Knowledge Management Theory Creation in Healthcare Environment

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Abstract. In this research project, the research environment is the central hospital of the South Karelia Social and Healthcare District, Finland. This study is qualitative research project in which the data is collected by semi-conducted interviews in order to create a knowledge management theory in a healthcare environment. The theory consists of conceptual frameworks and their categories and the relationships between the categories. The categories and their relationships are discovered by using the Grounded Theory approach. When discovering a new theory the approach needs both qualitative and quantitative methods. Therefore, this research project will utilize a new methodological approach where both qualitative and quantitative research approaches are applied. The quantitative data will be analyzed with the novel intelligent computing methods which are used to find out relationships of the data and to give deeper understanding of the research domain and its conceptual dependencies.

1 Introduction

The primary goal of this research project is to create a knowledge management theory in healthcare environment based on empirical findings. Health and healthcare are important components for physical and mental well-being and life satisfaction. Only part of the healthcare is medicine where the goal is to retrieve the lost homelike being-in-the-world experience of the patient e.g., by reducing pain and suffering via preventing and curing diseases. Healthcare also consists of nursing and rehabilitation which are lacking from the medicine [1]. In healthcare, the patients are aware of their own health including mental, physical, and social dimensions [2], and transparency, integrated care platform, consumer engagement, patient centeredness, evidence-based medicine, and doctor-patient relationship are needed to be implemented [3], [4], [2], [5].

Healthcare is a knowledge rich sector which experiences rapid growth in order to understand the different diseases and their treatments combined with the ability to apply and access the up-to-date and relevant information. Knowledge itself has many

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conceptualizations depending on disciplines [6]. For instance, accountants measure it on the balance sheet; information technologists want to codify it on systems; sociologists want to balance power with it; psychologists want to develop minds because of it; human resource managers calculate a return of investment on it; and training and development officers want to make sure that they can build it. It has been also claimed that knowledge can be divided into creation or construction process, transfer process, storage and retrieval process, and application process [7], [8], [1], [9]. These processes control organizational knowledge in the means of knowledge dissemination, organizational learning, and data management [8], [10].

Among healthcare practitioners, knowledge is captured in a social interaction, e.g. when physicians and nurses meet patients. Physicians transfer their knowledge and expertise in meetings and consultations sessions, and they can express and interpret diagnosis reports, create new expert knowledge by reading or learning in traineeship, and having discussions [7], [8]. Collective knowledge exists in the organizational networks and knowledge is internally ingrained in people [8]. People learn new knowledge through participation with each other, e.g. cardiologists can belong to a community of practice transferring and receiving knowledge on best practices [11]. Knowledge can be made useful to support a specific task or make a decision [12], personalized information [8], awareness, experience, skills, and learning [13], [14], tacit knowledge [15], [16], explicit knowledge [17], and clinical and medical knowledge of the physicians and nurses [18], [19].

Different types of knowledge concepts have been identified and integrated into existing and emerging healthcare information management practices [8]. Knowledge concepts are even expanded to cover clinical medical expert knowledge which is bounded to physicians' medical knowledge and expertise both in practice and theory [18], [19], [20]. Furthermore, collective knowledge is expanded to cover organizational learning from internal and external sources of organizations and sub-networks [20] and embedded knowledge of the members, tools, and tasks of the organization [21]. Mostly healthcare organizations utilize combination of the different types of knowledge and healthcare practitioners are able to apply it properly and efficiently in their work and tasks [20], [21].

Healthcare sector is heavily dependent on knowledge and it needs efficient knowledge management in order to achieve high standards in patient care quality and patent safety and centeredness, but also in cost-effectiveness. Therefore, knowledge management needs information communication technology (ICT) systems support to be applied in knowledge creation, as well as in the capturing, organization, access, and use of knowledge [22], [8]. Based on the ICT systems support, knowledge management includes knowledge acquisition, creation, transfer, storage, and application processes [8], and organizational learning, unlearning, and internal learning processes [23], [24], [25]. It has been stated that evidence-based medicine is a form of organizational learning in the knowledge management context [20]. The British Medical Informatics Society states that the goal of medical informatics, also defined as the health informatics, is to share and promote healthcare through the information technology (IT) with proper skills, knowledge and tools [26]. In healthcare, there exist different types of healthcare information systems, such as electronic health records, electronic medical records, and electronic patient records [26], [8]. These records based information systems contain data about the patient diagnosis, drugs and electronic prescriptions of medical laboratory examinations. The

functionalities and goals of these three types of systems, however, are different from each other and dependent on the hospital or clinic they are used [27], [22], [28].

The physicians' and nurses' tacit, expertise, medical and nursing knowledge, however, cannot be found from the healthcare information systems. This is an unfortunate omission because without such knowledge the other healthcare professionals are not able to carry out the similar diagnoses and nursing decisions in a similar patient care situation. The important role of information and communication technologies (ICT) in healthcare is also ignored due to its problematic nature [26], [29], [30], [31]. Furthermore, studies of knowledge management theory creation in healthcare have been neglected, and past studies have rather focused on knowledge management theory creation in IT context [32], [33].

At our research site practice, external and tacit knowledge is captured and transferred by conducting lectures, and special training sessions to young physicians, and learning by experience. The current healthcare information systems are updated regularly and it causes stress for the physicians and nurses because they need to learn parallel the issues of new healthcare information systems and new medicine and nursing practices. The physicians in the central hospital even claim that the healthcare information systems do not support but on the contrary often disturb and complicate their clinical work. Therefore, there is immense need for information systems modernization, as well as restructuration of knowledge management processes. This is a challenging task because the nationwide medical and nursing practices have to be updated regularly and new guidelines should be easily retrieved from the information systems. In addition, the changes in Finnish and European Union (EU) legislation, national guidelines for management practices, and economic and political situation have to be found from the healthcare information systems [34].

Due to these several important omissions in the past studies, and on the other hand a simultaneous need to modernize the information systems in practice in the research site because of the new guidelines and legislation, this research project is important and carried out in South Karelia Social and Healthcare District, Finland. In this district's central hospital we choose a department as a unit of analysis in order to create a knowledge management theory in a healthcare environment. The theory also includes the healthcare information systems, information systems integrations', and cloud computing adoption's impact to knowledge management. This research project is very significant nationally, because the Finnish healthcare districts are under a great pressure of the growing healthcare costs and organizational changes due to need of specialized medical and nursing care. In the future, the hospitals and social and healthcare districts in Finland have to decide their main quality of service, because the level of service must be balanced with the money and resources available. In Finland, there are nationwide guidelines and operational processes of how to take care of a patient, and the goal of these processes is to provide the same patient care nationally. It should be noted that similar problems have been faced in very many other EU countries making this research also significant internationally.

The rest of this paper is organized as follows. In section two the objectives and research problems are outlined. In section three, we develop the conceptual framework of knowledge management. In section four, we outline research methodology consisting of data collection and categorization, and qualitative data analysis with the grounded theory and quantitative data analysis with the novel

intelligent computing approach. Finally, in section five we communicate the major research findings of the project.

2 Objectives and Research Problems

The goal of this research project is to create a theory in healthcare environment by using both the Grounded Theory (GT) qualitative research approach [35] and novel intelligent computing methods based on general framework called the Cross Industry Standard Process for Data Mining (CRISP-DM) [36]. This research project is planned to take a total of 9 years (2012-2020) in which the output will be five doctoral theses. Furthermore, at least 20 conference and 10 journal articles in high quality conferences and journals will be published.

Table 1. Research areas, research problems in healthcare, and related theories.

Research area	Research problems in healthcare	**Related theory**
Knowledge concepts	What are the knowledge concepts?	[8], [1], [12]
Internal and external knowledge acquisition mechanisms	How do the nurses and physicians acquire knowledge?	[45], [9], [46], [32], [20]
Knowledge use and application	What practical, clinical, medical, and nursing knowledge the physicians and nurses use and apply in patient care situation?	[37], [47], [8], [1], [48], [12], [45], [20], [7]
Knowledge creation	How the physicians and nurses construct knowledge?	[49], [37], [47], [8], [1], [48], [12], [45], [20], [7]
Knowledge transfer mechanisms and transfer problems	How knowledge is transferred? What are the knowledge transfer problems?	[37], [50], [9], [51], [52], [53], [9], [20], [54], [55]
Organizational learning mechanisms, unlearning and internal learning mechanisms	What are the organizational learning, unlearning and internal learning mechanisms?	[45], [37], [9], [32], [56], [23], [24], [25]
Role of information and communication technology	What is the role of information and communication technology?	[43]
Information systems' integration	How to integrate information systems together?	[26]
Information systems' integration approaches and mechanisms	What are the information systems' integration approaches and mechanisms?	[57]
Information systems' standards and technologies	What are the information systems' standards and technologies?	[58]
Cloud computing adoption	How to adopt cloud computing?	[44]
Healthcare services in cloud computing	What healthcare services are available when using cloud computing?	[29]
Data security and privacy issues in cloud computing	What data security and privacy issues must be taken into account in cloud computing?	[29], [59]
Cloud computing risks	What are the risks associated with cloud computing?	[29]

The first primary objective of this study is to discover and conceptualize

knowledge concepts and knowledge management processes in a hospital environment by combining together information systems science, knowledge management science, medical science, nursing science, sociology of knowledge, management science, and computational intelligence [15], [7], [37], [8], [9], [38], [39], [32], [40], [41], [13], [14], [2], [42]. The second primary objective is concerned to discover healthcare information systems' impact to knowledge management in healthcare [43]. The third and fourth primary objectives are to study cloud computing adoption's impact [44], [29], [31], and information systems' integration impact [30], [26] to knowledge management in healthcare. The research questions, research problems in healthcare, and related theories are presented in Table 1.

3 Conceptual Framework of Knowledge Management

The research site is the South Karelia Social and Healthcare District, and the unit of analysis is a department at district's central hospital. As a whole, the study covers currently at least six departments. As shown in Figure 1, knowledge management processes are knowledge acquisition (1), knowledge creation and construction (2), knowledge transfer (3), knowledge storage (4), and knowledge application (5). Their interactions with each other are represented as solid arrows. Internal learning, organizational learning, and organizational unlearning have an impact to knowledge creation and construction process. Their impact is represented as dashed arrows. Cloud computing adoption, information systems' integration, and healthcare information systems' impacts to knowledge management processes, department, central hospital and healthcare district are seen as solid arrows.

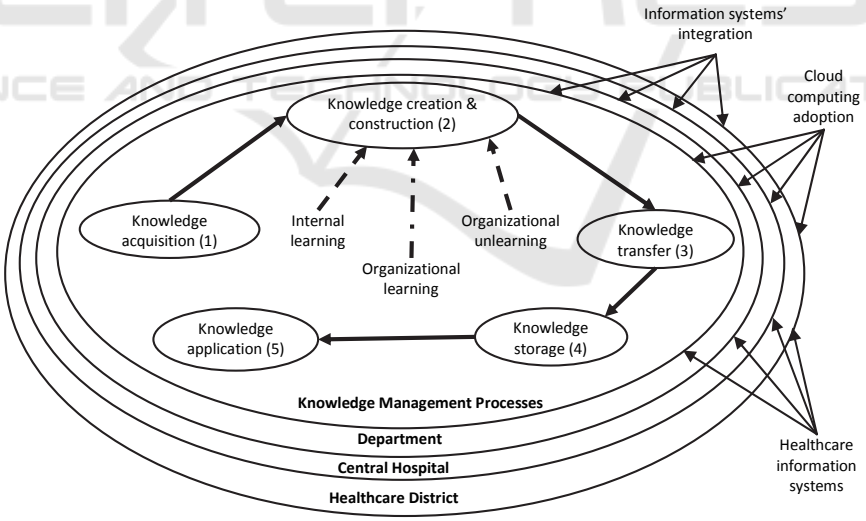

Fig. 1. The conceptual framework of the study.

In healthcare environment the knowledge is ingrained in the practitioners, and the knowledge exists in the medical practice and is stored to healthcare information

systems [1], [60]. In healthcare environment the amount of medical and nursing knowledge accumulates overtime, and the information collected from patients must be stored and updated to the information systems [13] in a way that supports medical practice needs 8], [61].

Knowledge acquisition involves searching for valuable knowledge, and external knowledge may be acquired by importing knowledge components directly or by depending on intermediaries [45], [32]. It has been argued that an organizational gatekeeper is the key individual who connects the organizational members to the external sources of information, and the organizational members are kept up-to-date with the outside information by communicating with the gatekeepers [46].

Learning influences knowledge creation, and knowledge provided by evidence-based medical guidelines and drug information databases help physicians to learn new issues [14]. The electronic patient records enable creation of organizational knowledge, and they are a useful tool to survive in everyday work in primary care [13], [14]. In decision-making and clinical practice, knowledge is transferrable through individual learning for example by observation [9], [62]. It is also possible that knowledge transfer can occur without the individual being aware of it happening [9]. Learning in groups occurs through discussions, meetings and lecture sessions in which people share their experiences [9].

It has been stated that knowledge transfer is the ability to apply knowledge gained in one situation in another similar situation, or to use metacognitive strategies to act in a novel situation [50]. New knowledge is generated by the influx of information into an individual's mind, combined with the existing knowledge of this individual, and then communicated further and made explicit [63]. After knowledge creation, it needs to be transferred throughout the healthcare organization. The knowledge that is relevant and right to be transferred needs to be determined as well [9]. The formal communities of practice include meetings, and the informal communities of practice will include discussion groups, study groups and online communities [53]. When more knowledge is shared between individuals, the more opportunities there are for knowledge creation [9]. Due to the reason that communities are formed with different ways of working and adoption of different vocabularies, they may not understand each other [9]. For example, human actors in IT and the business domain often speak different technical and procedural languages [63]. In addition one domain can articulate requirements, goals and constraints that another domain can think of as being unreasonable and uncooperative [63].

Knowledge storage can be defined as the organization's memory which comprises the knowledge and information that the people working in the organization possess through their skills and experiences. The collective memory of the organization in the organizational culture is expressed through the routines and attitudes inhabiting in groups and networks [48]. Organizational memory can be mental abilities and issues inside the organizational members, but also the information possible to retrieve, such as copies of memos, letters, spreadsheets, and data stored in computers constitute organizational memory [48]. It has been stated that knowledge management systems are a supporting class of systems to the organizational processes of knowledge management and knowledge storage [8]. The organization's computer-based communication and information system applications contain databases, repositories, directories, and networks [8].

Knowledge application is the ability to use the learned material in new and concrete situations by applying rules, methods, concepts, principles, laws, and theories [9]. The use of external knowledge will create new knowledge [45].

Internal learning has two modes of knowledge: tacit and explicit knowledge. Tacit knowledge is gained through clinical and practical experience [9]. It has been argued that the use of healthcare information systems has enhanced individual learning and group learning, and the physicians can achieve and create new knowledge by using information systems [60]. A physician will require also other knowledge than medical and clinical knowledge, such as technical skills, academic knowledge, a hospital's and healthcare organization's cultural knowledge, management know-how, and administrative skills. Healthcare organizations' knowledge can be transferred to an individual, a group or a system [51]. A patient relationship management system is affected by the impact of the knowledge work performed by the physicians in a hospital, and the use of the case system seems to enhance knowledge creation [13]. The knowledge transfer barriers are lowered between the physicians and the patients by enhancing communication through a follow-up system [13].

In organizational learning, knowledge is stored in databases in documents, and the learning entities are both the individual and organization [20]. This kind of organizational learning is an 'old organizational learning'. On the other hand, new organizational learning means discovering new theories, practices and innovation and then distributing or transferring that new knowledge to the organization [32], [20].

In organizational unlearning, the old organizational knowledge is disregarded. The knowledge considered for elimination is the same knowledge that led the organization to its previous success [64], and there is a need to remove or reject previously used practice from the organization [32]. Therefore, change and learning theories are relevant and should be included in a framework in order to draw a comprehensive image of processes at work in the changing organizations [64], [25].

It has been claimed that security and confidentiality issue has slowed down the cloud computing adoption in knowledge management systems in healthcare [31]. When using commercial cloud computing it is not known where the data is physically stored and how it is secured. This issue is problematic especially if the data is confidential [29], [59]. Of course, by creating own cloud computing environment this problematic issue related to the physical location of data is solved, but the security issues still remain. The communication between the healthcare actors and awareness of their relationships with each other is important in information systems' cloud computing adoption [44], [31]. Healthcare personnel must understand how the cloud computing adoption to information systems affects to the processes and how adoption on the other hand is affected by the relationship between personnel and processes [44], [31]. It has been further claimed that cloud computing adoption in its best would minimize costs of healthcare personnel's information retrieval because they can use laptops and mobile phones everywhere when using cloud services remotely, and thus cloud computing helps to simplify the management and access of patients' data [31].

Healthcare information systems' and information systems' integration both need integration requirements gathering in order to evaluate different approaches and industrial integration standards [30]. The goal of information systems' integration is to offer services to disease management [22], to promote and prevent healthcare to identify cause of illnesses, to help in medication and therapy, to offer rehabilitation services, offer long term care, to provide clinical healthcare, and to offer information

communication technologies (ICTs) in order to support management, administrative activities and logistic services [22], [30]. ICTs cover electronic patient records, electronic medical records, picture archiving communication systems, physicians' e-Prescriptions and e-Referrals, and portals with healthcare information and health cards [30]. Healthcare information systems and information systems' integration should also offer infrastructure, research, education, collaboration, healthcare knowledge infrastructure, clinical trials, medical education, local and international platforms and collaborations, efficient IT infrastructure and security, deployment of e-Health with efficient IT infrastructure, establish physical networks which allows connectivity supporting interoperability of various technologies and various systems, data integrity and security, and frame work of security and confidentiality [22], [30]. Thus, cloud computing adoption, information systems' integration, and healthcare information systems all impact to knowledge management in healthcare.

Our conceptual framework in healthcare has many dimensions and due to its complexity and lack of solid and matured knowledge management theories in healthcare it has a lot of challenges both for the academic studies, but also for the practical implementations. As already outlined healthcare is a knowledge driven process and hence knowledge management when properly studied and formalized and implemented provides an opportunity to improve the healthcare performance at its all levels.

4 Research Methodology

4.1 Data Collection

This study is a qualitative inquiry based on a case study approach [65], [66], [67] on the empirical data collected by interviews [16]. This method is best suited for social sciences, as it allows the researcher to interact with the society through interviews and observations for the purpose of acquiring the desired data, such as in our case for creating a knowledge management theory in healthcare. The researcher will be able to combine various data sources such as archival records, interviews, observations, audio recording, and even quantitative data for the analysis without restricting the data formats [68]. The Grounded Theory (GT) approach [35], [69] is used in data collection and analysis.

The individuals considered for the interviews need to have participated in the process or action, and they must be given the time and place to be interviewed [67]. Our study is in line with this, because the central hospital arranges the place and time for the interviews and the research coordinator arranges the interview timetables. It has also been highlighted the importance of type of sampling and the number of interviews needed [67]. Before the interview, permission is asked from the interviewee to use the tape recorder. Audio-recorded unstructured and semi-structured recordings of the interviews will be transcribed.

In our study a department in a central hospital is the unit of analysis and the study covers several departments in order to generalize the results to have a wider impact for the healthcare. A hypothesis was made that via a deep understanding of the selected case departments and the identification of their knowledge management

processes, categories, relationships between the categories, healthcare information systems' impact, cloud computing adoptions' impact, and information systems' integration impact to knowledge management in healthcare would provide a solid background for the generalization of the results. The primary data sources are both open-ended and structured interviews which create the possibility for individuals or groups to express themselves freely in a relaxing atmosphere. Furthermore, archival records are used as secondary data sources, and the background context data includes the annual and financial reports, and press releases of the South Karelia Social and Healthcare District [70], [71].

At first a pilot study was carried out in the Obstetrics and Gynaecology department in January - March 2013 including 10 interviews. The interview questions were predesigned and they were sent to the interviewees in advance [67]. The interviewees were highly motivated, and they were asked to describe how they use their own knowledge in medical and patient care. After this first pilot study, the interview questions were improved based on the received feedback. This reformulation of the research questions was needed in order to match better each of the different department's knowledge management. The chief physician of the Obstetrics and Gynaecology department, who acts also as the research site coordinator, has arranged the research permission and interviews. This is because in the hospitals and healthcare districts in Finland the national laws and regulations are very strict, and the interviews also need a specific time table not to affect the patient care work.

After the pilot study and reformulation of the interview questions, five other departments were included in the research, and new interview rounds have been and will be carried out in the following order (number inside parenthesis gives the number of interviews): in January - April 2014, a second round of interviews was carried out in the Obstetrics and Genecology department (10); in March - May 2014 the first interview round was carried out in the Paediatric department (5); in March - June 2014 the first interview round was carried out in the Paediatric Neurology department (4); in May 2014-June 2014 the first interview round was carried out in the Anaesthesia and Surgery department (10), and finally in May - June 2015 the first interview round will be carried out in the Surgical department (10). Furthermore, more interviews will be carried out in December 2015 - December 2018, including, e.g., hospital IT administration department (10).

The ethical issues related to the data are guaranteed both in the case of the primary data (interviews) and secondary data (the archival material). One of the risks is the difficulty to build up a theory from the empirical case studies. In addition, it may turn out that a single theory is not sufficient to cover all aspects in a required and selected detail level. The validity and reliability of the research can be although affected by the research design, data collection and methods, quality of data, analyses of data, presentation of the results and making the conclusions [72], but simultaneous triangulation from different data sources, such as archival material will improve the validity and reliability of data, and the data is stored and protected according to the Finnish laws. The legal permission to use central hospital as the research site was granted in December 2012 by the Social and Healthcare District's Service Director, because every research which needs attendance and interviews of the staff must be approved by the service director. Each of the interviewees has been and will be asked in the future a permission to use the interviewee material as the data in the study and

their anonymity is guaranteed. The collected data material is not allowed to be taken abroad and hence it will stay in Finland.

4.2 Data Categorization and Analysis with the Grounded Theory

The pre-classified data will be analyzed first with grounded theory (GT) approach [35] which allows the researcher to interact with the society through the interviews and observations for the purpose of acquiring the desired data. This methodology will allow the researcher to combine the various data sources such as interviews, and observations, and even quantitative data for the analysis without restricting the data formats [68].

The knowledge management research problems are the basis for interviews and data collection. The research problems are presented to the interviewees, and they are chosen because their role is to use, create and transfer healthcare-related medical and ICT information, and translate it to knowledge relevant to the healthcare situation at hand. We will use fragmentation and reassembling based on the researchers' own intuition and knowledge in order to categorize our data into thematic categories by trying to capture a broader social system of ideas from the experience of the social actors working in the Social and Health Care District [35], [69]. After the categories have been found, we determine the properties of the categories and propositions (hypotheses) for how the categories were related. The constant comparison between the data and concepts in the past studies in order to accumulate evidence convergence on simple and well-defined categories will led us to a higher level of abstraction of statements about the relationships between the categories. This theorizing is in line with GT approach suggestions in creating a theory [69], [35]. Finally, in the future we will develop several conceptual frameworks of the discovered categories, and their relationships between each other [35], [69]. Furthermore, in our in-depth case studies, we must take carefully take into consideration beforehand who to interview, what to do next, what group to look for, and what additional data we should collect in order to develop a grand theory from the emerging data.

4.3 Quantitative Data Analysis

As this is research is also quantitative in its nature, the collected qualitative data will be converted to quantitative form in order to carry out the needed statistical and computational analyses. The exploratory data analysis approach is needed for generating hypothesis due to weaker assumptions and prior knowledge about the data and the domain. Data mining techniques are tools for exploratory data analysis [36]. The goal of data mining is to find unsuspected relationships and to summarize the data in novel ways that are both understandable and useful for the goals of the project. This includes visualization, projection methods, clustering, regression, classification, and association analysis such as association rule mining techniques. Especially data visualization methods, such as the Self-Organizing Maps [73], [74], Bayesian networks [75], and multidimensional scaling and hierarchical clustering [36], are needed for the deeper understanding of domain and variable dependencies. Quantitative analysis covers both linear and non-linear methodologies combined with

variable selection and uncertainty analysis but also classical hypothesis testing to reject or accept hypotheses whenever available.

As a general framework (Figure 2) for quantitative data analysis, the Cross Industry Standard Process for Data Mining (CRISP-DM) [36] approach is followed to guarantee that no important steps in data analysis are missed.

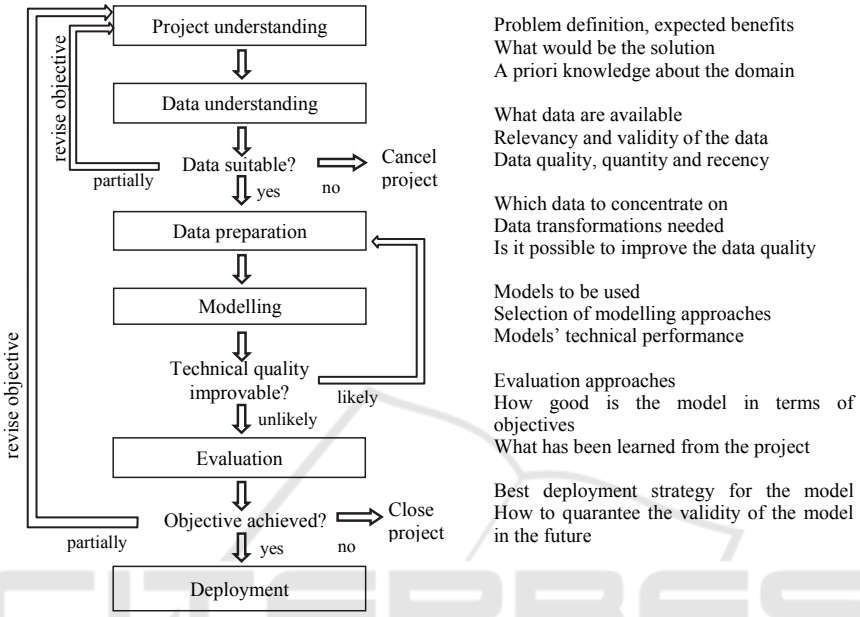

Fig. 2. CRISP-DM framework for data analysis.

5 Conclusions and Discussion

The primary theoretical and scientific outcome and contribution of the project is to create a theory of knowledge management in healthcare in specifically in the hospital environment based on empirical findings. Here the term theory should be understood as 1) a new conceptual framework of the knowledge management processes, and 2) new knowledge management categories, and the relationships between the categories in healthcare environments. Furthermore, the healthcare information systems' impact, cloud computing adoption's impact, and information systems' integration impact to knowledge management in healthcare are also studied. In this research project the research environment is the central hospital of the South Karelia Social and Healthcare District, Finland.

In general, when discovering a new theory, a multiple case study approach should be applied [66], [72]. In our study a department in the central hospital is our unit of analysis. The sample, however, has not been limited to one department, but several departments, because the goal of the study is to achieve a deep understanding of the selected case departments and to identify their knowledge management categories, relationships and processes. Theory creation should also combine multiple data

collection methods due to the triangulation in order to provide stronger substantiation of categories. Collecting different types of data by different methods from different sources produces a wider scope of coverage may result in a fuller picture of the phenomena under study. Thus, both quantitative and qualitative data are used in this study [72]. The flexibility given by Grounded Theory (GT) on the other hand gives respondents an ability to express their views and opinions easily and freely [66], [72]. Therefore, the methodological scientific contribution of this study is to utilize a new methodological approach where both diverse qualitative research methods such as Grounded Theory (GT) [35] and quantitative research analyzing approaches are applied. As the quantitative research approach we use novel intelligent computing and analyzing methods, and as a general framework, the Cross Industry Standard Process for Data Mining (CRISP-DM) [36] approach has been selected. Constant comparison between the data and concepts will be made so that accumulating evidence converges on simple and well defined constructs. The boundary conditions of the theory, however, have to be taken into account, because the phenomenon is so atypical that it holds only in this specific contextual healthcare environment.

The practical and managerial contributions of this study are as follows. First, to help physicians and nurses to understand their own valuable knowledge capital and practice, to understand knowledge management better, and to get familiar with knowledge management practices in the hospital. Second, to develop knowledge transfer from the physicians to nurses, and vice versa. Third, with the discovered knowledge new and user friendly knowledge management processes could be remodeled. Fourth, the hospital based knowledge could be used later to implement more user-friendly healthcare information systems. Of course, it may also turn out that the data will not contain enough information to derive valid and solid knowledge management categories and therefore a very careful analysis has to be carried out to find out if the categories discovered in the data are the correct ones.

The results of this project are expected to gain a lot of interest in other Finnish social and healthcare districts and most probably the results are applicable to many hospitals due to their similarity. Internationally this study can offer guidelines and good practices to follow up in the hospitals abroad, and also to improve their ability to better and safety patient care. The research project will have several collaboration partners which have special knowledge in medical science, nursing science, sociology, intelligent computing and systems, information systems, and software engineering. The collaboration partners include both other Finnish Social and Healthcare Districts and international cooperation.

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