevalent in the care of elderly people. Many developments in Germany, such as electronic patient records or the telematics infrastructure, were initiated by the government for support and must be implemented in healthcare facilities [3]. Furthermore, hospitals, care facilities and other healthcare stakeholders have the responsibility to decide which internal software solutions are best for the staff to use to carry out improved patient management.

However, when making investment decisions for healthcare software solutions in general, and specifically for elderly care software, it is often a hurdle to evaluate the implementation outcomes economically. In particular, the denotation and definition of the expected benefits are often a problem for healthcare organizations [4]. The lack of valid comparable evidence on costs and benefits has been found to be a potential reason for the slow uptake of eHealth interventions [2].

Although there is a large body of literature dealing with economic evaluations of investment decisions in general, contributions regarding economic evaluations of IT investments in elderly care are rare [1,5]. Hence, this article aims at closing a research gap in

this study field. Rezapour et al. [1] focused on evaluating the economic impact of eHealth interventions in elderly patient care and stated that, so far, no comprehensive reviews about the sustainable economic impact of eHealth interventions for elderly patients have been conducted. Therefore, this article aims to add an important contribution to the economic evaluation of software solutions for healthcare workers supporting elderly people in need of care by analyzing the sustainability of the software's benefits. The focus on these downstream benefits is especially relevant to show the vigor, and therefore necessity, of such CMSW, since the sustainability of rather simple information entries was often underestimated by the interviewed stakeholders, leading to a lower intention to use it.

In our research, we focus on a specific type of healthcare service for the elderly: the case management (CM) concept for care. This leads to the following research questions (RQ):

RQ1: *What are the task-specific benefits of case management software for care?*

RQ2: *How can the impact of case management software be visualized using utility effect chains?*

In the following, an overview of the theoretical background of the case management concept for care is provided. Based on this, the potential benefits of healthcare IS are described. Subsequently, the methodology on which this research work is based is presented. Furthermore, the results of the analysis are pointed out and critically discussed, and the implications of this research are given.

2. Theoretical Background

2.1. IT-Supported Case Management Concept and Case Management Software

The central analysis area of this study is the case management concept for the care sector. The concept aims to be a solution in the care of elderly people. These people in need of care use healthcare services relatively often, as they usually suffer from long-lasting illnesses and are multimorbid [1,6]. Case management targets this patient group and has the ability to increase the care quality [7,8]. Therefore, case managers constantly coordinate the care services for their clients. Case management can be explained as "a collaborative process of assessment, planning, facilitation, care coordination, evaluation, and advocacy for options and services to meet an individual's and family's comprehensive healthcare needs through communication and available resources to promote quality cost-effective outcomes" [9].

As illustrated in Figure 1, the case management process includes six iterative phases: clarification (1), assessment (2), service planning (3), linking (4), monitoring (5) and evaluation (6) [10,11].

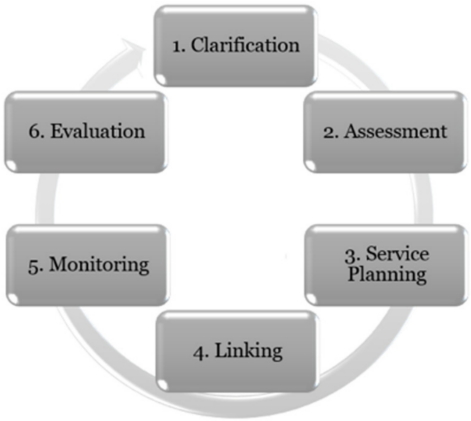

Figure 1. Case management phases according to Löcherbach [10].

In the first phase, selection criteria are applied to decide if a patient will receive the novel case management concept or regular care services. During the assessment, the re-

spective patients' difficulties are discussed. The assessment serves as a foundation for subsequent service planning. In this phase, healthcare plans and goals are manifested. The linking phase includes forwarding the information to the service providers, as well as networking with the involved stakeholders, in order to enable adequate care implementation. During monitoring, the responsible case manager closely supervises the case progress. Evaluation helps participants learn from completed cases and, therefore, helps to improve future processes. Consequently, case management addresses the individual client's situation, can be seen as a continuous learning process and, accordingly, surpasses standard care solutions [11]. After completing the evaluation phase, a newly carried-out clarification phase may occur.

The used case study is the ReKo project, located in a rural area in Northwest Germany, which started providing case management services in 2020. The case managers implement care plans and use the CMSW solution Quovero, aiming to support and simplify healthcare services. Quovero incorporates the case management concept by integrating all six phases, and it enables the case managers to document the respective case progress.

Quovero can be used to identify adequate healthcare providers for therapies (linking) and to control the following progress (monitoring). The software's main features consist of master data management and integrating care planning and client files. The client file provides a clear display of the client data, such as the client's health history and links to healthcare service providers.

Relevant information about the client's current therapies can be found in the care plan. Accordingly, the case manager is able to monitor problems, respective measures and timeframes. Automatic resubmissions additionally assist the user to review the aims. Further functionalities consist of an integrated chat and enhanced documentation of past and planned communications.

Not all functionalities have been provided yet. The implementation of the telematics infrastructure with central applications, such as the electronic patient file, is planned in order to improve networking with relevant healthcare stakeholders. The networking integration of the various service providers, such as hospitals, health insurances and care centers, but also family caregivers and volunteers, is assessed to be a key contribution to the efficient use of Quovero in order to significantly improve communication, as well as to prevent duplicate documentation in parallel systems.

2.2. Benefits of Healthcare IS Investments

Due to a large number of intangible resulting benefits that are difficult to measure, quantifying information system investment decisions can be identified as a major challenge [12]. One method for the economic evaluation of eHealth interventions is the cost utility analysis (CUA), in which the increase in benefits of an investment is compared to the increase in costs. In our analysis, we want to focus on the crucial benefits. CUA measures benefits with utility outcomes in terms of healthy years or quality-adjusted life years (QALYs) [2]. As stated before, uncertainty about the expected benefits is a key obstacle for healthcare organizations [4]. Accordingly, it seems logical that individual studies have focused solely on conducting a cost analysis of eHealth interventions, rather than including respective benefits [1]. Benefits in healthcare investments must be divided into tangible and intangible benefits. Tangible benefits are less problematic because they can be objectively measured and quantified, usually in financial terms [13]. In contrast, intangible benefits are rather subjective and often very difficult to measure, especially when they need to be converted into monetary values.

However, healthcare has always been a questionable field of application for trading off monetary costs against the benefits of improved care and hence, life quality [14], not least because the ultimate benefits of healthcare interventions, in terms of, e.g., QALY, are difficult to quantify. In contrast to the healthcare sector, manufacturing industries can more precisely assign benefits to products, departments and specific cost centers within one company. When dealing with outcomes of the adoption of IS in healthcare, the resulting

benefits are rather complex to assign, since they do not affect just one department, but many stakeholders within this open system. Additionally, the interwoven processes within the healthcare system lead to imbalanced cross-institutional time efficiencies resulting from the adoption of improving processes or systems. Thus, the overall sustainable benefit of one improved process might not be observable for each stakeholder involved in the operation [15].

3. Methodology

Our analysis follows a multi-method approach by first conducting a systematic literature review, according to vom Brocke et al. [16], to identify benefits of CMSW, in particular, and healthcare software, in general. Regarding the literature analysis, the search string "ehealth AND economic AND evaluation AND (cost OR benefit)", limited to title, abstract and keywords, was used to search for relevant scientific research. Due to the current nature of the topic, no contributions published in 2011 or earlier were taken into account. The databases Scopus, PubMed and ScienceDirect were used. It was apparent that limiting the search to benefits and economic analyses of CMSW would not have generated sufficient results. Research on CMSW is scarce, especially dealing with the topic of economic analysis and the identification of benefits. Despite this identified research gap, which we aim to address with our contribution, we first wanted to gain a better understanding of benefits in healthcare IS using broader literature, so the search was extended to economic analyses and benefit identification of further care and eHealth interventions. Ultimately, 12 sources were assessed to be highly relevant in identifying benefits of eHealth interventions. Additionally, these scarce results prove the necessity for further research in economic analyses for eHealth interventions.

In order to extend the insights gained from the literature and derive the specific effects from the IS investment CMSW, we carried out four focus groups, with each consisting of four key users of the software. The design of the focus group schedule and ground rules were chosen according to Breen [17]. The 16 participants in the age range of 25 to 56 years had worked in a case management organization in rural areas for two years. The case managers were found to provide an especially informative basis, since each of these experienced workers originally practiced the profession of a hospital nurse, geriatric nurse, physician assistant or further medical job roles.

We used utility effect chains, following Oesterreich and Teuteberg [18] and Schumann and Linß [19], in order to visualize the direct and indirect benefits of the implementation of CMSW. However, since the context changed from industries to healthcare, a few basic changes had to be made.

Schumann and Linß [19] proposed examining the utility effects, resulting from an IS investment for one focal firm, on four different levels: task level, division level, corporate level and market level. Each level represents a firm-internal area in which tangible, as well as intangible value for the respective company is created. This model can be used to prescind the direct and indirect effects of one specific software investment. The task level contains the direct effects or functions resulting from the IS implementation. Due to their proximity to the actual software in use, these are likely to be of an operational nature. The division level includes the utility effects that can be derived from task fulfilment on the task level, such as concluding cost reductions or increasing satisfaction and time savings. The corporate level synergizes the upstream utility effects and transfers these to the entire company. The market level expresses which indirect effects lead to advantages in the competitive environment.

In contrast to Schumann and Linß [19], we did not differentiate between the four firm levels as described above. In addition to the task level, which still forms the functional base after implementing software, we replaced the division, corporate and market level with several stakeholders in the healthcare system. This step was carried out to live up to the aforementioned interwovenness of the system. In an industrial context, improved in-house processes can be explained along the improvements in a product's value chain, which is

illustrated in the four firm levels. In healthcare, the patient passes through a variety of practicing stakeholders, who all contribute to the patient's health status. This adaptation was found to be more realistic in this context by the interviewees.

The focus groups were held from January 2022 to October 2022. Due to contact restrictions, a video conference tool was used for verbal communication. Simultaneously, all participants had insights into the blank utility effect chain table via Miro Board. Miro Board is a software tool that allows multiple users to work simultaneously in a shared virtual environment, adjust notes and patterns and bring in several ideas at the same time. The researcher introduced the research topic to the participants and explained the general idea behind utility effect chains. It was emphasized that small tasks, during the use of the CMSW, can have significant subsequent effects in the holistic picture of healthcare. Hence, each group focused on what tasks of their everyday work could be fulfilled with the help of the software and what benefits or consequences follow from these entries for downstream stakeholders.

The interactive and collaborative work of the focus groups meant the meetings were like a workshop in nature and, therefore, lasted between 70 and 120 min. After the creation of the effect chains within the stakeholder table, the group was asked to discuss the results and rearrange paths that did not seem well-fitting. After the effect chains of group one were finished, it could be taken into the next group and be supplemented by the following group, after their self-generated picture was completed. Thereby, an iterative creation process could be ensured, and the results of all groups could be considered and revised.

4. Results

4.1. Literature Analysis

The included articles covered a range of eHealth applications. Some included a holistic cost-benefit analysis of various eHealth measures in care [2,20,21]. Other articles analyzed specific eHealth tools, such as patient web portals [22] or mobile-based interventions [23]. Rezapour et al. [1] focused on eHealth measures for elderly care, similarly to Sülz et al. [24], who also included the transmission of patient data to healthcare professionals.

Benefits resulting from IS investments relate to various stakeholders involved in the respective eHealth interventions. First of all, the micro level involves a person or groups of people. These include the patients themselves, as well as their relatives as informal family caregivers and healthcare workers.

Organizational benefits at the meso level must also be considered. They relate, in particular, to the healthcare institution that implements eHealth interventions and external companies, such as IT service providers, that develop software solutions. Additionally, benefits can relate directly to an improved health status, physically or psychologically. This primarily affects patients directly, who are expected to receive improved healthcare as a result of the eHealth intervention.

Quantitative studies mostly utilize QALYs as a measure [2,23–25]. However, the IS investment can also relieve the burden on relatives if they have to invest less energy and effort in the care of people close to them. Likewise, the benefits can affect professional caregivers who experience greater job satisfaction when the eHealth software they use creates time efficiencies or improves the health and well-being of the relatives they care for [24,26].

In addition to the aforementioned benefits, which increase the health and well-being of the involved stakeholders, the benefits of eHealth measures can also be expressed in the fact that individual cost components are reduced in comparison to standard care. This applies, for example, to reduced travel costs [1], but also to shorter hospital stays [20]. Benefits can also manifest in enabling patients to achieve enhanced self-management of their disease and caring for their disease more continuously [20,27].

Table 1 shows the benefits of care software and the affected stakeholders. Most of the benefits are at the micro level, as they affect individual groups of people, such as patients, caregivers or family members. It should be mentioned that the long-term benefits described

here are also accompanied by expenses, which tend to be relatively high, especially in the initial period when the respective eHealth solution is implemented [26]. However, in the long term, the digital solution should ensure that the demonstrated benefits outweigh the costs.

Table 1. Benefit identification.

Benefits	Stakeholders	Sources
Improved health status (physical and/or psychological)	Patients, family caregivers	[20,22–24]
Improved job experience (workload, self-satisfaction, etc.)	Professional caregivers	[24,26]
Improved self-management	Patients	[20,25]
Lower treatment costs	Patients	[1,23]
QALY	Patients	[2,23–25,27]
Quality of life (if measured differently than QALY)	Patients	[20,22,25]
Less productivity loss for patients (loss of income, etc.)	Patients	[22,24]
Time spent in the residence	Patients	[20,24]
Reduced travel time to patient's home	Professional Caregivers	[1,24]
Reduced driving costs	Patients	[1,21]
Less time absent from work	Family caregivers,	[22,24]
Fewer days in hospital	Patients	[20,26]
Patients' adherence to medication, diet, etc.	Patients	[25,27]
Time Efficiencies/higher productivity through digital information sharing (Avoidance of double-documentation, etc.)	Patients, Healthcare institutions, professional caregivers	[21,22,26]
Economical participation for further branches	IT providers	[24]
Improved decision-making and accurate diagnosis	Healthcare professionals, Professional caregivers	[8,28]

4.2. Analysis of Focus Groups with Case Managers

A proven approach to begin with the utility effect chain is the categorization of tasks into the application areas on the task level. Since the area of CMSW is rarely analyzed in IS research, a systematic literature review alone could not fulfill the need for proper categorizations. Additionally, it became obvious that the application areas that were used in related research on utility effect chains were also generic and could be adapted to suit this study [18]. A vast variety of tasks that can be accomplished using CMSW could be derived from success factors of CMSW. The described usefulness of the system could be directly translated into respective functions [8]. On this basis, the application areas have been altered, resulting in four main categories: *communication and collaboration*, *case planning and coordination*, *information access* and *administration*.

The focus groups were surveyed to either identify false scientific considerations for the tasks and application areas, or complement the considerations made prior to the interviews. In a first editing step, the four groups assigned the tasks to the respective application areas and added new tasks from their experience with the CMSW. In particular, Vernier adjustments were made in the focus groups. For example, the task communication of various user groups was initially reduced to general communication.

The participants found it important to differentiate between "communication among the CM organization", "communication among care providers" and "communication among care providers and case managers", due to differences in the benefits resulting from each communication level.

In contrast to the later connection of benefits, the task assignment to the corresponding application area did not raise any concerns. Additionally, tasks that were, e.g., added by group two, were accepted and confirmed without controversy by the subsequent groups. Hence, the task level reflected a homogenous picture of functions that CMSW accomplished.

In the next step, the relevant stakeholders in healthcare were identified: hospitals, general practitioners, municipal providers, rehab clinics, nursing homes, outpatient care

services, pharmacies, health insurances/care insurances, family caregivers and patients. Then, particular direct benefits were assigned.

The first obvious benefits were mostly shaded in a dark gray color. The four groups proceeded very similarly as each participant automatically focused on a particular stakeholder and added tiles with benefits to the picture. The follow-up discussion revealed that the case managers mainly focused on the stakeholder groups they were employed at before their current job, since the process chains could be modeled more reliably.

The first cycle of filling in the picture made up 55 to 65 percent of the final result. The groups were sensitized to identifying all kinds of far-reaching effects by their entries into CMSW, even if it appeared to be minor in the overall system.

The association with the commonly known butterfly effect was given as a metaphorical aid [29]. At this point, the group discussions began to peak as the participants realized how the subsequent healthcare network can benefit from their typed in information and how these benefits are linked to each other. To give a broad understanding of Figure 2 (to be viewed in landscape format), notably significant paths from task to quantifiable benefit will be explained.

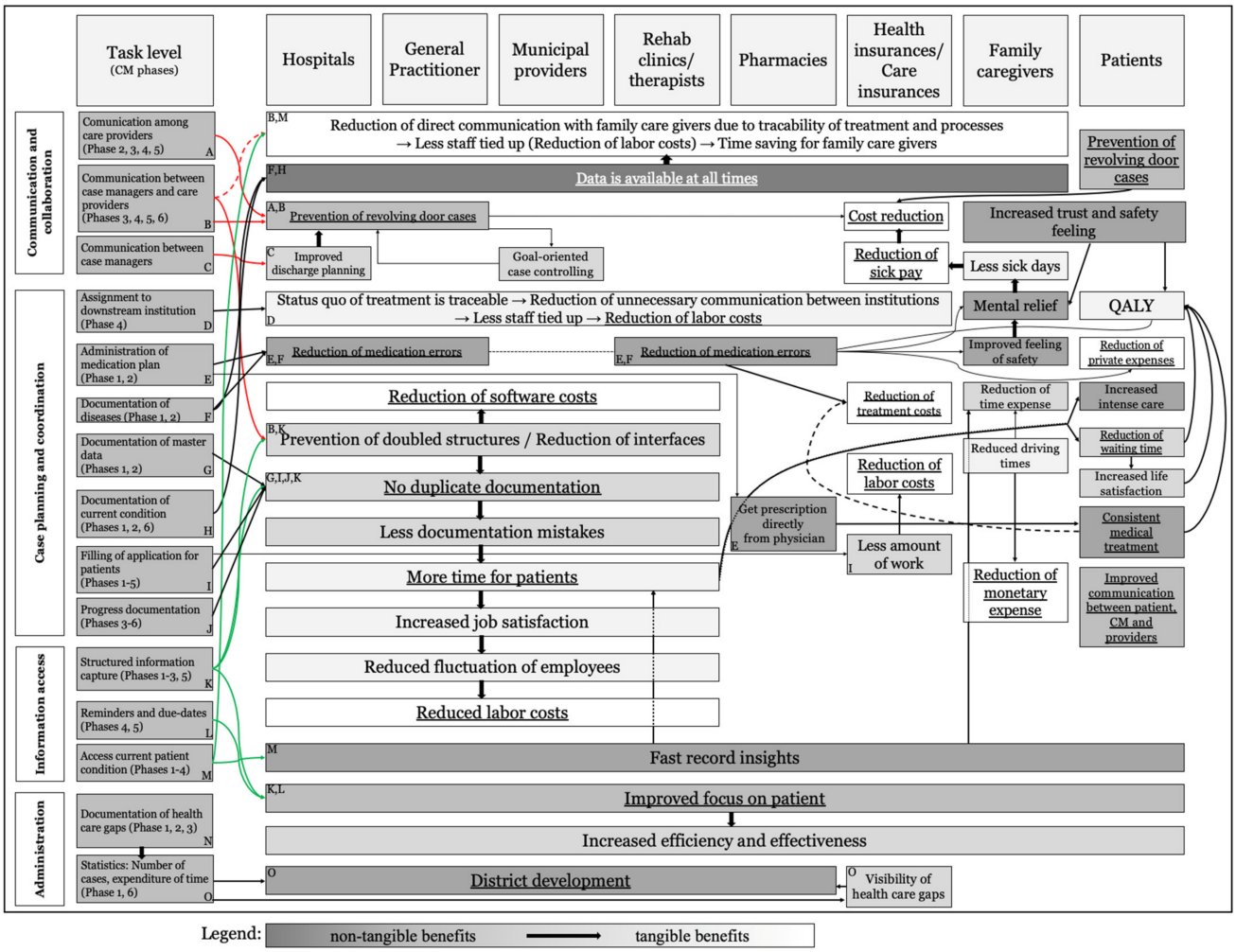

Figure 2. Utility effect chains for all identified tasks and benefits of CMSW. The letters in the boxes link the tasks to their respective outcomes on the stakeholder dimension. For a better understanding the capital letters in the boxes form a connection and the lines are in different colors and line types.

The most obvious benefit for the healthcare network relates to the documentation work. Since the CMSW functions as a documentation tool, providing memory aid for the case managers, the entry of information yields the most downstream benefits. The importance

of documentation goes along with the need to allow information access to the stakeholders. In the effect chain, the redundant entry of patient data, symptoms, medication and others is a resource-binding factor that can be overcome with efficient CMSW. It not only saves time for a multitude of medical employees, but also prevents them from accidentally entering false data in a subsequent institution.

The case managers identify a particular advantage for a stress-reduced working environment for the healthcare workers, on the one hand, and for the family caregivers, on the other hand. The fact that all parties that are involved in one particular case are able to see the status quo of the treatment process makes unnecessary communication obsolete. If, for example, diagnostic findings were in progress or an available place in a nursing home is needed, the current pending status can be traced via the software. A member of group two states that, "the information insight leads to less stress for the caring family. They are not professional healthcare workers and have their own life to manage besides. There is less running after prescriptions and information from physicians' assistants. Things that the family members worry about subconsciously over the day".

The case managers expect this relief to cause far less absenteeism for family caregivers, which, from their experience, is often a consequence of being overloaded and losing track. This benefit directly affects the expenses of health insurance and is related to the function of organizing the medication plan of the patient as well. The medication plan is visible for all treating institutions; hence, drug interactions can be more reliably prevented, leading to reduced treatment costs for maltreatment. The possibility to network with all partners that are involved in the medication process ensures consistent medical treatment on top of that.

If the physician prescribes a drug, the prescription cannot be lost on the way to the pharmacy since the pharmacist has already received notice of it, and the caregiver obtains insight into the process, knowing whether the medicine has been picked up yet. However, it is not guaranteed that the patient will take the medicine; it is assured that no previous step can be skipped since the assignment would be marked as incomplete in the system.

A key benefit of the CMSW solution, Quovero, is the prevention of revolving door cases, which refers to the permanent return of patients to inpatient facilities and the associated return to a previous health condition. These yield massive expenses for health insurances and tie up valuable resources in hospitals. Hence, CMSW as a platform fosters the sustainability of hospital stays and can save a lot of money. CMSW, functioning as an interface between case managers and all healthcare stakeholders, stands as a supplement to hospital social services and supports a needs-oriented approach that can identify corresponding risk factors and prevent the revolving door effect, in particular through communication and networking of the central contact persons and a digital, uniform exchange of information. Hung [30] emphasized the presence of comparable elderly care service platforms, but also criticized the demand for it. This reinforces the need to make the enduring character of its benefits more visible.

A representative example of the aforementioned butterfly effect is the effect chain behind the reduction in duplicate documentation, resulting from operating with the CMSW. While the avoidance of double documentation could directly prevent documentation mistakes, it also accounts for more time for the patients. The medical staff, in turn, have more time for patient care and, therefore, more time for the tasks that originally shaped their job role. This leads to more self-fulfillment and job satisfaction, which is a major influencing factor for fluctuation [31]. Patients benefit in terms of a lower waiting time, and more importantly, they receive care with higher quality. This has an improving impact on their health status, which increases their quality of life and, at the same time, drives down the costs of health insurance.

In addition to the large magnitude of benefits resulting from the use of CMSW, the focus groups brought up a few negative aspects that need to be considered and taken care of. One emphasizes that the input of patient data and documentation needs to be performed even more conscientiously than before: "When everybody in this system blindly trusts into the information that someone before him has typed in, mistakes can be made

easily when the initial person made a mistake". They propose random requests within the software for institutions to double-check critical information.

It was found to be resource-efficient that continuing care physicians have the ability to look into previous reports at all times in order to avoid unsuccessfully medicating their new patient the same way their predecessors did. However, this yields the risk that some physicians treat new patients with a sort of prejudice. A case manager in group one states that, "when a doctor sees what other colleagues already did with a patient and diagnosed, but the patient still has complaints, he doesn't know the whole story behind the consultations. I know doctors who then take patients not seriously and would impute doctor hopping to them. But maybe someone has overseen something in the past and this will not be uncovered later on".

In accordance with the results from the literature review, a summary of the identified benefits, only resulting from analyses with the case managers, can be found in Table 2.

Table 2. Benefit identification from focus groups.

Benefits	Stakeholders
Documentation tool as memory aid	Case managers
Constant data availability	Healthcare professionals, Family caregivers, Healthcare institutions
Saving time by reduction of redundant entries of patient data, symptoms, medication, etc.	Case Managers, Healthcare professionals, Professional caregivers
Reduction of software costs (CMSW as central software)	Healthcare institutions
Improved health related district development	Healthcare institutions, healthcare professionals
Reduced labor costs	Healthcare institutions
Improved/ less unnecessary communication	Case managers, healthcare professionals, family caregivers, patients
Reduction in expenses of health insurances	Health insurance
Reduction of treatment costs for maltreatment	Health insurance, patients
Consistent medical treatment	Patients, healthcare professionals, case managers, family caregivers
Prevention of revolving door cases	Health insurances, patients, healthcare professionals
More time for patients	Patients, health insurances, healthcare professionals, case managers
Less waiting time	Patients

5. Discussion

The connectedness of the different stakeholders in the healthcare system and soft decision factors, such as life quality, make it especially difficult to highlight the benefits of an IS investment. The soft factors make it even harder to trade off benefits against costs. We found utility effect chains to be an appropriate approach to make soft decision factors' accountably visible and provide various implications, as summarized in Table 3.

Previous economic studies about eHealth mainly focused on the cost analysis of interventions since the differentiation between tangible and intangible benefits makes the process of a cost-benefit analysis very complex. Furthermore, an abstraction of the intangible benefits needs to be made in order to quantify their value and include them in the analysis. Additionally, research about utility effect chains indicates that benefits of IS investments in companies can be visualized on different firm levels, and can take intangible and tangible benefits into account at the same time [18].

Table 3. Overview of implications.

No.	Implications
1	Utility effect chains can be used in healthcare to quantify benefits among various stakeholder groups.
2	Utility effect chains can be used to allocate costs for software due to the visualization of incurred added value.
3	The use of utility effect chains in healthcare helps to identify nontrivial subsequent effects of software, e.g., district development or mental relief and less private expenses for family caregivers.
4	CMSW is not an end in itself. It supports case managers in their daily work and provides a magnitude of benefits to subsequent stakeholders.
5	CMSW connects relevant partners in patient care and enables an uncomplicated communication, which yields major time efficiencies for every involved stakeholder.
6	Using CMSW leads to a reduction in costs for all healthcare institutions.
7	The possibility to constantly gain insight into patient records and processes relieves healthcare professionals and family caregivers.
8	Preventing the repeated documentation of redundant information can be seen as a key benefit of CMSW.

The combination of these findings generates a helpful framework in order to measure the impact of IS investments in healthcare. However, the interwoven processes among different stakeholders are not necessarily suited for a transfer on the framework with many different firm levels. Therefore, an adaptation of the original levels must be undertaken in this sector in order to address the prevalent circumstances. It is necessary to substitute the firm levels for the different stakeholders in healthcare that could profit from the processes of the IS investment. Thereby, a holistic picture of the resulting benefits can be created, and the magnitude of the intervention can be retraced.

The health sector is characterized by the fact that not every stakeholder benefits equally from an intervention. Some innovations do not find acceptance because of this peculiarity, as they appear to have no direct added value. If, on the other hand, the added value for downstream processes is also considered for other stakeholders, it becomes clear that the invisibility of the direct added values contributes to a distortion.

The example of the analyzed CMSW solution, Quovero, is very suitable to visualize the usefulness in the healthcare context, since it was initially created for structuring the daily business of a case management organization, enabling the communication to partners and managing the care of their clients. Furthermore, it relieves family caregivers, which has been proven to make the care system more sustainable [32]. In order to convince governmental authorities of an IS investment, such as CMSW, it is necessary to outline the benefits for a variety of stakeholders, rather than primarily stating that the investment helps one's own institution. This may increase the acceptance rate for such implementations, which highly contributes to the sustainability of the software solution [33].

Considering the labor shortages in healthcare systems, there is a push for better resource allocation [34]. CMSW leads to better planning of appointments and seeks to prevent unnecessary treatments that tie up valuable capacities.

With regard to the research question, it can be said that the benefits of an IS investment in care can be illustrated using utility effect chains that visualize their impact. Interestingly, the utility effect chains illustrate the resulting benefits from the software, among the whole healthcare system, to such an extent that the users were astonished by the magnitude of positive influence that can be attributed to the work with CMSW.

In addition to the advantages of using utility effect chains, it is also important to point out their boundaries. They are used to visualize the resulting benefits in order to illustrate the extent of an investment. However, decision makers must not be overloaded with information. It is important to examine at which point an effect chain has its end so that it is convincing, but also depicts realistic facts. There is a risk that too many effects have to be integrated, resulting in a too complex construct. Likewise, effect chains that are

too long can lead to a viewer no longer seeing the end of a chain in the context of the actual intervention, causing it to lose its credibility. Additionally, there is not always adequate selectivity, in many cases, of the interdependent effect chains.

It also remains challenging to numerate the actual benefits for each stakeholder in advance of the actual implementation of the IS investment. Thus, it is only possible to develop forecasts of how the added value could be represented in quantitative terms. However, it is also important that realistic values are stated so as not to make utopian, untrustworthy promises. It is also essential to emphasize that utility effect chains, while providing important insights into cause–effect relationships of benefits, do not represent a detailed quantitative calculation, but rather can serve as a basis for doing so.

The conducted research and the designed framework are not free of limitations. The healthcare system is very complex and constantly changing, so the framework can only represent the status quo. Additionally, only case managers were interviewed for the research. Since stakeholders from other institutions may have different opinions or identify further benefits, the framework may not be complete. In addition, the framework represents the situation of the German healthcare system.

However, it can serve as an important insight and be considered as a basis for further research in other countries. Furthermore, the software analyzed in our research has not yet been implemented by all stakeholders.

It is currently still in the implementation phase with other stakeholders, so further benefits can be identified and analyzed through future research. The application of the utility effect chain to healthcare software showed that the proposed categorization of the framework into different firm levels is not generally practicable. We therefore motivate scientists to look beyond the focal firm and investigate which further process steps can be performed, due to the IS investment, and what the positive effects are, including which steps can be economized in order to save labor for subsequent institutions. In addition, the aforementioned quantitative cost-benefit analyses of CMSW should be conducted to monetize the processes analyzed in this research.

Due to the labor shortage in healthcare, it is extremely important to receive as much assistance from smart software as possible in order to unburden the employees. Many institutions share the perception that an asymmetric distribution of time efficiencies exists in the healthcare system when it comes to the implementation of new software. This can be overcome by pointing out the range of benefits among the variety of stakeholders. This circumstance could prevent the sector from importing ever more isolated applications, rather than establishing synergies by using collaborative systems.

6. Conclusions

Overall, it could be shown that effect chains can be assessed as a suitable way to uncover the benefits of CMSW in the healthcare sector. The framework is capable of both combining and illustrating several stakeholders' actions within one process and pointing out the additional value in subsequent process steps, which can help to raise the acceptance of necessary, yet neglected software solutions. Nevertheless, it remains difficult to quantify the benefits on the one hand, but, on the other hand, this framework makes it easier to label them. The effect chains are adjuvant in giving a good overview of the positive effect of a digital intervention in healthcare among all stakeholders. However, their conception needs to be handled with care in order to avoid causing information overload or increasing complexity, rather than eliminating it. Additionally, delivering an unrealistic picture of far-fetched benefits should be avoided.

Through this research, it can also be seen that CMSW offers the potential to achieve diverse cost savings that are reflected in several stakeholder groups, and thus provide a benefit to the healthcare system as a whole. Regarding the interviews, a variety of new benefits of CMSW (cf. Table 2), that were not discovered through literature research (cf. Table 1), could be collected.

The focus groups revealed that CMSW can be used as a documentation tool with a guidance function for each case, but it also connects important stakeholders in the healthcare system. Parallel structures tie up a magnitude of resources when each stakeholder undertakes their own documentation and manages a patient's record isolated from other attending practitioners. CMSW connects health professionals and gives them holistic insights into a patient's case in order to provide the best possible treatment, since they are able to react to a complete individual care plan.

Additionally, a lot of personal, medical and pharmaceutical information can be reviewed. As a result, already existing indications do not have to be collected repeatedly, which saves laboratory costs and also prevents people from making false entries. The latter is especially unnecessary when the true data is already recorded and only has to be recalled. Overall, it is a relief for people in need of care and their family caregivers, who also gain faster insights into care plans, upcoming and unassigned appointments and day care vacancies. Thus, CMSW contributes to enabling people to experience dignified aging in familiar surroundings and prevents them from becoming revolving door cases at hospitals, which can yield high expenses for health insurance companies on the one side, and exhaustion for the patient and their family on the other side.

Case management is an instrument that can be used by governmental institutions to counteract undersupply in a country's healthcare system. However, literature regarding supportive systems is still lacking. With our research, we have made a further step in outlining functionalities, and provide reasoning for measuring the monetary effectiveness of such systems. However, research about case management and its assisting systems is still in its infancy. Further cost-benefit analyses will shed more light on the technology and the magnitude of its existence.

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